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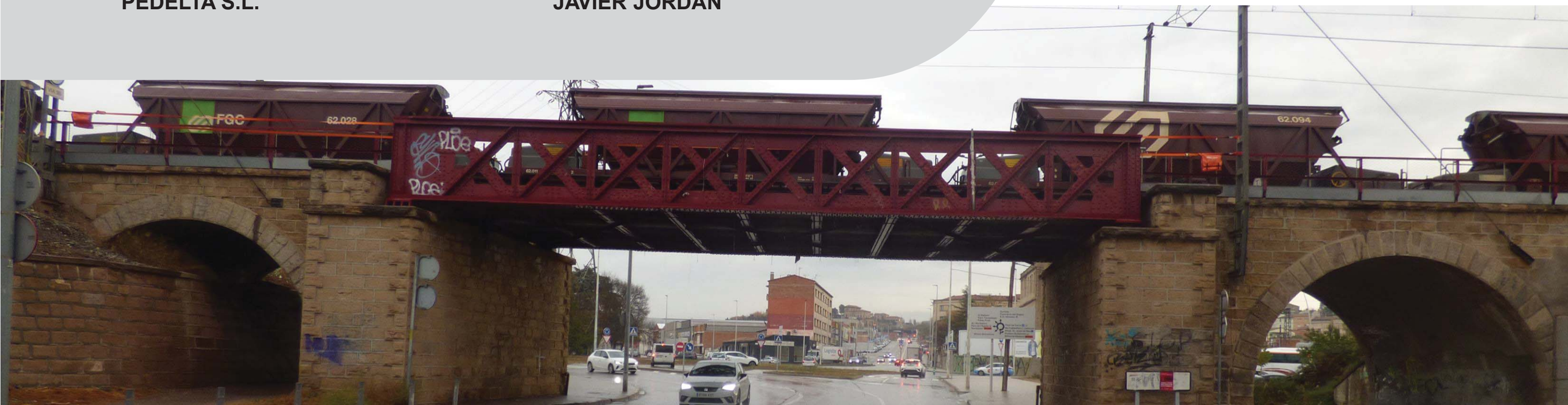
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Títol
# PROJECTE DE REPARACIÓ DEL PONT DE CTRA DE VIC A LA LÍNIA LLOBREGAT - ANOIA DE LA LINIA DELS FERROCARRILS DE LA LA GENERALITAT DE CATALUNYA.

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V I S A T

# DOCUMENT NÚM 1: MEMÒRIA I ANNEXOS

# MEMÒRIA

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# 1 OBJECTE I ANTECEDENTS

L'objecte del present projecte és la definició i valoració de totes les obre necessàries per a l'execució de la "reparació del pont metàl·lic sobre la carretera de Vic de la línia Llobregat-Anoia de FGC" en els termes i condicions establertes en la licitació d'aquest projecte per part de FGC.

## 1.1 ANTECEDENTS ADMINISTRATIUS

Segons les documentacions de la estructura estudiada, l'any de construcció del pont està datat a 1924 (aprox.).

Com a antecedents, es disposa dels documents següents previstos per personal tècnic de la FGC;

**LA_CB-SV_INF_IT_21_069**, informe de prova de càrrega amb data de 19 de gener de 2022. En aquest informe es va realitza l'anàlisi comparativa dels resultats teòrics dels càlculs i els obtinguts experimentalment a la prova de càrrega sobre el pont. A partir d'aquesta anàlisi, es realitzen, amb les aproximacions que es considerin raonables, extrapolacions a possibles situacions de sobrecàrregues que puguin resultar més desfavorables que les emprades a la prova. En qualsevol cas, les tensions, calculades o mesures, es consideren dins un comportament elàstic-lineal del material.

Amb data octubre de 2022, es va emetre l'informe d'Inspecció Principal del pont metàl·lic Pont sobre la carretera de Vic, amb referència **TT_GL_INF_IT_073**. S'han detectat algunes anomalies greus i patologies o danys rellevants relacionades amb l'estructura metàl·lica del pont. Segons les dades aportades per FGC no hi ha hagut intervencions ni inspeccions posteriors a aquest Inspecció principal de pont.

## 1.2 SITUACIÓ ACTUAL I DESCRIPCIÓ DE L'ESTRUCTURA

El pont sobre la carretera de Vic de FGC al PK 60+720, es troba a la carretera de Vic al terme municipal de Manresa, Barcelona. Data de l'any 1924 i ha servit durant gran part de la seva vida per al trànsit de vagons carregats de potassa des de les mines de Súria.

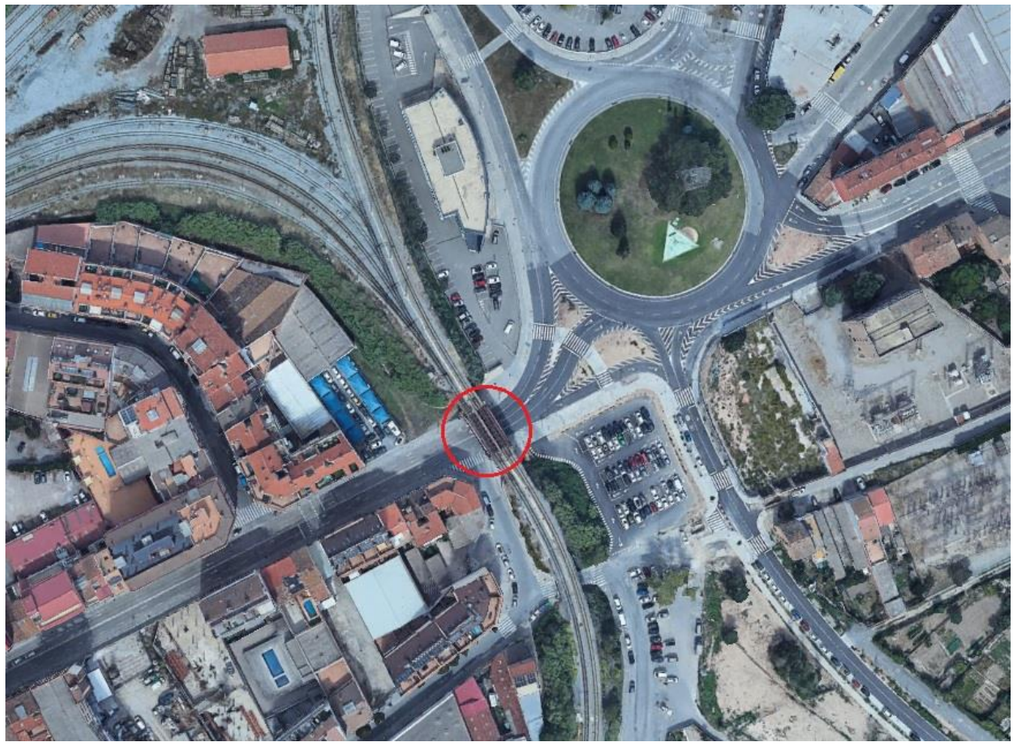


*Figura1: Ubicació del Pont metàl·lic*

És un pont de estructura metàl·lica, el pont té un únic vanol (isostàtic) amb longitud de 17,9m i 8,8m d'amplada.

El pont es constituït per les bigues principals són gelosies a Cruz de Sant Andreu, amb sustentació isostàtica i longitud entre suports de 17,3 m. Consten de 9 mòduls de 1,82 m, amb diagonals creuades a tots ells. El seu cantell màxim és de 2,002 m i la separació entre els seus eixos de 8,8 m. Els cordons estan constituïts per seccions a "T", invertida la inferior, i són variables en anar entrant xapes de reforç. Tant el superior com l'inferior estan reforçats amb perfils angulars simples. Els muntants estan constituïts per xapes i angulars. Les diagonals estan formades per parells d'angulars de diferents mides units entre si per xapes d'ànima. Les unions entre els diferents elements són reblonades. Hi ha cartells als nusos superiors extrems i a les unions amb les biguetes i elements d'arriostraments.

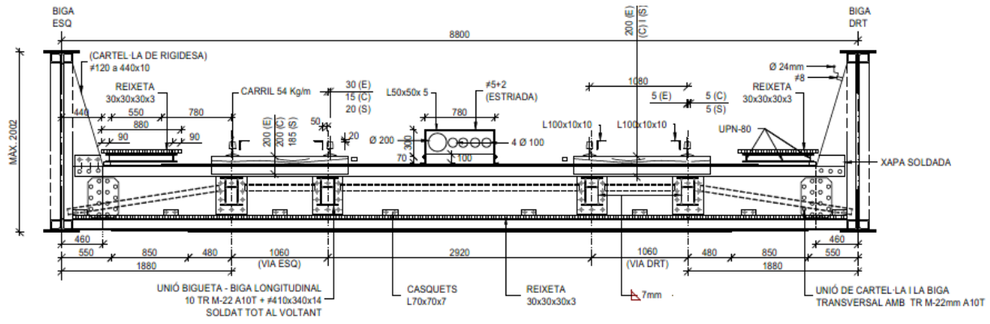



*Figura 2 Secció Transversal*

La posició del tauler és inferior en relació amb les bigues principals. Les biguetes tenen una longitud teòrica de 8,8 m i estan modulades cada 1,82 m, coincidint amb els muntants de les bigues principals. Són bigues armades d'ànima plena, constituïdes per xapes i quatre angulars, amb angulars de reforç a les ales inferiors que no és existent al costat exterior de les biguetes extremes. Tenen secció variable amb un cantell màxim de 0,74 m, al centre de va, i cantell mínim de 0,72 m en els recolzaments. Les unions amb les bigues principals són roblonades i es realitzen a través de les cartelles de rigidesa dels muntants.

Els bigues longitudinals originals han estat substituïts per bigues al calaix. La separació transversal entre eixos és de 1,060 m, sent 1,880 m la distància entre la biga longitudinals exterior i la biga principal, per a ambdues vies, finalment, la separació entre els bigues longitudinals interiors és de 2,92 m. Tenen una llum de 1,82 m i 0,303 m de cantell. S'uneixen a les biguetes mitjançant cargols d'alta resistència a través de casquets d'angular. La unió entre els diferents elements es realitza mitjançant reblons.

El pont disposa d'un arriostrament horitzontal contravent entre les dues bigues, amb modulació cada tres mòduls de biga, a nivell del seu cordó inferior, constituït per una gelosia a la Creu de Sant Andreu.

A més, recentment, s'ha disposat un arriostrament contravent nou entre els bigues longitudinals interiors de cada via, resolt també mitjançant una gelosia a Cruz de San Andrés, modulada igual que les biguetes del tauler.

Finalment, hi ha pòrtics de frenada disposats en els mòduls 2 i 8, resolts mitjançant mòduls a "K" entre el la biga longitudinal exterior i el cordó inferior de la biga principal adjacent, i per mòduls a Cruz de San Andrés entre els bigues longitudinals dels mòduls afectats.

Totes les unions són reblonades, excepte a les diagonals de l'arriostrament inferior reforçades. Les unions es fan a través de cartel·les, presentant excentricitat totes les diagonals.

El pont també disposa de dues passejades de servei interiors a les bigues principals que han estat producte de les feines de renovació. A més, s'han disposat pòrtics de suport de canonades a la zona d'entrevies, cobertes per una xapa estriada que dóna lloc a un tercer passeig.

La xapa de pis és metàl·lica estriada, i està reblonada als perfils que les sustenten. Existeix unes baranes als passeigs laterals.



*Figura 3 Fotografia del pont*

Els estreps del pont presenten paraments frontals plans de maçoneria carejada amb carreus en cantonades i imposta de coronació. Els paraments laterals són murs envoltats de la mateixa tipologia que els frontals. Amb l'existència de dos passos inferiors, en ambdós estreps. Els murs guardabalast són de carreuat, a l'estrep d'entrada, i de formigó, al de sortida. Les coronacions de suports són de carreuat.

Els aparells de suport fixos es troben a l'estrep de sortida. La biga s'uneix a una peça metàl·lica alleugerida que descansa sobre la coronació dels suports. Els mòbils estan a l'estrep d'entrada i compten amb una peça esfèrica que permet el moviment i una base que recolza sobre la coronació. Les bigues estan unides amb quatre cargols a la peça superior dels aparells.

# 2 ESTAT ACTUAL DEL PONT

## 2.1 INSPECCIÓ PRINCIPAL

S'ha realitzat la inspecció principal del pont, realització inspecció visual tant per la part superior en àmbit de vies com la part inferior de l'estructura del pont.

La inspecció s'ha fet a càrrec de PEDELTA S.L (Jordi Pons) amb l'assistència tècnica de FGC (Daniel Aymerich Parera).

A la inspecció, en general, s'ha detectat oxidació generalitzada.

Es descriuen a continuació l'estat i les particularitats observades en aquesta inspecció, per als diferents elements de la seva estructura.

### 2.1.1 Estreps

Els estreps presenten un bon estat general, amb les particularitats i els danys que s'indiquen a continuació.

S'ha observat de manera generalitzada en ambdós estreps una lleu meteorització dels carreus, sent més acusada als extrems de les paraments frontals de la zona dreta i esquerra del parament frontal de l'estrep d'entrada i sota l'imposta a la zona central del parament frontal i del parament lateral esquerre de l'estrep de sortida.

El carreu de cantonada del parament lateral esquerre de l'estrep de sortida està partit.

Hi ha pintades vandàliques als paraments laterals de tots dos estreps.

Les juntes entre carreus s'han reparat recentment a tots els paraments; no obstant això, s'han trobat zones aïllades on s'ha produït un deteriorament del rejuntat o on aquesta reparació no s'ha fet correctament. A l'estrep de sortida s'ha localitzat una lleu separació del rejuntat a la zona superior del parament lateral dret i del parament lateral esquerre, a la cara dorsal amb el va d'aproximació.

S'ha detectat una fissura partint els dos carreus superiors sota la imposta del parament frontal de l'estrep de sortida, a la zona central.

Els murs guardabalast es troben, en general, en un bon estat, excepte unes armadures vistes que s'han localitzat sota la via dreta a l'estrep de sortida.

Les coronacions d'ambdós estreps es troben en bon estat, i s'aprecia una mica de brutícia i balast acumulat en ambdós estreps.

### 2.1.2 Vanols d´aproximació

Les obertures d'aproximació als extrems del pont tenen un estat de conservació acceptable. Cal destacar que les voltes de carreuat han estat cobertes per un morter, impedint així la correcta inspecció de les voltes. Aquest morter, de manera general, es troba en mal estat a causa de la seva mala execució.

S'observen pintades vandàliques de forma generalitzada en les dues obertures d'aproximació.

S'ha localitzat fissuració horitzontal a la quarta filada superior i a l'arrebossat de morter del filtre dret, i als carreus sobre la clau del filtre esquerre, així com fissuració vertical del carreu sobre la clau del filtre dret i a prop de la unió amb el terraplè a l'esquerra.

A més, s'han observat fissures als carreus de l'espatlla de sortida de la rosca dreta del filtre dret, a l'espatlla d'entrada del costat dret i esquerre de la volta i als carreus de rosca esquerra, a prop de la clau del filtre esquerra.

S'ha detectat un lleuger enlairament del timpà amb el terraplè del filtre dret.

A la volta s'han trobat eflorescències a l'espatlla de sortida del costat esquerre i una pèrdua d'esquerdejat al parament de sortida.

Es poden apreciar fissures horitzontals amb eflorescències al parament d'entrada de la volta, fissures transversals a la clau al costat del filtre dret i fissuració en escala seguint les juntes sobre l'espatlla d'entrada. També hi ha fissures en carreus de rosca amb lleugers dipòsits a tots dos filtres, a la zona inferior del filtre esquerre i al costat dret del mur del parament frontal.

S'ha observat certa separació del rejuntat sobre la clau de rosca i al costat del pal de la catenària al filtre esquerre i a la segona filada sobre la clau del filtre dret.

S'han localitzat carreus meteoritzats a l'ancoratge de la catenària i al mur del parament frontal i eflorescències a través de l'esquerdejat del filtre esquerre.

Finalment, hi ha nombrosos carreus d'imposta trencats, a la zona de sortida del filtre esquerre i a la unió amb l'estrep de sortida, així com prop de la barana i a la zona intermèdia del filtre dret.

Existeixen baranes a banda i banda de la plataforma ferroviària a aquest trams d'aproximació.

### 2.1.3 APARELLS DE SUPORT

Els aparells de suport es troben en bon estat de conservació. No s'observa greix a les xarneres i les fundes de protecció es troben trencades. S'observen focus de corrosió començant a reactivar-se al contacte entre el suport i la bigueta, així com a la cara interior de les peces metàl·liques dels suports fixos.

Els bressols d'anivellament es troben en bon estat a tots els suports, excepte en el dret de l'estrep de sortida, que no té bon contacte.

L'estructura no fa topall amb els murs guardabalast, però en el suport mòbil dret es troba molt proper al mur guardabalast de l'estrep d'entrada.

Els cargols de subjecció a les bigues principals estan en bon estat, excepte la manca del cap del cargol dorsal interior dels dos suports mòbils, així com la presència de cargols lleugerament minvats als aparells de suport fixos.

No s'aprecien seients ni desnivellacions.

### 2.1.4 BIGUES PRINCIPALS

Durant la inspecció s'observa la pintura en els elements de la biga principal es troba envellida de forma generalitzada, i s'aprecien saltats de pintura especialment a l'ala del cordó superior i inferior.

S'aprecien corrosions generals als plànols horitzontals dels cordons superior i inferior d'ambdues bigues.

S'han observat corrosions locals als següents punts:

- Paquets d'hidròxid actius entre les xapes d'ala que formen el cordó inferior a les dues bigues principals, causant deformacions a l'ala, En algunes zones, aquests paquets d'hidròxid han estat reparats amb massilla.

- Corrosió al contacte entre el faldó del cordó inferior amb l'angular de reforç de la biga principal.

No s'han observat cops, a excepció es poden apreciar fissures als puts d'unió entre rigiditzadors.

L'estat dels roblons és correcte.

S'ha detectat que hi ha una fissura transversal a l'ala exterior de la diagonal del cinquè mòdul de la biga dreta.

### 2.1.5 TAULER

La pintura del taler es troba en mal estat. Es poden apreciar corrosions generalitzades als plànols horitzontals i a les vores de l'ala de les biguetes amb paquets d'hidròxid, i són més acusades a la via dreta.

S'han observat corrosions locals als següents punts:

- Paquets d'hidròxid intensos entre xapes de l'ala inferior de les biguetes de manera generalitzada, arribant a deformar l'ala i saltar els caps dels roblons a les següents zones.
- Focus de corrosió a les vores de l'ala inferior de les biguetes i als contractes dels cobrijuntes, arribant a produir perforacions de manera generalitzada.
- Escorredor d'òxid als travessers sota les travesses.
- Focus de corrosió aïllats amb pèrdues de secció a l'ala superior de les biguetes.
- Pèrdua de secció a l'ànima inferior de les biguetes extremes.

### 2.1.6 ARRIOSTRAMENTS

L'estat de la pintura dels elements d'arriostrament és nociu. Durant la inspecció, s'observa una pèrdua de la pintura de protecció als elements d'arriostrament inferior, especialment sota els travessers i a la cara superior de les diagonals, així com a les cartel·les. Hi ha una corrosió més intensa a la unió de les cartelles d'arriostrament superior amb el travesser extrem dret. També s'han trobat escorreguts a les cares més exposades d'algunes diagonals i brutícia acumulada a la cara superior de l'arriostrament superior, sota la canaleta de comunicacions.

S'han observat nombroses corrosions locals:

- Saltats de pintura i corrosió a diversos punts de les diagonals d'arriostrament inferior.
- Focus d'òxid a la unió d'arriostrament inferior l'ala de les biguetes.
- Paquets d'òxid intensos a la semidiagonal dreta més propera a l'estrep de sortida.
- Fous d'òxid a les vores de les diagonals de l'arriostrament inferior, a l'arriostrament superior sota les travesses, ales cartelles d'unió a les bigues principals i a les de l'arriostrament superior.
- Picades a les vores de les diagonals que es tornen més intenses a la via dreta.

La diagonal frontal del segon mòdul de l'arriostrament inferior localitzada al costat dret es troba deformada.

L'estat de roblons és adequat. Les cartel·les d'unió es troben en bon estat sota la via esquerra. No obstant això, a les cartel·les del costat dreta es generen focus de corrosió, arribant a causar algunes perforacions.

### 2.1.7 PASSEJOS DE SERVEI

S'observa durant la inspecció que la pintura dels elements de les passejades de servei es troba en estat adequat, exceptuant els suports longitudinals del passeig del costat dret, els quals estan molt corroïts fis i tot arribant a produir deformacions en diversos mòduls per paquets d'hidròxid.

### 2.1.8 MATERIAL DE VÍA

Es va fer la renovació de les travesses d'una de les vies.

Les travesses de fusta es troben amb esquerdes just als punts de fixació dels tirafons dels carrils.

Les encarriladores no estan pintades, l'estat de la via esquerra és bo, però en el cas de la via dreta es troba en un estat d'oxidació elevat.

## 2.2 CONCLUSIONS

Durant la realització del present projecte s'ha realitzat la inspecció de l'estructura, que serveix per a complementar la ja realitzada per INECO i que es va reflectir en el seu *INFORME DE LA PROVA DE CÀRREGA DEL PONT METÀL·LIC DEL PONT SOBRE LA CARRETERA DE VIC DEL PK 60+720 DE LA LÍNIA LLOBREGAT-ANOIA DE FGC, I* que data d'octubre de 2022.

Les principals deficiències trobades en el pont han estat:

- Perforacions en l'ànima de les bigues transversals de diafragma. Poden arribar a afectar la capacitat estructural de les biguetes pel que han de ser reparades a curt termini.
- Reblons saltats a causa de paquets d'hidròxid entre xapes a l'ala inferior de biguetes i oxidació en les xapes. L'avaluació realitzada en aquest document mostra que la capacitat estructural de les biguetes és suficient sense tenir en compte les xapes de reforç inferior, però la seva esperança de vida és limitada.
- Arriostraments inferiors doblegats. D'acord amb els càlculs interns realitzats, si no es té en compte l'acció del arriostrament inferior altres elements se sobrecarreguen, la qual cosa porta a l'incompliment en diversos d'ells. Per tant s'ha de reposar aquests arriostraments. A més, es mostrarà en aquest annex que la seva capacitat estructural és insuficient. També algunes de les xapes de connexió estan deteriorats i s'han de substituir.
- Existeix una fissura en la diagonal del cinquè mòdul de la biga dreta. Si bé els roblons han detingut la seva progressió, ha de ser reparada.
- Algunes soldadures estan fissurades.
- Els aparells de recolzament estan en un estat acceptable. No obstant això, presenten oxidacions i pèrdues de greix, per la qual cosa han de sotmetre's a manteniment per a assegurar el seu adequat comportament.

- Els murs dels estreps i buits d' aproximació de carreuat presenten defectes habituals en aquesta tipologia, però que no revesteixen gravetat, com ara pintades, eflorescències, separació de les juntes, trencament de carreus en coronació o fissures.
- Les voltes de les obertures d'aproximació s'han arrebossat, i presenten importants humitats, la qual cosa ha deteriorat greument l'arrebossat. També hi ha humitats en els murs.
- Els extrems dels murs també s'han arrebossat, i en alguns d'ells han aparegut fissures.
- La part superior dels murs guarda balast és en formigó. Algunes de les armadures es troben actualment exposades.

# 3 AVALUACIÓ ESTRUCTURAL

Es resumeixen en aquest apartat les principals conclusions de l'avaluació:

- La capacitat portant dels elements de les bigues principals, bigues transversals i bigues longitudinals és satisfactòria en tots els casos. El càlcul de fatiga d'aquests elements també ha estat satisfactori i no han esgotat la seva vida útil a fatiga.
- Les bigues transversals presenten un estat de degradació elevat. Tanmateix, la capacitat dels bigues transversals es suficient tenint en compte fins i tot la pèrdua de les xapes de reforç de les ales. També s'ha comprovat que en cas de trencament d'una biga transversal el pont té capacitat de redistribució suficient.
- Els arriostraments inferiors estan doblegats i a més no tenen capacitat suficient. S'han de substituir per dos L90x10.

## 3.1 PROPOSTA D'ACTUACIÓ

Prenent com a punt de partida l'estat actual del pont s'han proposat diverses millores per incrementar la seguretat estructural del pont existent i afavorir- la conservació.

Pel que fa a l'estructura metàl·lica, les reparacions proposades són:

- S'ha de reparar l'ànima de les bigues d'estrep, ja que hi ha perforacions. Per això es proposa accedir des de sota del tauler i retirar les L que cobrin l'ànima i les xapes inferiors. Posteriorment es talla la zona malmesa i es remulla amb soldadura. A més, i per evitar, en la mesura del possible, la presència de soldadures en elements antigues, es proposa reblar els perfils en L i les xapes per uns de nous. Finalment, s'ha comprovat que aquesta connexió té problemes de capacitat estructural, per la qual cosa es proposa el seu reforç.
- Es proposa substituir les xapes de l' ala inferior de totes les bigues transversals a causa del seu avançat estat de deteriorament. A causa dels problemes d' accessibilitat als perns, i per tal de simplificar la reparació, es proposa que la nova xapa se soldi a les L existents. Per això, la xapa serà més estreta que les L, 230 mm, i de gruix idèntic a la suma de les dues, 20 mm.
- S' han de substituir els arriostraments inferiors per uns de major capacitat, ja que els actuals no compleixen amb la normativa. Per això es proposa reblar els perfils actuals L 70x10 per uns L 90x10. A més, s' ha de verificar l' estat de les xapes de connexió i reblar-les si és necessari.
- Per a la reparació de la fissura existent en la diagonal, es proposa la tècnica d'adossar xapes als costats, ja que és el recomanat en aquest tipus de estructures roblonades.
- Es recomana realitzar les tasques habituals de manteniment en recolzaments: neteja, aplicació de greix i remull de proteccions.
- Finalment, és important en aquesta mena d'estructures assegurar la seva durabilitat mitjançant l'aplicació d'un tractament anticorrosiu adequat. Per a això, primerament s'ha de netejar el pont amb doll de sorra, deixant al descobert l'estructura metàl·lica i eliminant l'òxid. Posteriorment s'ha d'inspeccionar l'estructura per a identificar soldadures degradades i altres possibles fissures en elements metàl·lics. Aquests desperfectes s'han de reparar seguidament. I finalment, es pot aplicar la nova capa de pintura. Es proposa que la pintura aquest preparada per a un ambient agressiu (Classe C5) i que tingui una durabilitat alta (Més de 15 anys).

Pel que fa als vanols d' aproximació en carreuat, les principals reparacions proposades són:

- Reparació dels arrebossats en les voltes. Es proposa primerament la seva neteja mitjançant doll a pressió. Seguidament s'instal·laran drenis californians per a millorar el drenatge dels murs i evitar futures humitats. A més, es reparessin les zones deteriorades dels arrebosats. Finalment, s'apliqués una pintura de protecció.
- També s'han de reparar els altres arrebossats, ja que presenten algunes fissures.
- Alguns carreus estan trencats i altres presenten fissures. A més, algunes juntes entre carreus estan degradades. S'han de reparar.
- En l'extrem exterior del mur del costat Barcelona s'ha després un carreu. S'ha de reposar el seu volum.
- Algunes armadures en els murs guarda balast estan exposades. Es recomana sanejar el formigó en aquestes zones.
- Finalment, es proposa la neteja dels murs, ja que presenten pintades i eflorescències.

Totes aquetes actuacions es poden fer sense tall de trànsit al pont, excepte la de reparació de les bigues transversals de diafragma o extremes del pot, on cal actuar per fases transversalment, recolzant la part que s'estigui reparant sota una via i tallant el trànsit a aquella via fins acabada la reparació.

# 4 PLA DE CONTROL DE QUALITAT

En compliment de la normativa vigent s'ha elaborarà un Pla de Control de Qualitat per a l'execució de les obres. A l'annex corresponent de Control de Qualitat, quedarà reflectit la proposta del pla on s'assenyalen les unitats objecte de control, el tipus i la quantitat d'assaigs a realitzar.

Durant l'execució de l'obra, la Direcció d'Obra podrà determinar la modificació del número d'assaigs establerts, així com la realització d'assaigs no previstos inicialment a la proposta del pla de control de qualitat.

El PEC sense IVA del pressupost de control de qualitat ascendeix a 2.946,06 euros que representa un 1,16 % del PEC de l'obra.

Els preus de pressupost tenen repercutit fins a un 1.5% en concepte de control de qualitat, per tant, com que el pressupost de control de qualitat és inferior a aquest percentatge, no hi ha lloc l' abonament de l' import excedent a aquesta quantitat.

# 5 CARTOGRAFIA I TOPOGRAFIA

Per a la realització del present projecte no s'ha realitzat cap aixecament cartogràfic i topogràfic ja que es disposa de tots els plànols amb la informació geomètrica de l'estructura del pont.

# 6 REPLANTEIG

No es preveu necessari donar les coordenades dels punts de replanteig proposats ja que es tracta de un projecte de reparació, en què els parcel·laris de l'ocupació temporal proposat per a les provisions de l'obra es plantegen distribuir en terrenys el propietari dels quals són la FGC (la part superior del pont) i l'Ajuntament de Manresa (la part inferior del pont).

# 7 ORGANITZACIÓ I DESENVOLUPAMENT DE LES OBRES

Per executar la reparació a nivell constructiu del pont metàl·lic sobre la carretera de Vic de la línia Llobregat-Anoia de FGC s'han establert 4 fases d'obra.

## 7.1 FASES D'OBRA

L'estudi i el desenvolupament de l'obra es du a terme mitjançant la divisió en fases, que es detalla a continuació:

### 7.1.1 FASE 1: TREBALLS PREVIS

- Coordinació i obtenció de permisos amb altres organismes i serveis.
- S'instal·laran els tancaments de la zona de casetes, apilaments, contenidors, es col·locaran els senyals de seguretat i salut, s'habilitaran les casetes d'obra (oficina, menjador, sanitaris, vestidor, caseta d'eines) incloent els subministraments a casetes d'aigua, llum. Es prepararan les zones de recollida i es col·locaran els contenidors de residus.
- Gestió de compres i subcontractació.
- Acte de comprovació de replanteig, redacció i aprovació de Pla de Seguretat i Salut, Pla de Qualitat i Medi ambient.

### 7.1.2 FASE 2: ACTUACIONS DE REPARACIÓ I CONSERVACIÓ

#### *7.1.2.1 FASE 2.1: ACTUACIONS AL TALL FASE 1*

- Tall de trànsit per fases 2.1
- Instal·lació de mitjans auxiliars i proteccions (lones, xarxa, barrera new jersey etc.)
- Retirada d'arriostrament inferior
- Retirada de tramex
- Neteja i preparació ST3
- Campanya d´inspecció i caracterització
- Reparacions:
    - Reparació de bigues d'estrep danyades. Aquesta actuació de reparació en concret s'executarà en 2 fases de tall a nivell de trànsit ferroviari, simultani al tall de trànsit inferior de la fase 2.1. Durant l'actuació es preveu realitzar un tall de la circulació de les vies preferiblement a caps de setmana. El tall de la circulació de les vies per a aquesta actuació es preveu amb una duració d'un cap de setmana per estrep (2 caps de setmana de tall de circulació de les vies), encara que el carril costat Sant Fruitós n'hi ha la possibilitat de fer un tall parcial amb desviament del pas dels trens al carril costat Manresa. Es preveu que aquesta actuació es faci en torn diürn i nocturn.
    - Substitució d'ala inferior de les bigues i arriostrament inferior
    - Reparació de fissures i soldadures
    - Revisió de bigues del tramex
- Conservació d'aparells de suport
- Pintura de protecció
- Col·locació de tramex
- Reparacions dels carreus de l'estrep
- Retirada de mitjans auxiliars i elements de protecció
- Desmantellament del tall Fase 1

#### *7.1.2.2 FASE 2.2: ACTUACIONS AL TALL FASE 2*

- Tall de trànsit per fases 2.2
- Instal·lació de mitjans auxiliars i proteccions (lones, xarxa, barrera new jersey etc.)
- Retirada d'arriostrament inferior
- Retirada de tramex
- Netejat i preparació ST3

- Campanya d´inspecció i caracterització
- Reparacions:
    - Reparació de bigues d'estrep danyades. Aquesta actuació de reparació en concret s' executarà en 2 fases de tall a nivell de trànsit ferroviari, simultani al tall de trànsit inferior de la fase 2.2. Durant l'actuació es preveu realitzar un tall de la circulació de les vies preferiblement a caps de setmana. El tall de la circulació de les vies per a aquesta actuació es preveu amb una duració d'un cap de setmana per estrep (2 caps de setmana de tall de circulació de les vies), encara que el carril costat Sant Fruitós n'hi ha la possibilitat de fer un tall parcial amb desviament del pas dels trens al carril costat Manresa. Es preveu que aquesta actuació es faci en torn diürn i nocturn.
    - Substitució d'ala inferior de les bigues i arriostrament inferior
    - Reparació de fissures i soldadures
    - Revisió de bigues del tramex
- Conservació d'aparells de suport
- Pintura de protecció
- Col·locació de tramex
- Reparacions dels carreus de l'estrep
- Retirada de mitjans auxiliars i elements de protecció
- Desmantellament del tall Fase 2

*7.1.2.3 ACTUACIONS AL TALL FASE 3*

- Tall de trànsit per fases 2.3
- Instal·lació de mitjans auxiliars i proteccions (lones, xarxa, barrera new jersey etc.)
- Retirada d'arriostrament inferior
- Retirada de tramex
- Neteja i preparació ST3
- Campanya d´inspecció i caracterització
- Reparacions: substitució d'ala inferior de les bigues i arriostrament inferior, reparació de fissures i soldadures i revisió de bigues del tramex
- Conservació d'aparells de suport
- Pintura de protecció
- Col·locació de tramex
- Retirada de mitjans auxiliars i elements de protecció
- Desmantellament del tall Fase 3

### 7.1.3 FASE 3: ACTUACIONS DE REPARACIÓ I COSERVACIÓ DELS VANOLS D'APROXIMACIÓ

*7.1.3.1 FASE 3.1: VANOL D'APROXIMACIÓ COSTAT BARCELONA*

- Es farà el tall i desviació de trànsit de vianants.
- Instal·lació de de mitjans auxiliars i proteccions.
- Reparacions: Neteja i regeneració superficial, tractament hidròfug i consolidant, segellat de fissures instal·lació de drens.
- Desmantellament de l'ocupació i mitjans

*7.1.3.2 FASE 3.1: VANOL D'APROXIMACIÓ COSTAT MANRESA*

- Es farà el tall i desviació de trànsit de vianants.
- Instal·lació de de mitjans auxiliars i proteccions.
- Reparacions dels carreus de l'estrep.
- Reparacions: Neteja i regeneració superficial, tractament hidròfug i consolidant, segellat de fissures i instal·lació de drens.
- Desmantellament de l'ocupació i mitjans

### 7.1.4 FASE 4: NETEJA I ACABAT DE LES OBRES

Es retirarà i desmantellarà tota la implantació d'obres (casetes d'obres, zona apilaments, subministraments a casetes d'aigua, llum, contenidors de residus, retirada de tancaments d'obra, retirada de senyals de seguretat i salut), es realitzaran els repassos i la reparació de petits desperfectes que indiqui la direcció d'obres i es procedirà a una neteja exhaustiva de tota la zona d'obres per tal de deixar-ho en condicions equivalents prèvia a l'execució de l'obra.

Un cop acabada la fase 4, s'estarà en condicions de fer l'acte de recepció d'obres i la signatura de l'acta de recepció. En aquest acte, es podrien detectar petits desperfectes i/o acabats de petita entitat pendents de realitzar i se'n podrà indicar l'esmena en un termini 1 mes, moment en què, si tot està correcte, es procedirà a realitzar l'acte de recepció definitiva.

D'altra banda, les durades estimades de les tasques a realitzar són les que es presenten a continuació:

Fase 1. TREBALLS PREVIS: 4 setmanes

Fase 2 ACTUACIONS DE REPARACIÓ I CONSERVACIÓ: 15 setmanes

Fase 3. ACTUACIONS DE REPARACIÓ I COSERVACIÓ DELS VANOLS D'APROXIMACIÓ: 4 setmanes

Fase 4.NETEJA I ACABAT DE LES OBRES: 2 setmanes

Al pla d'obres inclòs a l'annex del projecte es mostra el cronograma d'obres, amb detall de les partides/àmbits d'execució, durades, precedències i activitats successors, tipus de lligadures, obtenció del camí crític, etc.

És una durada total de 6 mesos.

## 8 SERVEIS AFECTATS

Durant la inspecció visual realitzat amb data de 01 de desembre 2023 s'ha observat que no es preveu necessari consultar les companyies i organismes de la zona ja que no s'estima cap incidència ni afectació en relació als serveis, atès que les actuacions de la reparació es determinen majoritàriament dins de l'àmbit de l'estructura metàl·lica del pont.

## 9 EXPROPIACIONS

Les expropiacions requerides per a les obres del present projecte consistiran únicament en ocupacions temporals. D'una banda, les zones ocupades pels treballs seran tota la superfície superior del pont; a més de tota la zona inferior del pont, si bé aquesta darrera s'ocuparà només durant fases puntuals.

D'altra banda, hi haurà diverses superfícies ocupades durant tota l'obra per establir la zona de casetes, recollida de materials i contenidors de residus.

Com que totes les superfícies afectades corresponen a vials públics de naturalesa urbana, no es requereix cap procediment expropiatori, i no cal valorar econòmicament l'ocupació temporal d'aquestes superfícies.

## 10 SENYALITZACIÓ, ABALIZAMENT I DEFENSES

La senyalització i abalisament d'obra es projecta en aquelles situacions en les quals és necessari indicar la presència de desviament provisionals o la zona d'obres quan aquestes se situen fora de les plataformes de les carreteres existents per a fer perceptible la seva presència.

S'han tingut en compte els criteris indicats en la instrucció d'obres i el manual d'exemples de senyalització d'obres fixes del Ministeri de Foment, editat en 1998.

El conjunt d'actuacions necessàries a l'efecte d'organització i desenvolupament de les obres ha de quedar reflectit en el pressupost general de l'obra mitjançant una partida alçada de cobrament íntegre. Aquesta partida es justifica a continuació i puja a 11.417,57 € PEM. En el pressupost es detallen tots els elements a utilitzar de senyalització, desviament, abalisament i defensa de l'obra.

## 11 ESTUDI DE SEGURITAT I SALUT

Es defineix com a Seguretat i Salut en el Treball el conjunt de mesures i precaucions que el Contractista està obligat a realitzar i adoptar durant l'execució de l'obra per a la prevenció de riscos d'accidents i malalties professionals, així com els derivats dels treballs de reparació , conservació i manteniment i les preceptives instal·lacions d'higiene i benestar dels treballadors.

D'acord amb el Reial decret 1627/97 de 24 d'octubre de 1997, i amb l'apartat 1 paràgraf g) de l'article 233 de la Llei 9/2017, de 8 de novembre, de contractes del sector públic, per la qual es transposen a l'ordenament jurídic espanyol les directives del Parlament Europeu i del Consell 2014/23/UE i 2014/24/UE, de 26 de febrer de 2014, en aquest projecte s'inclou un estudi de Seguretat i salut a la feina, que forma part del present projecte.

El pressupost de l'Estudi de Seguretat i Salut puja a 5.998,40 € PEM i s'incorpora com a partida alçada d'abonament íntegre al pressupost de les obres.

## 12 JUSTIFICACIÓ DE PREUS

La justificació de preus d'aquest projecte es basa en el banc de preus ITEC BEDEC Construcció 2023, realitzat amb els costos de mà d'obra, maquinària i materials. Els preus no trobats a aquest banc s'han obtingut de la base de preus pròpia de PEDELTA i/o s'ha completat amb la petició de cotitzacions/pressupostos a Industrials/ fabricants/ subministradors.

El percentatge de costos indirectes que s'aplica als preus és del 5 %, tal com ha indicat el Consorci de la FGC.

## 13 ESTIDU DE GESTIÓ DE RESIDUS

L'aprovació del Reial decret 105/2008, d'1 de febrer, pel qual es regula la producció i la gestió dels residus de construcció i demolició, estableix un precedent a nivell nacional en la gestió de residus de construcció i enderrocs.

A l'article 4 d'aquest Reial decret, s'obliga el productor de residus a incloure al projecte d'execució de l'obra un estudi de gestió de residus de la construcció i demolició.

El pressupost de gestió de residus teòricament amb les dades de la taula de previsions de generació de sobrats de materials surt uns 529.94€. Veient el volum de treball i el cost dels mitjans auxiliars per a la retirada de residus de la zona del treball, també amb experiència previs d'altres projectes es decideix pujar a 2500€.

## 14 PRESSUPOST

### 14.1 EL PRESSUPOST DE EXECUCIÓ MATERIAL

El Pressupost d'Execució Material ascendeix a la quantitat de **CENT SETANTA-SIS MIL SET-CENTS TRENTA-SET EUROS AMB NORANTA-QUATRE CÈNTIMS (176.737,94 €).**

## 14.2 PRESSUPOST D'EXECUCIÓ PER CONTRACTE (SENSE IVA)

El Pressupost d'Execució per Contracte sense incloure l'IVA ascendeix a la quantitat de **DOS-CENTS DEU MIL TRES-CENTS DIVUIT EUROS AMB QUINZE CÈNTIMS (210.318,15€).**

## 14.3 PRESSUPOST D'EXECUCIÓ PER CONTRACTE (IVA INCLÒS)

El Pressupost d'Execució per Contracte ascendeix a la quantitat de **DOS-CENTS CINQUANTA-QUATRE MIL QUATRE-CENTS VUITANTA-QUATRE EUROS AMB NORANTA-SIS CÈNTIMS (254.484,96€).**

## 14.4 PRESSUPOST PER AL CONEIXEMENT DE L'ADMINISTRACIÓ

El Pressupost per al coneixement de l'Administració puja a la quantitat de **DOS-CENTS DEU MIL TRES-CENTS DIVUIT EUROS AMB QUINZE CÈNTIMS (210.318,15€).**

No es genera pressupost d'expropiacions ja que els terrenys afectats són ocupacions temporals en vials públics o de FGC.

No es genera pressupost d'assajos de contrast de qualitat ja que el pressupost no excedeix l'import equivalent a l'1.5% del pressupost general de l'obra i el qual s'ha repercutit proporcionalment als preus de pressupost.

A l'annex de monitorització, s'ha estimat un cost de 36.500,00€ per a la partida de monitorització recomanada, que no s'ha inclòs al pressupost del projecte en poder-se gestionar per FGC amb un altre contracte independent.

# 15 CLASSIFICACIÓ DE CONTRACTISTA

D'acord amb el que estableix l'article 77 de la Llei 9/2017, de 8 de novembre, de contractes del sector públic, per la qual es transposen a l'ordenament jurídic espanyol les directives del Parlament Europeu i del Consell 2014/23/ UE i 2014/24/UE, de 26 de febrer de 2014, cal incloure un apartat, al Plec de clàusules administratives de l'obra de referència, on es disposi que les empreses que vulguin optar a la licitació hauran d'estar classificades a els grups, subgrups i categories que s'assenyalen a continuació, aplicables en virtut del Reial decret 1098/2001, del 12 d'octubre, modificat pel RD 773/2015, del 28 d'agost, el qual s'aprova el Reglament general de la Llei de contractes de les administracions públiques, classificacions que podran suplir la solvència sol·licitada si és el cas.

Es considera que la classificació exigible al contractista, segons les anualitats resultants reflectides a la taula adjunta, són:

| REPARACIÓ PONT CTRA. VIC A LA LÌNIA LLOBREGAT-ANOIA DE FGC | | | | | |
|---|---|---|---|---|---|
| Presupuest d'execució per contracte (1) | 254.484,96 € | | | | |
| Termini d'execució (mesos) | 6 | | | | |
| CONCEPTE | | EJECUCIÓ CONTRACTE (2) | % de (2) sobre (1) | TERMINI PARCIAL | Categoria |
| GRUP | SUBGRUP | | | | |
| B) Puentes, viaductos y grandes estructuras | 4) Metàl·lics. | 143.734,67 € | 56,48% | 6 | 1 |

# 16 DOCUMENTS QUE INTEGREN EL PRESENT PROJECTE

**DOCUMENT NÚM. 1: MEMÒRIA I ANNEXOS**

MEMÒRIA

ANNEX NÚM. 01 ANTECEDENTS

ANNEX NÚM. 02 QUALITAT I MEDI AMBIENT

ANNEX NÚM. 03 REPORTATGE FOTOGRÀFIC

ANNEX NÚM. 04 CARTOGRAFI I TOPOGRAFIA

ANNEX NÚM. 05 DEFINICIÓ GEOMÈTRICA

ANNEX NÚM. 06 REPLANTEIG

ANNEX NÚM. 07 ESTRUCTURES

ANNEX NÚM. 08 MONITORATGE

ANNEX NÚM. 09 SERVEIS AFECTATS

ANNEX NÚM. 10 PLA EXPROPIACIONS

ANNEX NÚM. 11 ESTUDI DE GESTIÓ DE RESIDUS

ANNEX NÚM. 12 ESTUDI DE SEGURETAT I SALUT

ANNEX NÚM. 13 PLA DE TREBALLS

ANNEX NÚM. 14 ORGANITZACIÓ I DESENVOLUPAMENT DE L'OBRA

ANNEX NÚM 15. JUSTIFICACIÓ DE PREUS

ANNEX NÚM 16. PRESSUPOST PER A CONEIXEMENT DE L'ADMIISTRACIÓ

ANNEX NÚM 17. PLA D'INSPECCIÓ I MANTENIMENT

**DOCUMENT NÚM. 2: PLÀNOLS**

**DOCUMENT NÚM 3: PLEC DE PRESCRIPCIONS TÈCNIQUES**

**DOCUMENT NÚM 4: PRESSUPOSTOS**

## 17 DECLARACIÓ D'OBRA COMPLETA

En compliment de l'article 127 del Reial decret 1098/2001 de 12 d'octubre, pel qual s'aprova el Reglament general de la Llei de contractes de les administracions públiques, i de l'apartat 1 de l'article 233 de la Llei 9/2017, de 8 de novembre, de contractes del sector públic, per la qual es transposen a l'ordenament jurídic espanyol les directives del Parlament Europeu i del Consell 2014/23/UE i 2014/24/UE, de 26 de febrer de 2014, es manifesta que el projecte comprèn una obra complerta en el sentit exigit a l'article 125 del Reial decret 1098/2001 de 12 d'octubre, ja que conté tots i cadascun dels elements que són necessaris per a la utilització d'obra i és susceptible de ser lliurada a l'ús general . Així mateix, es fa constar que l'obra compleix els requisits exigits per la Llei 3/2007 de 4 de juliol de l'Obra Pública i concretament el que reflecteix l'article 18 de la mateixa

Així mateix, es fa constar que l'obra compleix els requisits exigits per la Llei 3/2007 de 4 de juliol de l'Obra Pública i concretament el que reflecteix l'article 18 de la mateixa.

## 18 CONCLUSIONS

Amb tot allò que s'ha exposat a la present memòria i als seus annexos, així com a la resta dels Documents del present projecte constructiu, considerem el mateix perfectament justificat i, en conseqüència, es trasllada a la Superioritat per a la seva aprovació.

Barcelona, Març de 2024

Autor del Projecte

COL·LEGI D'ENGINYERS DE CAMINS, CANALS I PORTS CATALUNYA

| Expedient | Data |
|---|---|
| 2024/01262/01 | 10/04/2024 |

V I S A T

Fco. Javier Jordán García

PEDELTA SL

# ANNEX NÚM. 1: ANTECEDENTS

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 14/12/2023 | DJS | | |
| | | | | |
| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| Totes | Creació del document |
| | |
| | |
| | |

NOM FITXER : 231214 PMAN-FGC-PED-ANTECEDENTS-V00

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2 ANTECEDENTS ..... 1

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# 1 OBJECTE

Al present annex es relaciona tota la documentació referent als antecedents administratius pels quals ha passat l'expedient del present Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya.

# 2 ANTECEDENTS

Com a antecedents, es disposa dels documents previstos per personal tècnic de la FGC.

Segons les documentacions de la estructura estudiada, l'any de construcció del pont està datat a 1924.

Atenent la Inspecció Principal realitzada de l'estructural Pont metàl·lic sobre la carretera de Vic s'han observat algunes deficiències a les que FGC va acordar amb data de 19 de setembre 2023 adjudicar el servei de referència a l'empresa PEDELTA SL, i exigeix la redacció d'un projecte de reparació que defineixi les actuacions necessàries per evitar que els deterioraments detectats degraden el nivell de servei d'aquesta estructura.

FGC proveeix tots els document següents; projecte de rehabilitació, informe de prova de càrrega, l'anterior Inspecció Principal realitzada amb els plànols de l'estructura existent.

## 2.1 PROJECTE DE CONSTRUCTIU I PROJECTE DE REHABILITACIÓ DEL PONT

FGC facilita el projecte de rehabilitació del pont metàl·lic amb data de novembre 1991 i el projecte original amb data de 25 de febrer de 1923 amb les diagrames d'esforços tallants i moments flectors que actua a l'estructura del pont metàl·lic.

## 2.2 CONCURS I ADJUDICACIÓ DEL PRESENT PROJECTE DE REPARACIÓ

En data de desembre del 2022 FGC va treure a concurs públic la licitació del contracte de serveis relatiu a la redacció del projecte de reparació a la redacció de projectes de reparació dels ponts metàl·lics de Marganell, Boades i Ctra. de Vic de la línia Llobregat – Anoia dels ferrocarrils de la generalitat de Catalunya. Lot 3: servei de redacció del projecte de reparació del pont de Ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya.

L'adjudicació i formalització del contracte de redacció de projecte de reparació amb PEDELTA SL va ser en data 19 de setembre de 2023.

## 2.3 INFORME DE PROVA DE CÀRREGA

En aquest informe, LA_CB-SV_INF_IT_21_069 amb data de 19 de gener de 2022, es va realitza l'anàlisi comparativa dels resultats teòrics dels càlculs i els obtinguts experimentalment a la prova de càrrega sobre el pont. A partir d'aquesta anàlisi, es realitzen, amb les aproximacions que es considerin raonables, extrapolacions a possibles situacions de sobrecàrregues que puguin resultar més desfavorables que les emprades a la prova. En qualsevol cas, les tensions, calculades o mesures, es consideren dins un comportament elàstic-lineal del material.

FGC Juntament amb l'informe de la prova de carrega també facilita les fitxes de característiques tècniques de les càrregues que s'han fet servir durant l'anterior prova de càrrega son les següents:

- Fitxa tècnica de la Locomotora 254 I
- Fitxa tècnica de la Locomotora 257
- Tremuja 62000

## 2.4 INSPECCIÓ PRINCIPAL DEL PONT

Amb data octubre de 2022, es va emetre l'informe d'Inspecció Principal del pont metàl·lic Pont sobre la carretera de Vic, amb referència TT_GL_INF_IT_073. S'han detectat algunes anomalies greus i patologies o danys rellevants relacionades amb l'estructura metàl·lica del pont. Segons les dades aportades per FGC no hi ha hagut intervencions ni inspeccions posteriors a aquest Inspecció principal de pont.

# APÈNDIX 1 ACTA D'INICI DEL SERVEI

FGC
Ferrocarrils
de la Generalitat
de Catalunya

**Ord. 40**

## Acta d'inici del servei

Expedient: CONTR/2022/625 - CONTR/2023/603
Comanda: 4120003404

**SERVEI DE REDACCIÓ D'ASSITÈNCIA TÈCNICA PER A LA REDACCIÓ DE PROJECTES DE REPARACIÓ DELS PONTS METÀL·LICS DE MARGANELL, BOADES I CTRA. DE VIC DE LA LÍNIA LLOBREGAT – ANOIA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA. LOT 3: SERVEI DE REDACCIÓ DEL PROJECTE DE REPARACIÓ DEL PONT DE CTRA DE VIC A LA LÍNIA LLOBREGAT – ANOIA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA**

Reunits avui dia 19 de setembre de 2023, d'una banda el Cap de l'Àrea d'Infraestructura, el senyor Antonio Gil Tubella i el tècnic de l'àrea d'Infraestructura, Tomás de Martí Villalba, per part de Ferrocarrils de la Generalitat de Catalunya i d'una altra el senyor Francisco Javier Jordan García, en representació de l'empresa **PEDELTA, SL**, procedeixen a la revisió dels punts establerts al contracte per a l'inici d'aquest servei, signant de conformitat amb la Documentació Tècnica que reben de Ferrocarrils de la Generalitat de Catalunya a la fi que es puguin començar i portar a terme el servei adjudicat.

I perquè així consti, iniciant el servei i comptant a partir d'aquest moment el termini d'execució, signen la present Acta a Barcelona en la data assenyalada en principi.

**Cap d'Àrea d'Infraestructura**
**(Promotor)**
Antoni Gil Tubella
Signat electrònicament

**Tècnic de l'Àrea d'Infraestructura**
**(Promotor)**
Tomás de Martí Villalba
Signat electrònicament

**Per l'empresa**
**PEDELTA, SL**
Francisco Javier Jordan García
Signat electrònicament

37383096T
FRANCISCO JAVIER
JORDAN GARCIA (
R: B60453784)

Firmado digitalmente por: 37383096T FRANCISCO JAVIER JORDAN GARCIA ( R: B60453784)
ND: CN = 37383096T FRANCISCO JAVIER JORDAN GARCIA (R: B60453784) C = ES O = PEDELTA, SOCIEDAD LIMITADA
Fecha: 2023.09.19 19:02:45 +01'00'

**Vist i plau**
**EL DIRECTOR DE XARXA FERROVIÀRIA-PROJECTES –**
Pere Mateu Soler (Promotor)
Signat electrònicament

Nota: A tots els efectes la data d'aquesta acta d'inici del servei és la indicada a l'encapçalament, independentment de la data de la seva signatura digital. Els signats de l'acta fan constar que en la data de la seva signatura electrònica ratifiquen i fan constar que totes les dades que consten a l'acta són correctes, fent especial menció a que la data en la que es va aixecar la mateixa i es va procedir a realitzar l'inici del servei, la situació i estat eren els que es detallen a l'acta. Així mateix que la intervenció de diferents persones en l'acte i la necessitat d'incorporar mecanismes segurs de signatura (electrònica) impedeixen la signatura coincident amb la data en la que s'ha procedit a realitzar l'acte. No obstant, els que signen, en la data en la que ho fan, fan constar que confirmen que la informació que es detalla en l'acta és la que constava en la data efectiva en la que es van produir les actuacions.

# ANNEX NÚM. 2: QUALITAT I MEDI AMBIENT

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 31/01/2024 | DJS | JJO | JJO |
| 1 | 11/03/2024 | DJS | JJO | JJO |
| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| Totes | Creació del document |
| | |
| | |
| | |

NOM FITXER : 240131 PMAN-FGC-PED-QUALITAT I MEDI AMBIENT-V00

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3.2.1 Assaigs de control de gruixos ..... 2

3.2.2 Assaigs de control d' adherència ..... 2

4 VALORACIÓ ECONÒMICA ..... 2

5 FITXES TÈCNIQUES DE MATERIALS DE REFERÈNCIA ..... 3

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# 1 INTRODUCCIÓ

Al present annex de qualitat i medi ambient del projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya té per objectiu; identificar tots els condicionants i prescripcions sobre el citat projecte, determinar les actuacions a nivell ambiental que es poden dur a terme en fase de disseny i/o d'execució, establir les principals activitats i materials a controlar, elaborar el corresponent pla d'assaigs, i per últim, identificar les possibles situacions d'emergència ambiental.

# 2 DOCUMENTACIÓ A PROPORCIONAR A LA DIRECCIÓ DE LES OBRES

El contractista proporcionarà a la Direcció d' obra la següent documentació per a tots els materials utilitzats en obra o quan se li requereixi:

**CERTIFICAT I SEGELLS DE QUALITAT**

S' adjuntaran tots els documents que garanteixin la qualitat dels materials, com els certificats ISO 9001 de qualitat i ISO 14001 de medi ambient, segells de qualitat i certificacions de conformitat CE per a les plantes subministradores en general tots els que demandi la direcció d' obra.

**CERTIFICATS DE GARANTIA I CONTROL DE QUALITAT PREVI**

Prefabricats

- Control de qualitat de planta: materials i execució

Acer estructural en perfils

- Certificats de material
- Certificat conforme empresa té classe d' execució EXC3 segons norma EN 1090-1
- Procediments de soldadura
- Qualificació de soldadors
- Pla de punts d' Inspecció

Altres:

- Certificats de tubs de PVC
- Certificats de pintura de senyalització viària

ESTUDIS COMPARATIUS DE MATERIALS

El procés que se seguirà fins a l' aprovació per a l' ús d' un determinat material serà el següent:

- El contractista presentarà un comparatiu amb característiques tècniques de totes les ofertes que té per a la compra d' un equip per l' obra.

- La Direcció d' Obra, el contractista i l' Assistència tècnica debaten la idoneïtat d' escollir una oferta o una altra, tenint en compte les condicions tècniques i econòmiques.

- Com a resultat d' aquest debat es formalitza una proposta de comanda en la qual la Direcció d' Obra i el Contractista es posen d' acord en l' oferta escollida pel subministrament d' un equip determinat.

Dins d' aquest estudi comparatiu de materials, es presentaran uns quadres resum. Com a mínim, es formalitzaran els següents:

- En cas de subcontractar-se, industrial que realitzarà els reforços i reparacions d'estructura metàl·lica.
- Acer estructural en perfils i xapes
- Pintura anticarbonatació
- Pintura de protecció d'estructura metàl·lica
- Senyalització
- Drenatge

A continuació, s' adjunta el model de quadre comparatiu:

| | | | | | | |
|---|---|---|---|---|---|---|
| **COMPARATIU D´OFERTES** | | | | | | |
| **OBRA:** | | | | | | |
| **ACTIVITAT:** | | | | | | |
| **DATA:** | | DD.MM.AAAA | | | | |
| **DESCRIPCIÓ UNITATS** | | | Empresa | | | |
| | | | Telèfon | | | |
| | | | Fax | | | |
| | | | sr. | | | |
| | | | Empresa | | | |
| | | | Telèfon | | | |
| DESCRIPCIÓ | UT. | MEDICIÓ | Fax | | | |
| | | | sr. | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| **PROPORCIONAL TOTAL COST** | | | | | | |
| | | | | | | |
| **OBSERVACIONS:** | | | | | | |
| | | | | | | |
| **CONDICIONS:** | | Plaç entrega | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| **Proposta d´adjudicació** | | | | | | |
| | | | | | | |
| Empresa | | | | | | |
| | | | | | | |
| Motius ppals. | | | | | | |
| | | | | | | |

## 3 CONTROL DE CALIDAD DURANTE LA EJECUCIÓN DE LA OBRA

### 3.1 ACER ESTRUCTURAL

Es desenvoluparà un pla de punts d'inspecció (PPI) que servirà de guia per al control de fabricació i execució d'estructura metàl·lica. Tindrà els següents àmbits:

Fase prèvia

Fase de taller

Fase d' obra

S' inclou com a apèndix el PPI proposat.

### 3.2 SUPERFÍCIE PINTADA

#### 3.2.1 Assaigs de control de gruixos

En obra i en laboratori (assaig tipus PIG). S' utilitzarà un Mesurador de gruix PIG multicapa ISO 2808 per a qualsevol substrat: fusta, plàstic, metall.

#### 3.2.2 Assaigs de control d' adherència

Adherència per Tracció, mesurador electrònic KN-1: La prova d' adherència per arrencada determina l' adherència del revestiment mitjançant el mesurament de la força d' arrencada necessària per retirar la patidora del revestiment.

Tall per Enreixat, aplicació de ganiveta en la posició correcta segons l' angle especificat en la norma d' assaig d' adherència ASTM D3359, ISO 2409.

## 4 VALORACIÓ ECONÒMICA

El PEC sense IVA del pressupost de control de qualitat ascendeix a 2.946,06 euros que representa un 1,16% del PEC de l'obra.

Els preus de pressupost tenen repercutit fins a un 1.5% en concepte de control de qualitat, per tant, com que el pressupost de control de qualitat és inferior a aquest percentatge, no hi ha lloc l' abonament de l' import excedent a aquesta quantitat.

# 5 FITXES TÈCNIQUES DE MATERIALS DE REFERÈNCIA

En pàgines següents, s'adjunten fitxes tècniques de materials proposats només amb caràcter de referencia pel contractista. Aquesta podrà escollir-ne d'altres sempre i quan compleixin amb les especificacions tècniques mínimes que estableixi la present memòria valorada o el director de les obres.

S'adjunten fitxes tècniques del següents materials/productes:

- PPG Amerlock R 2 Sigma cover TM 2
- AMERSHIELD

# APÈNDIX 1 PLA DE CONTROL

# PLA DE CONTROL DE QUALITAT

Operacions de Control | Planejament | 

| | |
|---|---|
| Obra | 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC |
| Capítol | 01 REPARACIÓ I CONSERVACIÓ D'ESTRUCTURA METÀL.LICA |
| Titol 3 | 02 REPARACIÓ |

**P447-DMDM** Acer S275J0 segons UNE-EN 10025-2, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat a taller i amb una capa d'imprimació antioxidant, per a reforç d'elements d'encastament, recolzament i rigiditzadors, col·locat a l'obra amb soldadura (P - 15) — 2.773,597 kg

Tipus de Control: Control d'execució

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J441FF0N | Mesura del desplom i de la fletxa d'elements verticals i bigues d'acer segons l'article 19-2 de la Instrucció EAE 2011 | 2,00 | 16,51 | 33,02 | | 1 | 2.000,000 | KG | 1,0000 | Tram |

Tipus de Control: Control d'obra acabada

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J441J108 | Jornada per a inspecció visual d'unions soldades segons les normes UNE 14044, UNE-EN 13018 i per a assaig mitjançant partícules magnètiques i/o líquids penetrants segons les normes UNE-EN ISO 17638, UNE-EN ISO 3452-1 i la seva acceptació segons les normes UNE-EN ISO 23277, UNE-EN ISO 23278 | 1,00 | 600,00 | 600,00 | | 1 | 10.000,000 | KG | 1,0000 | Tram |

**P448-DMDQ** Reparació de cordó de soldadura segons classe d'execució exc3 de norma en-1090:2-2011, incloent retirada de cordó de soldadura existent fins a deixar exposat metall base, preparació de vores d'acord amb el mètode i procés de soldadura, alineat i fixació de xapes, preescalfament de xapes segons EN-ISO-13916 I 1011-2, execució de soldadures segons l'especificació que s'estableixi de WPS, soldadura de filet en angle amb gruix no inferior al valor mínim de coll per a cada unió soldada, inclòs classificació residus, càrrega , transport i cànon d'abocament i manteniment de l'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en feines en àmbit ADIF (P - 16) — 30,000 m

Tipus de Control: Control d'execució

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J441FF0N | Mesura del desplom i de la fletxa d'elements verticals i bigues d'acer segons l'article 19-2 de la Instrucció EAE 2011 | 1,00 | 16,51 | 16,51 | | 1 | 2.000,000 | KG | 1,0000 | Tram |

Tipus de Control: Control d'obra acabada

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| J441J108 | Jornada per a inspecció visual d'unions soldades segons les normes UNE 14044, UNE-EN 13018 i per a assaig mitjançant partícules magnètiques i/o líquids penetrants segons les normes UNE-EN ISO 17638, UNE-EN ISO 3452-1 i la seva acceptació segons les normes UNE-EN ISO 23277, UNE-EN ISO 23278 | 1,00 | 600,00 | 600,00 | Si | 1 | 0,000 | KG | 1,0000 | Tram |

P448-DMDUA Reposició de perfils en costat tauler de bigues diafragma, incloent perfils L120x120x15 i Lx100x100x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants en L120x120x15, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 18) 688,000 kg

Tipus de Control: Control d'execució

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J441FF0N | Mesura del desplom i de la fletxa d'elements verticals i bigues d'acer segons l'article 19-2 de la Instrucció EAE 2011 | 1,00 | 16,51 | 16,51 | | 1 | 2.000,000 | KG | 1,0000 | Tram |

Tipus de Control: Control d'obra acabada

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J441J108 | Jornada per a inspecció visual d'unions soldades segons les normes UNE 14044, UNE-EN 13018 i per a assaig mitjançant partícules magnètiques i/o líquids penetrants segons les normes UNE-EN ISO 17638, UNE-EN ISO 3452-1 i la seva acceptació segons les normes UNE-EN ISO 23277, UNE-EN ISO 23278 | 1,00 | 600,00 | 600,00 | | 1 | 10.000,000 | KG | 1,0000 | Tram |

P448-DMDU1C Substitució de arriostrament inferior, incloent perfils Lx90x90x10, xapes de conexió de 10 mm i reposició de fins a quatre xapes de connexió de 10 mm en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant i la part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 24) 1.738,800 kg

Tipus de Control: Control d'execució

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J441FF0N | Mesura del desplom i de la fletxa d'elements verticals i bigues d'acer segons l'article 19-2 de la Instrucció EAE 2011 | 1,00 | 16,51 | 16,51 | | 1 | 2.000,000 | KG | 1,0000 | Tram |

Tipus de Control: Control d'obra acabada

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J441J108 | Jornada per a inspecció visual d'unions soldades segons les normes UNE 14044, UNE-EN 13018 i per a assaig mitjançant partícules magnètiques i/o líquids penetrants segons les normes UNE-EN ISO 17638, UNE-EN ISO 3452-1 i la seva acceptació segons | 1,00 | 600,00 | 600,00 | | 1 | 10.000,000 | KG | 1,0000 | Tram |

les normes UNE-EN ISO 23277, UNE-EN ISO 23278

P448-DMDUE Substitució del reforçament de bigues metàl·liques amb xapes planes de 230x20 mm en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant, soldadura a la xapa existent, part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 21) 3.105,480 kg

Tipus de Control: Control d'execució

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J441FF0N | Mesura del desplom i de la fletxa d'elements verticals i bigues d'acer segons l'article 19-2 de la Instrucció EAE 2011 | 2,00 | 16,51 | 33,02 | | 1 | 2.000,000 | KG | 1,0000 | Tram |

Tipus de Control: Control d'obra acabada

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J441J108 | Jornada per a inspecció visual d'unions soldades segons les normes UNE 14044, UNE-EN 13018 i per a assaig mitjançant partícules magnètiques i/o líquids penetrants segons les normes UNE-EN ISO 17638, UNE-EN ISO 3452-1 i la seva acceptació segons les normes UNE-EN ISO 23277, UNE-EN ISO 23278 | 1,00 | 600,00 | 600,00 | | 1 | 10.000,000 | KG | 1,0000 | Tram |
| **Total** | **REPARACIÓ 01.01.02** | | | **3.115,57** | | | | | | |

Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 01 REPARACIÓ I CONSERVACIÓ D'ESTRUCTURA METÀL.LICA
Titol 3 03 CONSERVACIÓ

P8B2-G2EZ Pintat d'estructures d'acer amb sistemes de protecció amb grau de durabilitat H, per a classe d'exposició C5-I/M, segons UNE-EN ISO 12944-5, format per 3 capes, capa d'imprimació de, capa intermèdia de, i capa de acabat, amb un gruix total de protecció de 250 µm, aplicat de forma manual o amb pistola, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 31) 844,145 m2

Tipus de Control: Control d'obra acabada

| Codi Assaig | Descripció | Resultat | Preu | Import | Únic | Nº Assaigs per Lot | Freqüència Lot | Unitat Freqüència | Relació d'Unitats | Tipus de Càlcul |
|---|---|---|---|---|---|---|---|---|---|---|
| J89ZSH0M | Determinació del gruix de pel.lícula del recobriment de pintura sobre un element metàl·lic, segons la norma UNE-EN ISO 2808 | 30,00 | 14,90 | 447,00 | Si | 30 | 0,000 | | 1,0000 | Global |
| **Total** | **CONSERVACIÓ 01.01.03** | | | **447,00** | | | | | | |

# APÈNDIX 2 PLA DE PUNTS D' INSPECCIÓ

# PLAN DE PUNTOS DE INSPECCIÓN ESTRUCTURAS METÁLICAS

Rev-1 31-01-2024

OBRA: **PONT SOBRE LA CARRETERA DE VIC, MANRESA**

FABRICACIÓN DE ESTRUCTURAS DE ACERO: **FASE PREVIA**

HOJA 1 de 3

| Nº | Descripción Operación | Tipo Inspección | Procedimiento Norma | Frecuencia Extensión | Observaciones | Punto Aviso | Punto Espera | A quien aplica revisar y Firma ➡ | | | Fecha |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.p** | MEMORIA Y PLANOS DE PROYECTO | Revisión Documental | SE-Art.2.1.1 y 2.1.2 | 100% antes de iniciar fabricación | Instituir Registro de planos aprobados para Construir | - | HP | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA ➡ | |
| **2.p** | PLIEGO DE CONDICIONES TÉCNICAS PARTICULARES | Revisión Documental | SE-Art.2.1.3 | 100% antes de iniciar fabricación | Incluidos los requisitos y niveles de calidad esperada | - | HP | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA ➡ | |
| **3.p** | MANUAL DE CALIDAD DEL FABRICANTE/MONTADOR | Revisión Documental | | 100% antes de iniciar fabricación | Aprueba la Dirección Facultativa | - | HP | ➡ TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA ➡ | |
| **5.p** | APROBACIÓN DE PLANOS DE FABRICACIÓN | Revisión Documental | SE-A p.12.4.1 b) | 100% antes de iniciar fabricación | Aprueba la Dirección Facultativa | - | HP | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA ➡ | |
| **6.p** | APROBACIÓN DEL P.P.I. DE TALLER DEL FABRICANTE | Revisión Documental | SE-A p.12.4.1 c) | 100% antes de iniciar fabricación | Plan de aseguramiento de la Calidad del Estructurista (puede aprobarse en armonía con este PPI). Aprueba la D.F. | - | HP | ➡ TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA ➡ | |
| **7.p** | **CALIFICACIÓN DE LOS OPERARIOS SOLDADORES Y HABILITACIÓN DE LOS APLICADORES DE PINTURAS Y DE OTROS PRODUCTOS DE PROTECCIÓN** | Revisión Documental | EN 287 / ASME IX | 100% | Registros de taller y de obra | - | HP | ➡ TALLER | ➡ LABORATORIO CONTROL | DIRECCIÓN OBRA | |

Leyenda: t=realizar en taller; o= realizar en obra; : avisar LAB: CONTROL ; HP:prescritivo para poder seguir

# PLAN DE PUNTOS DE INSPECCIÓN ESTRUCTURAS METÁLICAS

Rev-1 31-01-2024

OBRA: **PONT SOBRE LA CARRETERA DE VIC, MANRESA** — FABRICACIÓN DE ESTRUCTURAS DE ACERO: **FASE DE TALLER** — HOJA 1 de 1

| Nº | Descripción Operación | Tipo Inspección | Procedimiento Norma | Frecuencia Extensión | Observaciones | Punto Aviso | Punto Espera | A quien aplica y Firma | | | Fecha |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.t** | ***RECEPCIÓN DE LOS MATERIALES A EMPLEAR EN LA FABRICACIÓN*** | | | | | | | | | | |
| 1.1.t | Perfiles Laminados: Revisión documental, Control visual y dimensional para la recepción | Documental Visual Dimensional | UNE EN 10025 SE-A UNE EN 10024 UNE EN 13018/A1 | 100% documental Muestreo 5% I.V. Muestreo 5% I.D. | Aplicable a todos los materiales a recepcionar para admisión a fabricación (100%) y a materiales ya transformados por terceros (muestreo). Se requiere trazabilidad física y documental de los materiales (cada conjunto debe tener una marca duradera, distinguible, que no produzca daño y resulte visible tras el montaje - están permitidos los números estampados y las marcas punzonadas para el mercado pero no las netalladuras cinceladas). Método de marcado duradero y distinguible de los aceros a proponer por FABRICANTE y autorizar por D.F. Incluye determincación de las características geométricas de un perfil o | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 1.2.t | Chapas: Revisión documental, Control visual y dimensional para la recepción | Documental Visual Dimensional | UNE EN 10025 SE-A ENV 1090 UNE EN 13018/A1 | | | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| | Ultrasonidos en chapas de esp ≥ 20 mm | UT | UNE EN 10160 S2-E3 | | | | | | | | |
| 1.3.t | Roblones/conectores para uniones metalicas | Documental Visual Dimensional | DIN 17100 UNE EN 10024 | 100% documental Muestreo 5% I.V. | | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 1.4.t | Verificación del cumplimiento del método de trazabilidad de los materiales en la estructura | Documental Visual | ENV 1090 Cap.5.2.1 Pliego de Condiciones | Muestreo periódico | En el control del proceso incluir sistemáticas de verificaciones mediante rutas inversas | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| **2.t** | ***AUTORIZACIÓN DE ENVIO A OBRA*** | Documental RPX 95 / SE-A | Pliego de condicones ENV 1090 capitulo 11 | 100% de cada envío a obra | Realiza DF con base en los avisos de disponibilidad del fabricante + los informes del Control de Calidad (Entidad de Control Independiente) y ATISAE | | HP | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |

| | |
|---|---|
| Notas | *a) Todas las inspecciones y los controles especificados en el PPI se documentarán convenientemente, ubicando detenidamente y de forma inequívoca las partes inspeccionadas, mediante croquis e indicación de los sectores examinados (los controles realizados deben mantener constantemente su trazabilidad exacta para poderse facilmente localizar durante todas las fase de la fabricación y del montaje de la estructura, incluída la estructura totalmente terminada). Los registros de los resultados obtenidos contendrán siempre los valores explícitos y su comparación con las tolerancias admisibles.* |
| | *b) La entidad de Control Independiente y el Departamento de Calidad Interna del Fabricante pondrán a disposición de la DF, en taller y en obra, toda la documentación de calidad referente a este PPI, según se genere (hojas de campo, borradores, comunicados diarios, y partes de desviación).* |
| | *c) Las operaciones de Inspección a realizar por el departamento de Calidad interna del Taller deben contemplar la correcta aplicación de los procedimientos durante el proceso de fabricación (por ejemplo en el caso de la trazabilidad, debe especificarse quien y como se verifica la correcta aplicación del método de trabajo, cuales con los puntos de control, como se realiza la comprovación, etc). Documentar el control con los valores medidos durante la verificación.* |

Leyenda: t=realizar en taller; o= realizar en obra; : avisar LAB: CONTROL ; HP:prescritivo para poder seguir

# PLAN DE PUNTOS DE INSPECCIÓN ESTRUCTURAS METÁLICAS

Rev-1 31-01-2024

OBRA: **PONT SOBRE LA CARRETERA DE VIC, MANRESA** FABRICACIÓN DE ESTRUCTURAS DE ACERO: **FASE DE OBRA** HOJA 1 de 3

| Nº | Descripción Operación | Tipo Inspección | Procedimiento Norma | Frecuencia Extensión | Observaciones | Punto Aviso | Punto Espera | A quien aplica y Firma | | | Fecha |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. o** | ***RECEPCIÓN DE ELEMENTOS PREFABRICADOS Y MATERIALES A EMPLEAR EN EL MONTAJE*** | | | | | | | | | | |
| 1.1.o | Recepción de elementos fabricados procedentes de taller o de otros suministradores | Visual | ENV 1090 SE-A<br>s/ Procemiento aprobado y Planos | 100% | Correspondiente con la autorización de envió, tipo, numero, trazabilidad aspecto general y condiciones de acopio en obra. | | HP | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 1.2.o | Material de aportación para el soldeo (incluye Gas, flux y respaldos). | Documental Visual Instrumental | UNE EN 729 ASME II parte c SE-A | Cada lote presente en obra | | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 1.3.o | Roblones/conectores para uniones metalicas | Documental Visual Instumental (Ensayos) | SE-A<br>EN 20898-1 Y 2<br>EN 10083-1 | Cada lote presente en obra | | | HP | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 1.4.o | Pinturas.<br>(incluye abrasivos de limpieza y diluyentes). | Documental Visual envases | UNE-EN ISO 12944<br>ISO 1512 / UNE 48083 | 100% docum.<br>Muestreo 5% I.V | | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 1.5.o | Verificación del cumplimiento del método de Trazabilidad de los materiales de estructura | Documental<br>Visual | ENV 1090 Cap. 5.2.1<br>Pliego de condiciones | Muestreo periodico | Incluir verificaciones mediante rutas inversas | | HP | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| **2.o** | ***REGISTRO DE OPERARIOS SOLDADORES*** | Revisión Documental | EN 287<br>(ASME IX) | Mantener<br>Actualizado | Indicar procesos, posiciones, fechas de alta y de baja en la producción de la estructura del puente | | HP | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| **3.o** | ***CONTROL DIMENSIONAL Y VISUAL DE CONJUNTOS MONTADOS*** | Instrumental (cinta métrica y calibre). | RPX 95 / SE-A, Art.11<br>UNE EN 22553<br>UNE EN ISO 6520 | Normal 10%<br>Elevado 100% | Exactitud en las alineaciones a montar. Documentar indicando las medidas explicitas | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| **4.o** | ***PREPARACIÓN DE BORDES PARA EL SOLDEO Y ACOPLAMIENTOS*** | | | | | | | | | | |
| 4.1.o | Control de dimensiones de la preparación | Visual Instrumental | EN ISO 13920 Clase Tolerancia A RPX 95/SE-A UNE EN 22553:1995 | 100% | Espesor piezas a unir geometría de transiciones entre espesores diferentes, ángulos biseles, separaciones, espesor del talón. | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 4.2.o | Alineación de bordes a unir. | Visual Instrumental | EN ISO 13920 Clase Tolerancia A RPX 95/SE-A UNE EN 22553:1995 | Minimo 30% | Todos los tipos de uniones. | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| **5. o** | ***ARMADO DE CONJUNTOS*** | Visual<br>Instrumental | s/Planos<br>RPX 95 / SE-A<br>ENV 1090 | Mínimo 40% | Según planos de montaje | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |

# PLAN DE PUNTOS DE INSPECCIÓN ESTRUCTURAS METÁLICAS

Rev-1 31-01-2024

OBRA: **PONT SOBRE LA CARRETERA DE VIC, MANRESA** — FABRICACIÓN DE ESTRUCTURAS DE ACERO: **FASE DE OBRA** — HOJA 2 de 3

| Nº | Descripción Operación | Tipo Inspección | Procedimiento Norma | Frecuencia Extensión | Observaciones | Punto Aviso | Punto Espera | A quien aplica y Firma | | | Fecha |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **6.0** | **CONTROL DE EJECUCIÓN DE SOLDADURAS** | Visual Instrumental | UNE EN 729 UNE EN 1011-1 UNE EN 1011-2 EN 288, EN ISO 13920 clase d tolerancia A Procedimientos Calificados | 1 vez por cada procedimiento y operario soldador | Comprobación de los medios disponibles y de la correcta ejecución de los procedimientos de soldeo aprobados (medición de parámetros esenciales), calificación de los operarios soldadores, limpieza, etc. Documentar características eléctricas, posiciones de soldeo, | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| **7.o** | **INSPECCIÓN DE UNIONES SOLDADAS ACABADAS** | | UNE EN ISO 6520 UNE EN ISO 5817 - B | | Control de Reparaciones al 100% + Ampliaciones correspondientes a cada caso | | | | | | |
| 7.1 o | Inspección Visual | Visual | UNE-EN-970 UNE EN ISO 6520 | 100% | | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 7.2 o | Control Dimensional | Instrumental | UNE 7470:1987 EN ISO 13920 clase tolerancia A SE-A | 25% | Control concentrado en soldaduras ángulo | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 7.3 o | Ensayos No destructivos Nivel de Calidad requerido: **UNE EN ISO 5817 - B** | E.N.D | s/Procedimiento y Normas alpicables en cada caso | Porcentajes complementarios a los controles del punto 7.o (INICIO PRODUCCIÓN) | Todos los END deberán realizarse después de 16 horas de terminar la ejecución de la soldadura (40 horas en caso de soldaduras a tope en espesores mayores de 40 mm) | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 7.3.1 o | UNIONES **EN ÁNGULO**. | **PM** | UNE-EN 1290-1998 | 5% | | | | TALLER | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| **8.o** | **ROBLONES/CONECTORES PARA UNIONES METALICAS** | | | | | | | | | | |
| 8.1.o | Revisión Procedimiento de soldeo y calificaión de soldadores | Revisión Documental | RPX-95, ENV 1090 ANSI/AASHTO/AWS | Antes del inicio INSTALADOSR; 2 VISITA LABORATORIO | A) ensayos de producción simplificados; Ensayos a realizar durante la ejecución. En cada visita se comprobarán los tres primeros espárragos con visual y doblado B) vigilancia de la producción: Comprobar visualmente el 100% de los espárragos. Control mediante doblado del 5% de espárragos o como mínimo 2 en cada elemento | HP | | INSTALADOR | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 8.2.o | Control ejecución | Visual | UNE-EN 13018/A1 D1.5 - 88 | DIARIAMENTE INSTALADOR; 2 VISITAS LABORATORIO | | | | INSTALADOR | LABORATORIO CONTROL | DIRECCIÓN OBRA | |
| 8.3.o | Inspección Visual de soldaduras nivel de calidad: **UNE EN 25817-C** | Visual | RPX-95, ENV 1090 | 100% INSTALADOR; 2 VISITAS LABORATORIO | | | | INSTALADOR | LABORATORIO CONTROL | DIRECCIÓN OBRA | |

Leyenda: t=realizar en taller; o= realizar en obra; : avisar LAB: CONTROL ; HP:prescritivo para poder seguir

# PLAN DE PUNTOS DE INSPECCIÓN ESTRUCTURAS METÁLICAS

Rev-1 31-01-2024

OBRA: **PONT SOBRE LA CARRETERA DE VIC, MANRESA** — FABRICACIÓN DE ESTRUCTURAS DE ACERO: **FASE DE OBRA** — HOJA 3 de 3

| Nº | Descripción Operación | Tipo Inspección | Procedimiento Norma | Frecuencia Extensión | Observaciones | Punto Aviso | Punto Espera | A quien aplica y Firma | | | Fecha |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **9.o** | ***SISTEMA DE PROTECCIÓN SUPERFICIAL. REPASOS DE PINTURA*** | | | | | | | | | | |
| 9.1.o | *Procedimiento de Aplicación Aprobado* | *Documental* | *Fabricante* | *Antes del inicio de la aplicación* | *Proyecto completo de: planos de la estructura, productos a utilizar, incluyendo fichas técnicas.* | | *HP* | *APLICADOR* | *LABORATORIO CONTROL* | *DIRECCIÓN OBRA* | |
| 9.2 o | *Tratamiento/ Limpieza Superficial* | *Visual*<br>*Comparativo* | *UNE-EN 13018/A1*<br>*UNE EN ISO 12944* | *Cada visita, Minimo 20% de la superficie.* | *Incluye comprobación del abrasivo, de las condiciones ambientales. Verificación de los registros de humedad y temperatura ambiente. Medición de los valores de temperatura superficial de las piezas a pintar. Seguimiento de la vida de las mezclas. Sondeo de medición de espesores de capa en húmedo. Recepción y registro de los materiales empleados (indicando cantidad y nº de lote)* | | | *APLICADOR* | *LABORATORIO CONTROL* | *DIRECCIÓN OBRA* | |
| 9.3 o | *Comprobación del método de aplicación y de las condiciones ambientales y de las superficies.* | *Visual*<br>*Instrumental* | *UNE-EN 13018/A1*<br>*UNE EN ISO 12944*<br>*s/Recomendaciones del Fabricante.* | *1 control a inicio producción y otros 2 durante la aplicación.* | | | | *APLICADOR* | *LABORATORIO CONTROL* | *DIRECCIÓN OBRA* | |
| 9.4 o | *Control de Espesor de Capas secas imprimación y finales* | *Instrumental* | *UNE-ENE-ISO 2808* | *20 puntos imprimación y 20 puntos acabado* | *Comprobar hasta alcanzar 45 puntos de medición* | | | *APLICADOR* | *LABORATORIO CONTROL* | *DIRECCIÓN OBRA* | |
| 9.5 o | *Control de la adherencia* | *Tracción* | *UNE EN ISO 4624* | *2 puntos imprimación y 2 puntos acabado* | *mínimo 25 Kg/cm2* | | | *APLICADOR* | *LABORATORIO CONTROL* | *DIRECCIÓN OBRA* | |
| **10.o** | ***REVISIÓN EL DOSSIER DE CONTROL DE CALIDAD DE MONTAJE Y VERIFICACIÓN DIMENSIONAL DE CONJUNTOS MONTADOS*** | *Documental*<br>*Visual*<br>*Instrumental* | *Pliego de condiciones*<br>*Procedimiento Aprobado ENV 1090* | *100% dossier incluye control de contra flechas* | *Esta documentación debe incluir todas las inspecciones y los controles especificados en este PPI* | | *HP* | *APLICADOR* | *LABORATORIO CONTROL* | *DIRECCIÓN OBRA* | |

*Notas*

*a) Todas las inspecciones y los controles especificados en el PPI se documentarán convenientemente, ubicando detenidamente y de forma inequívoca las partes inspeccionadas, mediante croquis e indicación de los sectores examinados (los controles realizados deben mantener constantemente su trazabilidad exacta para poderse fácilmente localizar durante todas las fases de la fabricación y del montaje de la estructura, incluída la estructura totalmente terminada). Los registros de los resultados obtenidos contendrán siempre los valores explícitos y su comparación con las tolerancias admisibles.*

*b) La entidad de Control Independiente y el Departamento de Calidad Interna del Fabricante pondrán a disposicón de la DF, en taller y en obra, toda la documentación de calidad referente a este ppi, según se genere (hojas de campo, borradores, comunicados diarios y partes de desviación).*

*c) Inspección de uniones soldadas: criterios de ampliacion en caso de defectos. En cas de detectarse defectos el control inicialmente previsto se amplie según los siguientes criterios:*

*· Primera ampliación:*

*Soldaduras alargadas: se examinarán las dos zonas contiguas a la parte examinada. Soldaduras cortas (de longitud igual o inferior a la extensión abarcada por el control): 2 nuevos controles de ampliación de uniones de iguales características (posiblemente en el mismo subconjunto).*

*· Segunda ampliación:*

*En caso de detectarse defectos durante la primera ampliación, las soldaduras del mismo subconjunto pasarán a inspeccionarse al 100% y todas las demás de características similares doblarán el porcentaje de control inicialmente previsto en el PPI.*

*· Retorno: Los porcentajes de control podrán volver a cuanto previsto por el PPI si, durante en periodo de producción equivalente al 10% de las uniones totales de la estructura, los porcentajes de ensayos con detección de fallos no supera el 1%.*

*Las inspecciones de ampliación se realizarán con el mismo método empleado en el sondeo inicial (incluída la dimensión del sector inspeccionado) y quedarán debidamente documentadas. Se incluyen END (IV, LP, PM, US Y RX) y controles dimensionales.*

*d) Las operaciones de Inspección a realizar por el Departamento de Calidad interna del Taller deben contemplar la correcta aplicaión de los procedimientos durante el proceso de fabricaión (por ejemplo en el caso de la trazabilidad, debe especificarse quien y como se verifica la correcta aplicación del método de trabajo, cuales con los `puntos de control, como se realiza la comprobación, etc.). Documentar el control con los valores medidos durante la verificación.*

Leyenda: t=realizar en taller; o= realizar en obra; : avisar LAB: CONTROL ; HP:prescritivo para poder seguir

# APÈNDIX 3 FITXES TÈCNIQUES DE MATERIALS I PRODUCTES DE REFERÈNCIA

PPG Protective & Marine Coatings
Bringing innovation to the surface.™

Dear Valued Customer,

As per your request, below is a copy of the laboratory results for the system(s) of interest. This document contains excerpts from the full third party report summarizing the specified coating system(s) and third party laboratory conclusion(s).

For additional information, please contact your local PPG representative.

SIGMA COATINGS

AMERCOAT

REPORT

Testing of AMERLOCK 2 and AMERSHIELD on
St 3 brushed steel according to various items
of ISO 12944 C5-I high and C5-M high

Haarlem, 14 November
2001 RB/M H

Principal Ameron B.V.
P.O. Box 6
4190 CA GELDERMALSEN
Atn.: Mr. H. Post

Order number : 28.660

Report number : LB01-1002-RAP

**Paintsystem**

| | Generic ty • e | Trade name | NDFT ( pm) |
|---|---|---|---|
| **1'** coat | two component epoxy | Amerlock 2 | 125 |
| 2'[d] coat | two component epoxy | Amershield | 125 |
| | | | Total: approx. 250 |

**CONCLUSION**

The system consisting of Amerlock 2 and Amershield on St 3 brush cleaned panels meets the requirements of ISO 12944 C5-I high and C5-M high.

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COI 01· AI C1FIF:RTIrS EN OVEREE FSDNI.STEN /LIN VAN TOEPASSING DE 6EFC.IFI I VOOK DIENSTVERLENING, 70AL V (1611E.F C1NI:Lit.DESII DE K.V.K. TE HAAWI.F.M UNDER NR. 34069955

# AMERSHIELD™

## DESCRIPTION

Two-component, polyester-acrylic aliphatic polyurethane topcoat

## PRINCIPAL CHARACTERISTICS

- Outstanding weather resistance with excellent color and gloss retention
- High solids, low VOC
- Tough, flexible and abrasion resistant
- Resistant to splash of mineral and vegetable oils, paraffins, aliphatic petroleum products and mild chemicals
- Direct-to-metal or concrete for ISO 12944 C1 and C2 environments
- Meets SSPC Paint 36 Level 3

## COLOR AND GLOSS LEVEL

- Standard and custom colors
- Gloss

Notes:
- Certain colors, especially red, orange, and yellow may require additional coats for adequate hiding, especially if applied over primers with a significant color contrast
- Yellow, red, and orange colors will fade faster than other colors due to the replacement of lead-based pigments with lead free pigments in these colors

## BASIC DATA AT 20°C (68°F)

| Data for mixed product | |
|---|---|
| **Number of components** | Two |
| **Mass density** | 1.3 kg/l (10.8 lb/US gal) |
| **Volume solids** | 73 ± 2% |
| **VOC (Supplied)** | Directive 1999/13/EC, SED: max. 207.0 g/kg<br>UK PG 6/23(92) Appendix 3: max. 185.0 g/l (approx. 1.5 lb/US gal)<br>EPA Method 24: 264.0 g/ltr (2.2 lb/USgal) |
| **Temperature resistance (Continuous)** | To 94°C (200°F) |
| **Temperature resistance (Intermittent)** | To 121°C (250°F) |
| **Recommended dry film thickness** | 75 - 150 µm (3.0 - 6.0 mils) depending on system |
| **Theoretical spreading rate** | 7.3 $m^2$/l for 100 µm (293 $ft^2$/US gal for 4.0 mils) |
| **Dry to touch** | 2.5 hours |
| **Overcoating Interval** | Minimum: 8 hours<br>Maximum: 7 days |
| **Full cure after** | 4 days |





AMERSHIELD™

| Data for mixed product | |
|---|---|
| **Shelf life** | Base: at least 36 months when stored cool and dry<br>Hardener: at least 24 months when stored cool and dry |

Notes:
- See ADDITIONAL DATA – Spreading rate and film thickness
- See ADDITIONAL DATA – Overcoating intervals
- See ADDITIONAL DATA – Curing time
- For compliance with regulations which require VOC less than 100 g/L, AMERSHIELD VOC can be specified interchangeably
- AMERSHIELD VOC is available only in US and Canada

## RECOMMENDED SUBSTRATE CONDITIONS AND TEMPERATURES

- Coating performance is proportional to the degree of surface preparation. Refer to the application instructions for specific primers and intermediate coats for application and curing procedure. All previous coats must dry and free of contaminants. Adhere to all minimum and maximum topcoat times for specific primers and intermediate coats

**Substrate conditions**
- Steel; blast cleaned to ISO-Sa2½ or minimum SSPC SP-6, blasting profile 30 – 75 µm (1.2 – 3.0 mils)
- Concrete / Masonry; see specific primer
- Previous coat (epoxy or polyurethane) must be dry and free from any contamination

**Galvanized steel and aluminum**
- Surface must be free from grease, salts and any contamination
- Surface should be sufficiently roughened (e.g. sandpapering, sweep blasting)

**Substrate temperature and application conditions**
- Substrate temperature during application and curing down to -5°C (23°F) is acceptable
- Substrate temperature during application and curing should be at least 3°C (5°F) above dew point
- Relative humidity during application and curing should not exceed 85%
- Premature exposure to early condensation and rain my cause color and gloss change

## SYSTEM SPECIFICATION

- Primers: Direct to substrate, AMERCOAT 68 Series, SIGMAZINC Series, AMERLOCK Series, AMERCOAT Epoxies & SIGMA Epoxies
- For products not listed above, contact your PPG representative

# AMERSHIELD™

## INSTRUCTIONS FOR USE

**Mixing ratio by volume: base to hardener 80:20 (4:1)**

- Pre-mix base component with a pneumatic air mixing at moderate speeds to homogenize the container. Add hardener to base and agitate with a power mixer for 2-3 minutes until completely dispersed
- The temperature of the mixed base and hardener should be above 10°C (50°F), otherwise extra thinner may be required to obtain application viscosity
- Thinner should be added after mixing the components
- Adding too much thinner results in reduced sag resistance

**Induction time**
None

**Pot life**
2.5 hours at 20°C (68°F)

Note: See ADDITIONAL DATA – Pot life

**Air spray**

**Recommended thinner**
Global standard : THINNER 60-15, US and Canada Only : THINNER 50-48 (AMERCOAT 923), THINNER 21-06 (AMERCOAT 65), THINNER 60-12 (AMERCOAT 911) and THINNER 21-25 (AMERCOAT 101) (recommended for > 90 °F (32°C))

**Volume of thinner**
5 - 15%, depending on required thickness and application conditions

**Nozzle orifice**
1.0 - 1.5 mm (approx. 0.040 - 0.060 in)

**Nozzle pressure**
0.3 - 0.4 MPa (approx. 3 - 4 bar; 44 - 58 p.s.i.)





# AMERSHIELD™

**Airless spray**

**Recommended thinner**
Global standard : THINNER 60-15, US and Canada Only : THINNER 50-48 (AMERCOAT 923), THINNER 21-06 (AMERCOAT 65), THINNER 60-12 (AMERCOAT 911) and THINNER 21-25 (AMERCOAT 101) (recommended for > 90 °F (32°C))

**Volume of thinner**
3 - 5%, depending on required thickness and application conditions

**Nozzle orifice**
Approx. 0.43 – 0.48 mm (0.017 – 0.019 in)

**Nozzle pressure**
20.0 MPa (approx. 200 bar; 2901 p.s.i.)

**Brush/roller**

- Use a high-quality, well-loaded, solvent-resistant, low-nap (0.25 in – 0.375 in/ 64 mm – 95 mm) roller. AMERCOAT 851 flow control additive may be used to enhance flow and leveling of brush strokes and roller stipple
- Multiple coats may be required to achieve proper film build and hiding with roller application

**Recommended thinner**
Global standard : THINNER 60-15, US and Canada Only : THINNER 50-48 (AMERCOAT 923), THINNER 21-06 (AMERCOAT 65), THINNER 60-12 (AMERCOAT 911) and THINNER 21-25 (AMERCOAT 101) (recommended for > 90 °F (32°C))

**Volume of thinner**
0 – 5%

**Cleaning solvent**
THNNER 90-53, THINNER 90-58 (AMERCOAT 12) OR THINNER 21-06 (AMERCOAT 65)

## ADDITIONAL DATA

| Spreading rate and film thickness | |
|---|---|
| **DFT** | **Theoretical spreading rate** |
| 75 µm (3.0 mils) | 9.7 $m^2/l$ (390 $ft^2$/US gal) |
| 100 µm (4.0 mils) | 7.3 $m^2/l$ (293 $ft^2$/US gal) |
| 125 µm (5.0 mils) | 5.8 $m^2/l$ (234 $ft^2$/US gal) |
| 150 µm (6.0 mils) | 4.9 $m^2/l$ (195 $ft^2$/US gal) |

# AMERSHIELD™

| Overcoating interval for DFT up to 150 µm (6.0 mils) | | | | | | |
|---|---|---|---|---|---|---|
| **Overcoating with...** | **Interval** | **-5°C (23°F)** | **0°C (32°F)** | **10°C (50°F)** | **20°C (68°F)** | **30°C (86°F)** |
| itself | Minimum | N/A | N/A | 48 hours | 8 hours | 4 hours |
| | Maximum | N/A | N/A | 7 days | 4 days | 12 hours |
| itself + PPG 866M(AMERCOAT 866M) accelerator | Minimum | 16 hours | 8 hours | 4 hours | 2 hours | 1.5 hours |
| | Maximum | 4 days | 48 hours | 24 hours | 12 hours | 6 hours |

| Curing time for DFT up to 150 µm (6.0 mils) | | |
|---|---|---|
| **Substrate temperature** | **Dry to touch** | **Dry to handle** |
| -5°C (23°F) | 8 hours | 16 hours |
| 0°C (32°F) | 4 hours | 10 hours |
| 10°C (50°F) | 1.5 hours - 4 hours | 6 hours - 36 hours |
| 20°C (68°F) | 45 minutes - 2.5 hours | 3 hours - 10 hours |
| 30°C (86°F) | 25 minutes - 1 hour | 2 hours - 5 hours |

Notes:
- Range indicates drying time without and with PPG 866M(Amercoat 866M) accelerator, respectively
- -5°C and 0°C data is only with PPG 866M (AMERCOAT 866M) accelerator
- Adequate ventilation must be maintained during application and curing
- Premature exposure to early condensation and rain may cause color and gloss change

| Pot life (at application viscosity) | |
|---|---|
| **Mixed product temperature** | **Pot life** |
| 10°C (50°F) | 4 hours |
| 20°C (68°F) | 2.5 hours |
| 30°C (86°F) | 1 hour |

Notes:
- Times are proportionally shorter at higher temperature and longer at lower temperatures
- PPG 866M (AMERCOAT 866M) accelerator will reduce pot life to half

**Product Qualifications**
- Compliant with USDA Incidental Food Contact Requirements
- Nuclear Service Level 2 (partial)
- NFPA Class A Flame Spread



PRODUCT DATA SHEET

November 10, 2020 (Revision of April 16, 2018)

AMERSHIELD™

## SAFETY PRECAUTIONS

- For paint and recommended thinners see INFORMATION SHEETS 1430, 1431 and relevant Material Safety Data Sheets
- This is a solvent-borne paint and care should be taken to avoid inhalation of spray mist or vapor, as well as contact between the wet paint and exposed skin or eyes
- Contains a toxic polyisocyanate curing agent
- Avoid at all times inhalation of aerosol spray mist

## WORLDWIDE AVAILABILITY

It is always the aim of PPG Protective and Marine Coatings to supply the same product on a worldwide basis. However, slight modification of the product is sometimes necessary to comply with local or national rules/circumstances. Under these circumstances an alternative product data sheet is used.

## REFERENCES

| | | |
|---|---|---|
| • CONVERSION TABLES | INFORMATION SHEET | 1410 |
| • EXPLANATION TO PRODUCT DATA SHEETS | INFORMATION SHEET | 1411 |
| • SAFETY INDICATIONS | INFORMATION SHEET | 1430 |
| • SAFETY IN CONFINED SPACES AND HEALTH SAFETY, EXPLOSION HAZARD – TOXIC HAZARD | INFORMATION SHEET | 1431 |
| • SAFE WORKING IN CONFINED SPACES | INFORMATION SHEET | 1433 |
| • DIRECTIVES FOR VENTILATION PRACTICE | INFORMATION SHEET | 1434 |
| • CLEANING OF STEEL AND REMOVAL OF RUST | INFORMATION SHEET | 1490 |
| • SPECIFICATION FOR MINERAL ABRASIVES | INFORMATION SHEET | 1491 |
| • RELATIVE HUMIDITY – SUBSTRATE TEMPERATURE – AIR TEMPERATURE | INFORMATION SHEET | 1650 |

## WARRANTY

**PPG warrants (i) its title to the product, (ii) that the quality of the product conforms to PPG's specifications for such product in effect at the time of manufacture and (iii) that the product shall be delivered free of the rightful claim of any third person for infringement of any U.S. patent covering the product. THESE ARE THE ONLY WARRANTIES THAT PPG MAKES AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, UNDER STATUTE OR ARISING OTHERWISE IN LAW, FROM A COURSE OF DEALING OR USAGE OF TRADE, INCLUDING WITHOUT LIMITATION, ANY OTHER WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE DISCLAIMED BY PPG. Any claim under this warranty must be made by Buyer to PPG in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life of the product, or one year from the date of the delivery of the product to the Buyer, whichever is earlier. Buyer's failure to notify PPG of such non-conformance as required herein shall bar Buyer from recovery under this warranty.**

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# AMERLOCK® 2 / SIGMACOVER™ 2

## DESCRIPCIÓN

Revestimiento epoxi de dos componentes, alto en sólidos

## PRINCIPALES CARACTERÍSTICAS

- Temperatura de curado por debajo de 0°C (32°F)
- Imprimación universal epoxi de altas prestaciones
- Altos sólidos, bajo COV
- Tolerante a baja preparación superficial y resistente a la abrasión
- Compatible con superficies preparadas húmedas
- Buena adherencia sobre la mayoría de las pinturas existentes
- Buena resistencia química a salpicaduras y derrames
- Cumple los estándares NSF 61 para tanques, tuberías, válvulas y accesorios (Sólo para fabricación en los Estados unidos)
- Probado como revestimiento de vagones de carga y revestimiento exterior DTM

## COLORES Y BRILLO

- Colores standard y bajo pedido
- Semibrillante

Nota: Los revestimientos epoxi se caracterizan por calear y perder tono y brillo bajo la exposición a la luz solar. Los colores claros tienen una tendencia mayor a este efecto. Los colores obtenidos en máquina tintométrica no se recomiendan para servicio en inmersión. Utilícese sólo productos con colores fabricados de serie para inmersión.

## DATOS PRINCIPALES A 10°C (50°F)

| Datos para el producto mezclado | |
|---|---|
| **Número de componentes** | Dos |
| **Densidad** | 1,4 kg/l (11,7 lb/US gal) |
| **Volumen de sólidos** | 85 ± 2% |
| **COV (Suministrado)** | Directiva 1999/13/EC, SED: max. 114,0 g/kg (Directiva 1999/13/EC, SED)<br>max. 163,0 g/l (aprox. 1,4 lb/gal)<br>1,5 lb/gal (180,0 g/ltr) (por EPA Method 24) |
| **Resistencia a la temperatura (en continuo)** | Hasta 120°C (250°F) |
| **Resistencia a la temperatura (Intermitente)** | Hasta 175°C (350°F) |
| **Espesor de película seca recomendado** | 100 - 200 µm (4,0 - 8,0 mils) |
| **Rendimiento teórico** | 8,5 $m^2$/l para 100 µm (341 $ft^2$/US gal para 4,0 mils) |
| **Seco al tacto** | 6 horas |
| **Intervalo de repintado** | Ver tablas de repintado |



HOJA DE PRODUCTO

2 de agosto de 2018 (Revisión de 16 de abril de 2018)

AMERLOCK® 2 / SIGMACOVER™ 2

| Datos para el producto mezclado | |
|---|---|
| **Estabilidad del envase** | Base: al menos 36 meses cuando se almacena en lugar seco y fresco<br>Endurecedor: al menos 24 meses cuando se almacena en lugar seco y fresco |

Notas:

- Ver DATOS ADICIONALES – Espesor de la película seca y rendimiento teórico
- Ver DATOS ADICIONALES – Intervalos de repintado
- Ver DATOS ADICIONALES – Tiempo de curado
- Para cumplir con aquellas legislaciones que exijan VOC menores de 100 g/L puede intercambiarse AMERLOCK 2 VOC en la especificación
- AMERLOCK 2 VOC sólo está disponible en Estados Unidos y en Canada
- La resistencia a la temperatura de forma intermitente debería ser menos de un 5% del tiempo y como máximo 24 horas
- La resistencia a la temperatura se entiende en condiciones atmosféricas Por favor contacte con su representante de PPG para conocer la resistencia a la temperatura en inmersión

## CONDICIONES RECOMENDADAS DEL SUBSTRATO Y TEMPERATURAS

- Las prestaciones del revestimiento están en relación directa con el grado de preparación superficial . Eliminar la pintura mal adherida, la calamina y el óxido. La superficie a pintar debe estar seca, limpia y libre de grasa, aceite y cualquier otra sustancia extraña. Cuando no es posible hacer una preparación superficial por chorro abrasivo, las superficies serán tratadas mediante herramientas mecánicas hasta dejar el acero limpio y expuesto.

**Acero al carbono**

- Para servicio en inmersión: acero; chorro abrasivo a grado ISO-Sa2½ (SSPC SP-10)
- Para exposición atmosférica, chorro abrasivo a grado ISO-Sa2½ ó mínimo SSPC SP-6, limpieza con herramienta mecánica a grado ISO-St3 (SSPC SP-3) o limpieza con herramienta manual a grado ISO-St2 (SSPC SP-2), también es admitido el lavado con agua a ultra alta presión a grado SSPC SP WJ-2(L) / NACE WJ-2(L)

**Hormigón / Mamposteria**

- Eliminar la grasa, aceite y cualquier otro contaminante que pueda penetrar tal y como se indica en la ASTM D4258
- Lijar la superficie como se recomienda en ASTM D4259 para eliminar cualquier presencia de contaminante sólido incluida las eflorescencias de color. Perfil de rugosidad- ICRI CSP 3 a 5
- Rellenar las coqueras del substrato con el producto epoxi AMERCOAT 114 A
- La transmisión máxima recomendada de humedad es 3 lbs / 1,000 ft2 / 24 horas medido según el test de transmisión de humedad (ASTM F1869, test de cloruro cálcico o por la ASTM D4263, test de la hoja de plástico)
- También se puede usar el método, ASTM D4944 (método del gas de carburo cálcico) , el contenido en humedad no excederá de 4%

**Acero galvanizado**

- Eliminar cualquier resto de aceite ó jabón con detergente ó emulsión limpiadora
- Chorro abrasivo ligero con abrasivo fino según la guía SSPC SP-16 y perfil de rugosidad 40 - 75 µm (1.5 - 3.0 mils). Cuando no se puede hacer un chorro abrasivo ligero, el galvanizado puede ser tratado con convertidores de fosfato de zinc.
- El galvanizado que ha tenido al menos 12 meses de exposición ambiental deberá, como mínimo, ser lavado con agua a presión para eliminar los contaminantes y los depósitos de sales, antes del pintado.

# AMERLOCK® 2 / SIGMACOVER™ 2

**Metales no ferrosos y acero inoxidable**
- Eliminar de la superficie la corrosión, suciedad, humedad, grasa y cualquier otro contaminante
- Chorro abrasivo con grano fino según SSPC SP-16 y perfil de rugosidad 40 - 100 µm (1.5 - 4.0 mils)

**Revestimientos antiguos y reparaciones**
- Cuando el revestimiento envejecido sea compatible debe de estar seco y libre de cualquier contaminación
- Para revestimientos monocomponentes, hay que tomar precauciones adicionales

**Temperatura del substrato**
- La temperatura del substrato durante la aplicación y el curado estará entre 0°C (32°F) y 50°C (122°F)
- La temperatura del substrato durante la aplicación y el curado deberá estar al menos 3 °C (5 °F) por encima del punto de rocío

## ESPECIFICACIÓN DE SISTEMA

- Imprimaciones: directas al substrato ; DIMETCOTE Series, AMERCOAT 68 Series, AMERLOCK 2 / 400 Series, SIGMAZINC Series, epoxis de AMERCOAT y epoxis de SIGMA
- Acabados: AMERCOAT 450 Series, SIGMADUR Series, SIGMACOVER Epoxies, AMERCOAT Epoxies, AMERSHIELD y PSX 700

Nota: Por favor contacte con su representante de PPG para utilizar otra imprimación

## INSTRUCCIONES DE USO

**Ratio de mezcla en volumen: base y endurecedor 50:50 (1:1)**
- La pintura debe agitarse bien antes de aplicar, preferentemente mediante mezclador mecánico, para asegurar homogeneidad
- Añadir el endurecedor a la base con agitación continua hasta homogenización

**Tiempo de inducción**

| Tiempo de inducción tras la mezcla del producto | |
|---|---|
| **Temperatura del producto mezclado** | **Tiempo de inducción** |
| 0 °C (32°F) | 45 minutos |
| 10 °C (50°F) | 30 minutos |
| 15 °C (59°F) | 20 minutos |
| 20 °C (68°F) | 10 minutos |
| Por encima de 23°C (73°F) | No tiene tiempo de inducción |





# AMERLOCK® 2 / SIGMACOVER™ 2

**Vida de la mezcla**
2 horas a 10°C (50°F)

Nota: Ver DATOS ADICIONALES – Vida de la mezcla

**PISTOLA CON AIRE**

**Disolvente recomendado**
THINNER 91-92 PARA EL MERCADO GLOBAL, THINNER 21-06 (AMERCOAT 65) PARA NSF/ANSI 61, THINNER 91-82 (AMERCOAT T10) cuando no es requerido NSF/ANSI 61 y \< 90°F (32°C), THINNER 21-25 (AMERCOAT 101) cuando no es requerido NSF/ANSI 61 y > 90°F (32°C)

**Volumen de disolvente**
0 - 10%, dependiendo del espesor recomendado y de las condiciones de aplicación

**PISTOLA SIN AIRE**

**Disolvente recomendado**
THINNER 91-92 PARA EL MERCADO GLOBAL, THINNER 21-06 (AMERCOAT 65) PARA NSF/ANSI 61, THINNER 91-82 (AMERCOAT T10) cuando no es requerido NSF/ANSI 61 y \< 90°F (32°C), THINNER 21-25 (AMERCOAT 101) cuando no es requerido NSF/ANSI 61 y > 90°F (32°C)

**Volumen de disolvente**
0 - 5%, dependiendo del espesor recomendado y de las condiciones de aplicación

**Orificio de boquilla**
Aprox. 0.48 mm (0.019 pulgadas)

**Presión en boquilla**
15,0 - 18,0 MPa (approx. 150 - 180 bar; 2176 - 2611 p.s.i.)

**BROCHA/RODILLO**
- Aplicar a brocha o rodillo bien cargados
- Aplicación a brocha o rodillo dará un espesor seco aprox. de 80 micras en una sola mano

**DISOLVENTE DE LIMPIEZA**
THNNER 90-53, THINNER 90-58 (AMERCOAT 12) ó THINNER 21-06 (AMERCOAT 65)

# AMERLOCK® 2 / SIGMACOVER™ 2

## DATOS ADICIONALES

| Espesor de película seca y rendimiento teórico | |
|---|---|
| **Espesor seco** | **Rendimiento teórico** |
| 100 µm (4,0 mils) | 8,5 $m^2$/l (341 $ft^2$/US gal) |
| 125 µm (5,0 mils) | 6,8 $m^2$/l (273 $ft^2$/US gal) |
| 200 µm (8,0 mils) | 4,3 $m^2$/l (170 $ft^2$/US gal) |

| Intervalo de repintado para espesor seco hasta 200 µm (8.0 mils) | | | | | |
|---|---|---|---|---|---|
| **Repintado con ...** | **Intervalo** | **5°C (41°F)** | **10°C (50°F)** | **20°C (68°F)** | **30°C (86°F)** |
| Con el mismo y varios revestimientos epoxi de dos componentes | Mínimo | 24 horas | 12 horas | 6 horas | 3 horas |
| | Máximo | 1 mes | 1 mes | 1 mes | 1 mes |
| Con uretanos y PSX | Mínimo | 24 horas | 12 horas | 6 horas | 3 horas |
| | Máximo | 14 días | 14 días | 7 días | 4 días |

Notas:

- La superficie debe estar seca y sin contaminación
- Después de 30 dias de exposición y antes de aplicar el acabado se deberá lavar la superficie con PREP 88, SIGMARITE 88 o un detergente equivalente.
- Si se sobrepasa el tiempo máximo de repintado, se debe proceder a rugosar la superficie
- Los revestimientos alquídicos y acrílicos base agua deberán de ser aplicados después que la pelicula este seca para manejo y no transcurran más de tres veces el tiempo de secado para manejo .
- El tiempo máximo de repintado tiene una alta dependencia de la temperatura de la superficie, no simplemente de la temperatura del aire. Cuando la superficie se expone al sol, al calentarse reducirá el tiempo máximo de repintado.

| Tiempo de curado para espesor seco hasta 200 µm (8.0 mils) | | |
|---|---|---|
| **Temperatura del substrato** | **Seco para manipular** | **Curado total** |
| 0°C (32°F) | 38 horas | 21 días |
| 10°C (50°F) | 14 horas | 7 días |
| 20°C (68°F) | 5 horas | 4 días |
| 30°C (86°F) | 3 horas | 3 días |

Nota: Se debe de mantener una ventilación adecuada durante la aplicación y el curado (Por favor consulte las HOJAS DE INFORMACIÓN 1433 y 1434)





# AMERLOCK® 2 / SIGMACOVER™ 2

| Vida de la mezcla (a viscosidad de aplicación) | |
|---|---|
| **Temperatura del producto mezclado** | **Vida de la mezcla** |
| 0°C (32°F) | 4 horas |
| 10°C (50°F) | 2 horas |
| 20°C (68°F) | 1 hora |
| 30°C (86°F) | 30 minutos |

**Certificaciones del producto**

- NORSOK M501 Rev. 5, System 7 Subsea surfaces
- Cumple los requerimientos de USDA para contactos esporádicos con alimentos
- NFPA Clase A para propagación de llama y desarrollo de humos.
- Certificado para ANSI/NSF Standard 61 (Agua potable). Para intrucciones de aplicación de NSF, por favor visite el siguiente sitio web: http://www.nsf.org/certified-products-systems/
- AWWA D102-06 ICS #1, #2, #3, #5
- Servicio en Nucleares nivel 2 (ANSI N 5.12 y ASTM D5144)
- Cumple norma LEED en la categoría de pintura anticorrosiva.

## PRECAUCIONES DE SEGURIDAD

- Para las pinturas y disolventes recomendados, ver hojas de información 1430, 1431 y las fichas de seguridad de los productos
- Esta es una pintura base disolvente y hay que tomar precauciones para evitar la inhalación del nebulizado, al igual que evitar el contacto de la pintura húmeda con la piel y los ojos

## DISPONIBILIDAD MUNDIAL

PPG Protective and Marine Coatings tiene siempre el objetivo de suministrar exactamente los mismos productos de protección y recubrimiento en todo el mundo. Sin embargo, en ocasiones resulta necesario llevar a cabo ligeras modificaciones de los productos para adaptarlos a la legislación nacional o a las condiciones locales. En dichas circunstancias, se utiliza una ficha de datos de producto alternativa.

## REFERENCIAS

| | | |
|---|---|---|
| • Tablas de conversión | HOJA DE INFORMACION | 1410 |
| • Explicación de fichas técnicas de productos | HOJA DE INFORMACION | 1411 |
| • Precauciones de seguridad | HOJA DE INFORMACION | 1430 |
| • Seguridad para la salud en espacios reducidos – Peligros de exposición y toxicidad | HOJA DE INFORMACION | 1431 |
| • Seguridad del trabajo en espacios reducidos | HOJA DE INFORMACION | 1433 |
| • Directrices para el uso de la ventilación | HOJA DE INFORMACION | 1434 |
| • Preparación de las superficies | HOJA DE INFORMACION | 1490 |
| • Especificación para abrasivos minerales | HOJA DE INFORMACION | 1491 |
| • Preparación de superficie de concreto (pisos) | HOJA DE INFORMACION | 1496 |
| • Humedad relativa – temperatura del substrato – temperatura del aire | HOJA DE INFORMACION | 1650 |

# AMERLOCK® 2 / SIGMACOVER™ 2

## GARANTIA

**PPG Protective and Marine Coatings garantiza (i) que es titular del producto; (ii) que la calidad del producto cumple las especificaciones de PPG en vigor en el momento de su producción, y (iii) que el producto se entrega libre de cualquier reclamación legítima de terceros por uso indebido de patentes estadounidenses asociadas el producto. ESTAS SON LAS ÚNICAS GARANTÍAS QUE PPG Protective and Marine Coataings OFRECE. PPG DECLINA CUALQUIER OTRA GARANTÍA EXPRESA O IMPLÍCITA CONTEMPLADA POR LA LEY O POR LAS PRÁCTICAS COMERCIALES, LO QUE INCLUYE DE FORMA NO EXHAUSTIVA CUALQUIER GARANTÍA DE IDONEIDAD PARA UN PROPÓSITO O USO PARTICULAR. Cualquier reclamación que se presente bajo esta garantía deberá ser presentada por el Comprador directamente a PPG, mediante comunicación escrita en un plazo máximo de cinco (5) días desde la detección del defecto, pero en ningún caso más allá de la fecha de caducidad del producto o, en todo caso, no más tarde de un año a contar desde la fecha de entrega del producto al Comprador (tendrá validez la opción que sea más temprana). El Comprador no podrá hacer uso de la garantía si no notifica la no conformidad a PPG del modo indicado.**

## LIMITACIONES DE RESPONSABILIDAD

**PPG Protective and Marine Coatings NO SERÁ RESPONSABLE EN NINGÚN CASO Y BAJO NINGUNA CIRCUNSTANCIA (INCLUIDA NEGLIGENCIA DE CUALQUIER TIPO, RESPONSABILIDAD ESTRICTA O DAÑOS) DE CUALQUIER DAÑO INDIRECTO, ESPECIAL, CASUAL O CONSECUENTE RELACIONADO, DERIVADO O RESULTANTE DE CUALQUIER USO QUE SE DÉ AL PRODUCTO. La información que contiene el presente documento tiene carácter exclusivamente orientativo y está basada en pruebas de laboratorio que PPG Protective and Marine Coatings considera fiables. PPG Protective and Marine Coatings podrá modificar la información contenida en el presente documento en cualquier momento como resultado de su experiencia práctica y el desarrollo continuo del producto. Todas las recomendaciones o sugerencias relacionadas con el uso de los productos de PPG Protective and Marine Coatings, ya se emitan en forma de documentación técnica, en respuesta a una consulta específica o de otra manera, se basan en datos que, según el conocimiento de PPG Protective and Marine Coatings, son fiables. El producto y la información relacionada están diseñados para usuarios con los conocimientos necesarios y la cualificación exigida por la industria. El usuario final es responsable de determinar la idoneidad del producto para su aplicación concreta. Se considera que el Comprador ha hecho las verificaciones oportunas por su cuenta y riesgo. PPG Protective and Marine Coatings no tiene control sobre la calidad o condición del sustrato, o sobre cualquier factor que afecte al uso y la aplicación del producto. Por consiguiente, PPG Protective and Marine Coatings no acepta ninguna responsabilidad originada por cualquier pérdida, lesión o daño resultante del uso del producto o de la presente información (salvo acuerdo por escrito en contrario). Si existen variaciones en el entorno de aplicación, cambios en los procedimientos de uso o extrapolación de datos, los resultados podrían ser insatisfactorios. Este documento prevalecerá sobre cualquier versión anterior. El Comprador deberá asegurarse de que esta información se mantiene vigente antes de utilizar el producto. La documentación actualizada referente a todos los productos de protección y recubrimiento para aplicaciones navales de PPG Protective and Marine Coatings se encuentran en www.ppgpmc.com. |La versión inglesa de este documento prevalecerá sobre cualquier traducción de la misma.**

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# ANNEX NÚM. 3: REPORTATGE FOTOGRÀFIC

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 01/02/2024 | DJS | | |
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ACTUALITZACIONS

| Apartat | Descripció |
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| Totes | Creació del document |
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NOM FITXER : 240201 PMAN-FGC-PED-REPORTATGE FOTOGRÀFIC-V00A

**ÍNDEX**

1 INTRODUCCIÓ ..... 1

# 1 INTRODUCCIÓ

El present Annex recull un seguit de fotografies obtingudes en el decurs de les inspeccions de camp realitzades pel PEDELTA en les visites en data 11 de abril de 2023 i 1 de desembre de 2023 (Inspeccions visuals) que mostren l'estat actual dels ponts objecte del projecte.

Al final de l'Annex s'inclou uns plànols amb indicació des d'on s'han pres les fotografies.



*Fotografia núm.1: Vista superior del tauler. Oxidació en conductes de canalització.*



*Fotografia núm.2: Fissura en soldadura*



*Fotografia núm.3 : Oxidació en cara superior de bigues transversals*



*Fotografia núm. 4: Fissura en diagonal 5 de la biga dreta*



*Fotografia núm. 5: Fissura en soldadura*



*Fotografia núm. 6: Picades en placa de connexió d' arriostrament*



*Fotografia núm. 7: Oxidació en suport de la reixeta*



*Fotografia núm. 8: Corrosió en soldadures*



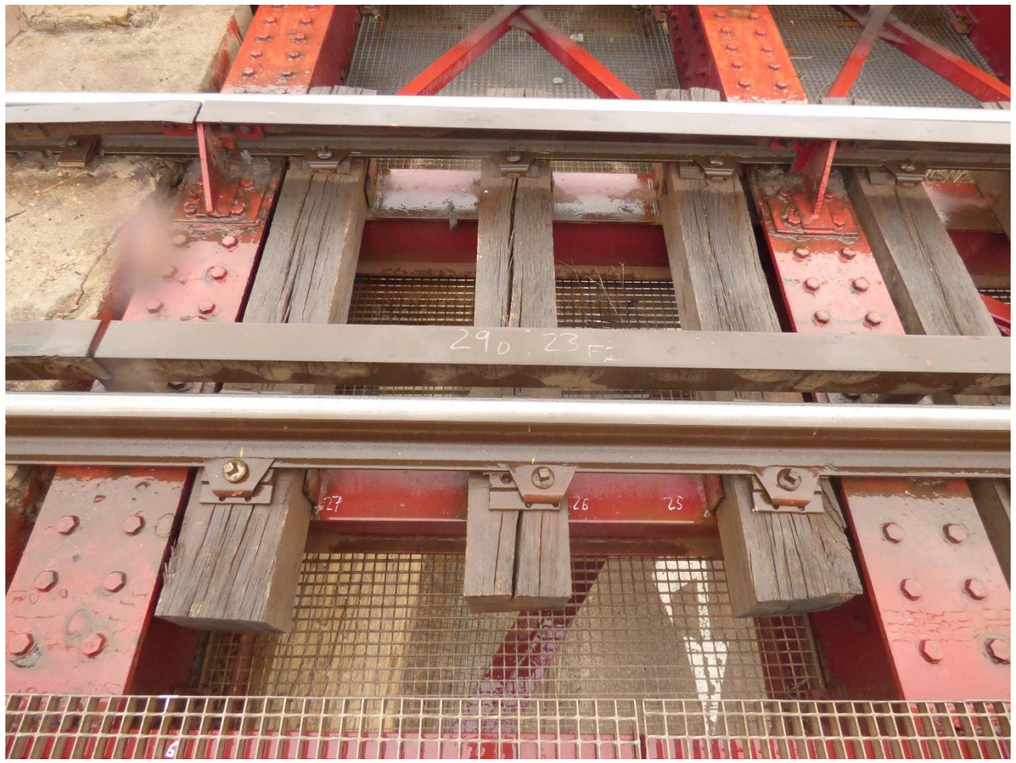
*Fotografia núm. 9: Picades a la biga d'estrep*



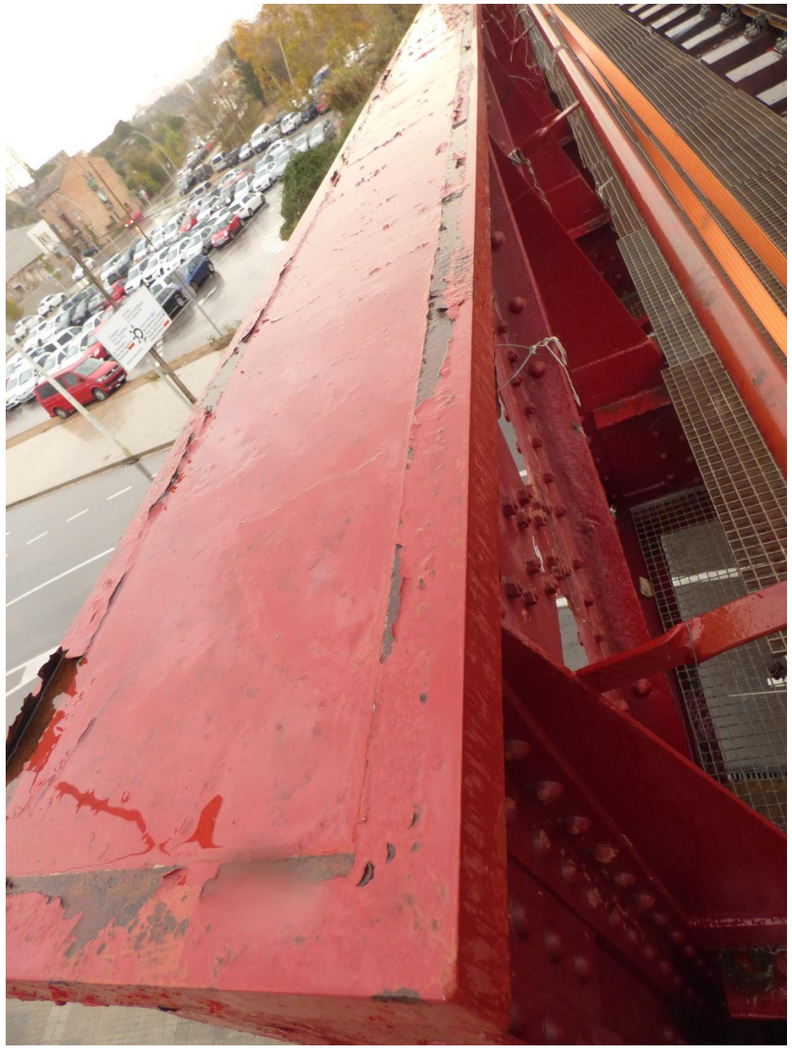
*Fotografia núm. 10: Corrosió en recolzaments.*



*Fotografia núm. 11: Vista general del tauler.*



*Fotografia núm. 12: Esquerdes en formigó de mur guarda balast.*



*IFotografia núm. 13: Pintura saltada*



*Fotografia núm. 14: Carreus trencats, eflorescències i juntes entre carreus degradades.*



*Fotografia núm.15: Meteorització de carreus.*



*Fotografia núm.  16: Fissures en carreus.*




*Fotografia núm. 17: Humitats en estrep.*



*Fotografia núm. 18: Corrosió en ala inferior de bigues transversals.*



*Fotografia núm. 19: Cargols saltats en ala inferior de bigues transversals*



*Fotografia núm. 20: Arriostraments doblats*



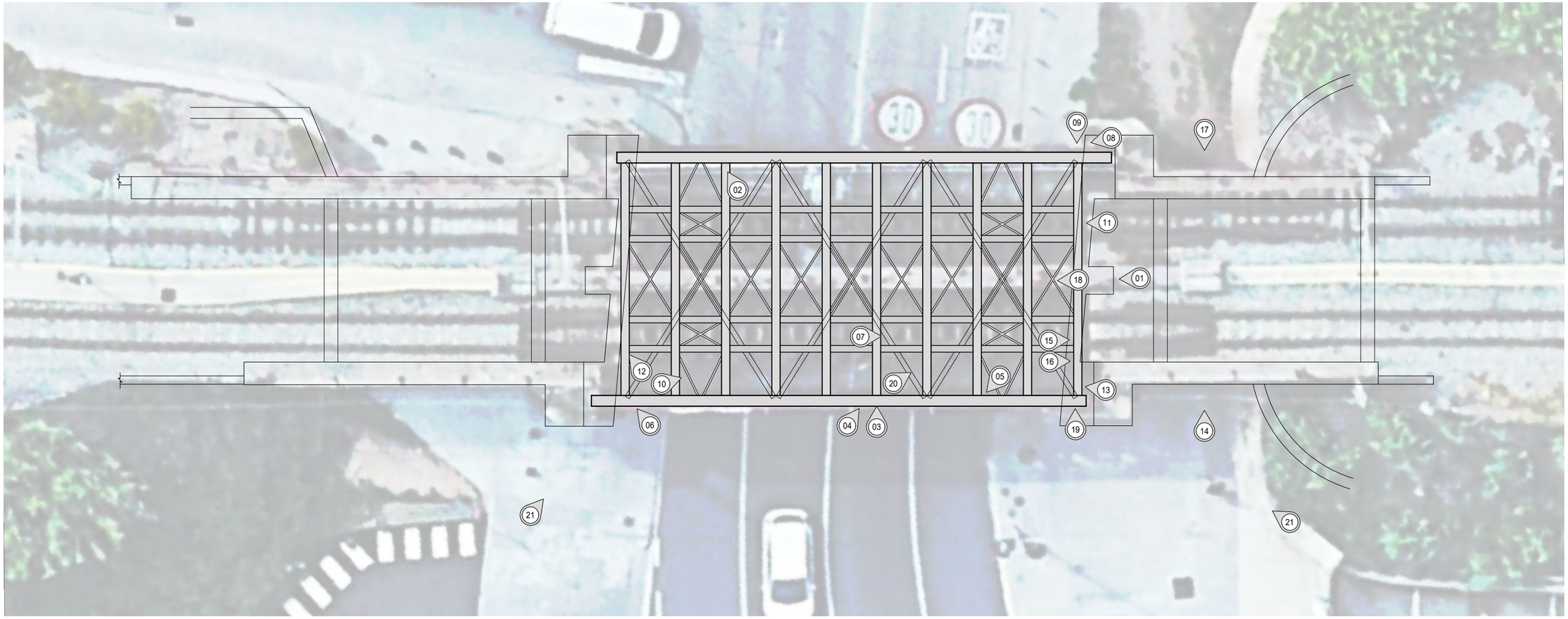
*Fotografia núm. 21: Vista general del pont des del costat Sant Fruitós*



*Fotografia núm. 22: Vista general del pont des del costat Manresa*

## PONT SOBRE CARRETERA DE VIC

ESCALA 1:150



















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| ELAB. | REV. | APR. |
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS: GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
REPORTATGE FOTOGRÀFIC
REPORTATGE FOTOGRÀFIC (I)

DATA: GENER 2024

PLÀNOL NÚM.: 04A

NOM FITXER: 04AF01-F02.dwg

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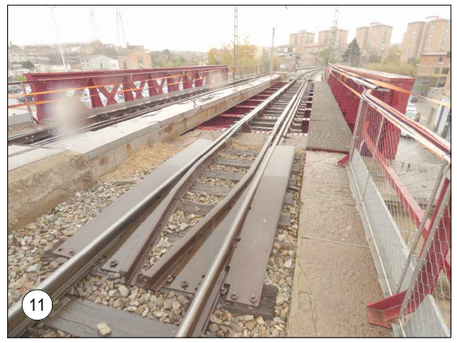


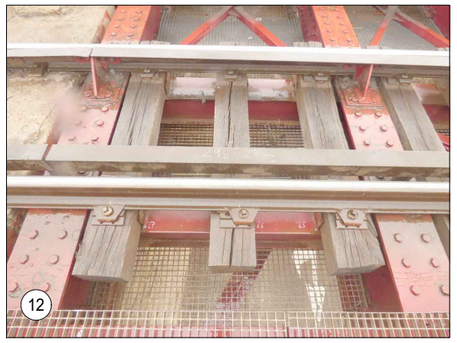


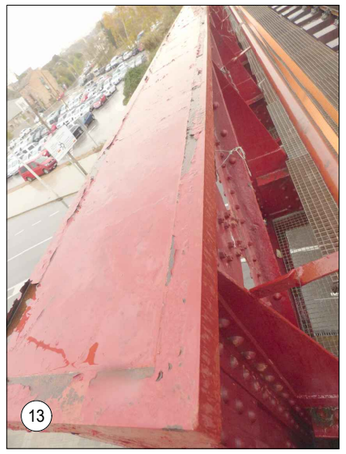






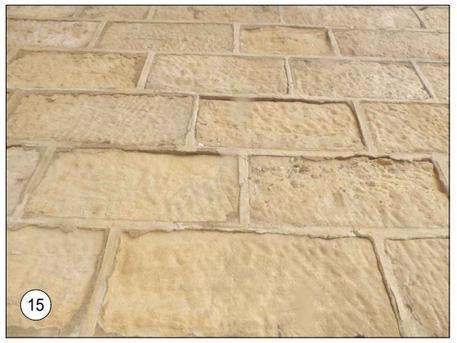



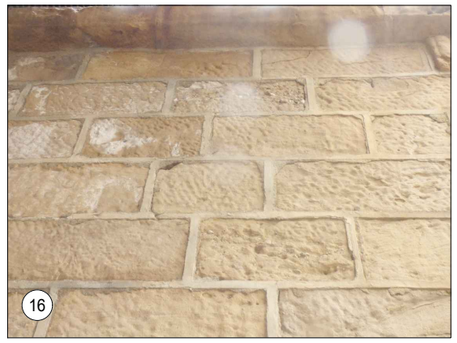



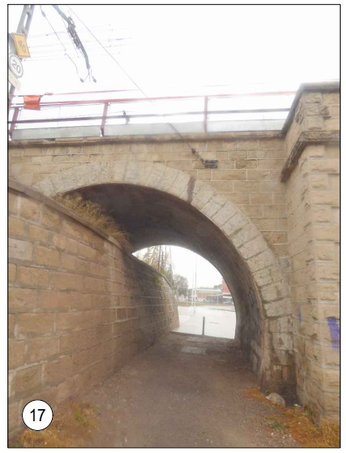

























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| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR
PEDELTA

AUTOR DEL PROJECTE
JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE
INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES
S/E
ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL
PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
REPORTATGE FOTOGRÀFIC
REPORTATGE FOTOGRÀFIC (II)

DATA
GENER 2024

PLÀNOL NÚM.
04A

NOM FITXER
04AF01-F02.dwg

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# ANNEX NÚM. 4: CARTOGRAFIA I TOPOGRAFIA

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
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| 0 | 17/01/2024 | DJS | | |
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ACTUALITZACIONS

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NOM FITXER : 240117 PMAN-FGC-PED-CARTOGRAFIA I TOPOGRAFIA-V00

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1 OBJECTE ..... 1

2 MEMÒRIA GENERAL ..... 1

2.1 INTRODUCCIÓ ..... 1

2.2 DESCRIPCIÓ DE L'ESTRUCTURA ..... 1

3 PROCEDIMENT ..... 1

APÈNDIX 1 PROJECTE DE REHABILITACIÓ 1991 (FGC) ..... 2

# 1 OBJECTE

L'objecte del present annex és explicar el procediment seguit per obtenir la cartografia i topografia utilitzades al "Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya".

# 2 MEMÒRIA GENERAL

## 2.1 INTRODUCCIÓ

Es tracta d'un pont metàl·lic d'una longitud de 17,90 metres. Es troba al P.K. 60+720 al terme municipal de Manresa, entre les estacions de Sant Vicenç de Castellgalí i Manresa. Es tracta d'un tram de via doble per on circulen tant trens de passatgers com a trens de mercaderies, que transporten potassa. La data de la construcció del pont és l'any 1924.

## 2.2 DESCRIPCIÓ DE L'ESTRUCTURA

És un pont de estructura metàl·lica, el pont té un únic vanol (isostàtic) amb longitud de 17,9m i 8,8m d'amplada.

El pont es constituït per les bigues principals són gelosies a Cruz de Sant Andreu, amb sustentació isostàtica i longitud entre suports de 17,3 m. Consten de 9 mòduls de 1,82 m, amb diagonals creuades a tots ells. El seu cantell màxim és de 2,002 m i la separació entre els seus eixos de 8,8 m. Els cordons estan constituïts per seccions a "T", invertida la inferior, i són variables en anar entrant xapes de reforç. Tant el superior com l'inferior estan reforçats amb perfils angulars simples. Els muntants estan constituïts per xapes i angulars. Les diagonals estan formades per parells d'angulars de diferents mides units entre si per xapes d'ànima. Les unions entre els diferents elements són reblonades. Hi ha cartells als nusos superiors extrems i a les unions amb les biguetes i elements d'arriostraments.

La posició del tauler és inferior en relació amb les bigues principals. Les biguetes tenen una longitud teòrica de 8,8 m i estan modulades cada 1,82 m, coincidint amb els muntants de les bigues principals. Són bigues armades d'ànima plena, constituïdes per xapes i quatre angulars, amb angulars de reforç a les ales inferiors que no és existent al costat exterior de les biguetes extremes. Tenen secció variable amb un cantell màxim de 0,74 m, al centre de va, i cantell mínim de 0,72 m en els suports. Les unions amb les bigues principals són roblonades i es realitzen a través de les cartelles de rigidesa dels muntants.

Els bigues longitudinals originals han estat substituïts per bigues al calaix. La separació transversal entre eixos és de 1,060 m, sent 1,880 m la distància entre la biga longitudinals exterior i la biga principal, per a ambdues vies, finalment, la separació entre els bigues longitudinals interiors és de 2,92 m. Tenen una llum de 1,82 m i 0,303 m de cantell. S'uneixen a les biguetes mitjançant cargols d'alta resistència a través de casquets d'angular. La unió entre els diferents elements es realitza mitjançant reblons.

El pont disposa d'un arriostrament horitzontal contravent entre les dues bigues, amb modulació cada tres mòduls de biga, a nivell del seu cordó inferior, constituït per una gelosia a la Creu de Sant Andreu.

A més, recentment, s'ha disposat un arriostrament contravent nou entre els bigues longitudinals interiors de cada via, resolt també mitjançant una gelosia a Cruz de San Andrés, modulada igual que les biguetes del tauler.

Finalment, hi ha pòrtics de frenada disposats en els mòduls 2 i 8, resolts mitjançant mòduls a "K" entre el la biga longitudinal exterior i el cordó inferior de la biga principal adjacent, i per mòduls a Cruz de San Andrés entre els bigues longitudinals dels mòduls afectats.

Totes les unions són reblonades, excepte a les diagonals de l'arriostrament inferior reforçades. Les unions es fan a través de cartel·les, presentant excentricitat totes les diagonals.

El pont també disposa de dues passejades de servei interiors a les bigues principals que han estat producte de les feines de renovació. A més, s'han disposat pòrtics de suport de canonades a la zona d'entrevies, cobertes per una xapa estriada que dóna lloc a un tercer passeig.

La xapa de pis és metàl·lica estriada, i està reblonada als perfils que les sustenten. Existeix unes baranes als passeigs laterals.

Els estreps del pont presenten paraments frontals plans de maçoneria carejada amb carreus en cantonades i imposta de coronació. Els paraments laterals són murs envoltats de la mateixa tipologia que els frontals. Amb l'existència de dos passos inferiors, en ambdós estreps. Els murs guardabalast són de carreuat, a l'estrep d'entrada, i de formigó, al de sortida. Les coronacions de suports són de carreuat.

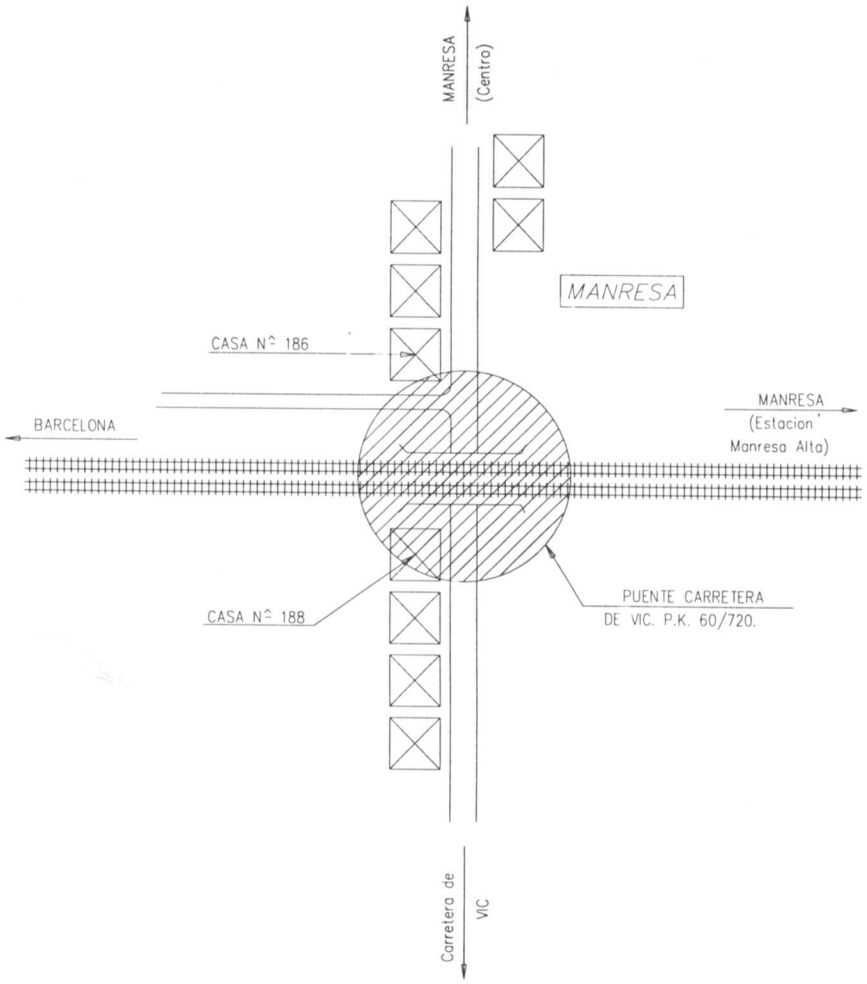
Els aparells de suport fixos es troben a l'estrep de sortida. La biga s'uneix a una peça metàl·lica alleugerida que descansa sobre la coronació dels suports. Els mòbils estan a l'estrep d'entrada i compten amb una peça esfèrica que permet el moviment i una base que recolza sobre la coronació. Les bigues estan unides amb quatre cargols a la peça superior dels aparells.

# 3 PROCEDIMENT

S'ha considerat no necessari realitzar un aixecament cartogràfic i topogràfic donada que la FGC facilita el projecte de rehabilitació del pont amb data de novembre 1991 que contenen els plànols geomètrics del pont (s'adjunta el projecte de rehabilitació mencionada com a apèndix del mateix annex) i que la informació continguda al document és suficient i permet la correcta definició de les actuacions del present projecte de reparació.

# APÈNDIX 1 PROJECTE DE REHABILITACIÓ 1991 (FGC)

LINEA: BARCELONA A MANRESA.
PUENTE: "CARRETERA DE VIC"
P.K. 60 / 720.




NOTA.-

-SU SITUACION CORRESPONDE A LA HOJA Nº 363 ,ESCALA 1/50000 DEL INSTITUTO GEOGRAFICO NACIONAL.

TECNOLOGIA E INVESTIGACION FERROVIARIA TIFSA

Referencia: E07 / A 1

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| Comprovat | ABRIL-1991 | A.G.NOTARIO | A.G.N |
| Aprovat | ABRIL-1991 | J.BATANERO | J.B |

Ferrocarrils de la Generalitat de Catalunya
Instal.lacions Fixes

ESCALA: S/E

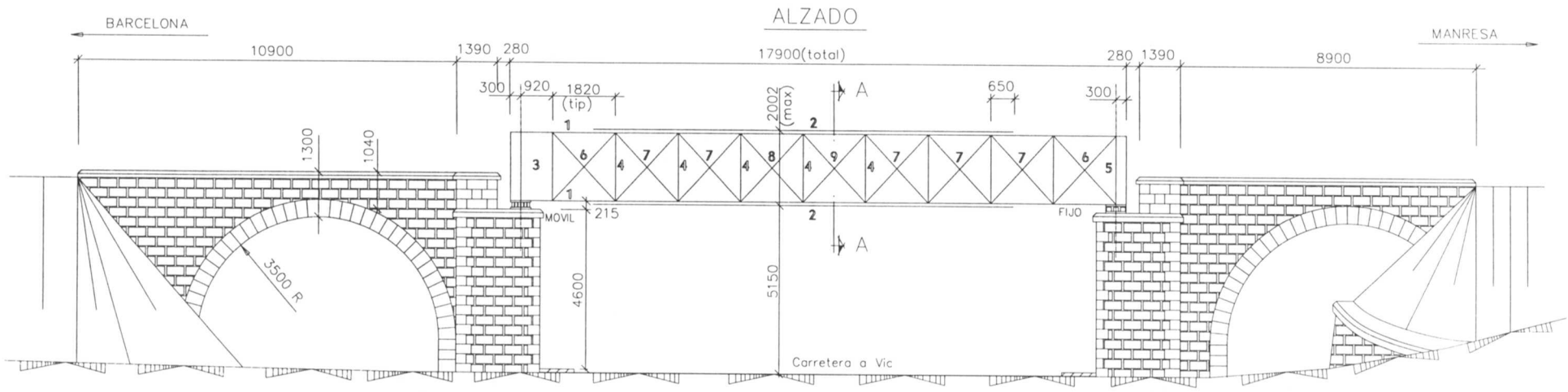
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PUENTE CARRETERA DE VIC. P.K. 60/720.
SITUACION GEOGRAFICA.

SERVEI: OBRES

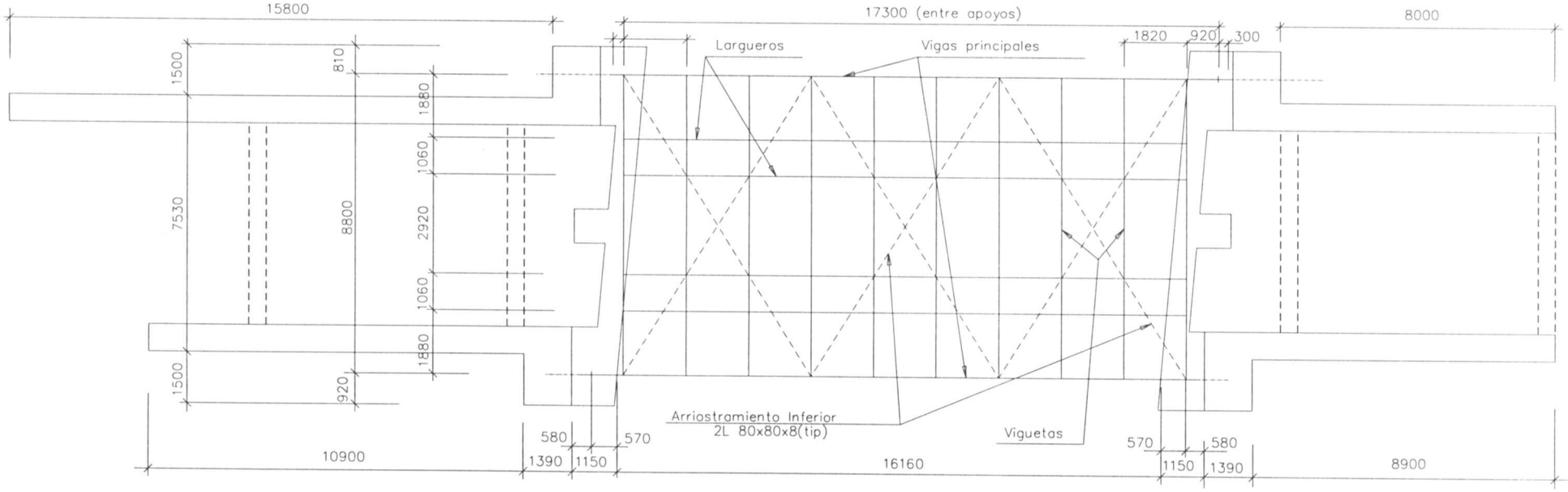
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## ALZADO




## PLANTA




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| Comprovat | ABRIL-1991 | A.G.NOTARIO | |
| Aprovat | ABRIL-1991 | J.BATANERO | |

TECNOLOGIA E INVESTIGACION FERROVIARIA TIFSA

Referencia: E07 / A 1

Ferrocarrils de la Generalitat de Catalunya

Instal.lacions Fixes

ESCALA: 1:125

LINEA DE BARCELONA A MANRESA

PUENTE CARRETERA DE VIC. P.K.60/708.

ALZADO Y PLANTA

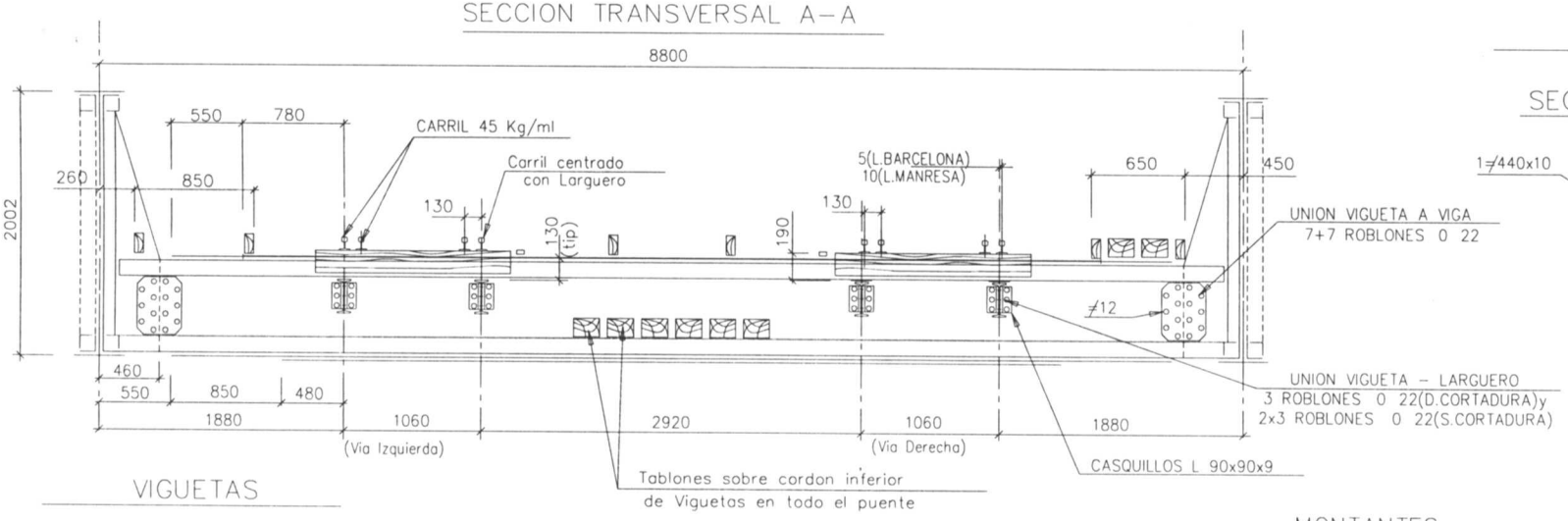
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PLANOL N. º1 2 0100 004 02

Substitueix

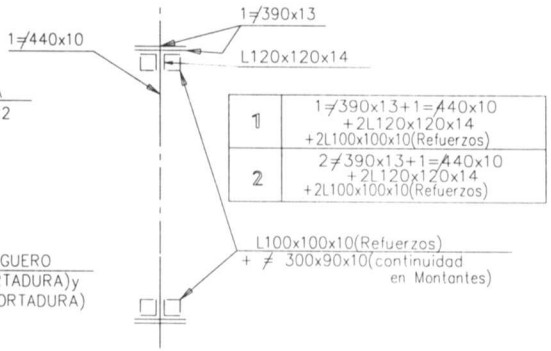
Substituit

## SECCION TRANSVERSAL A-A



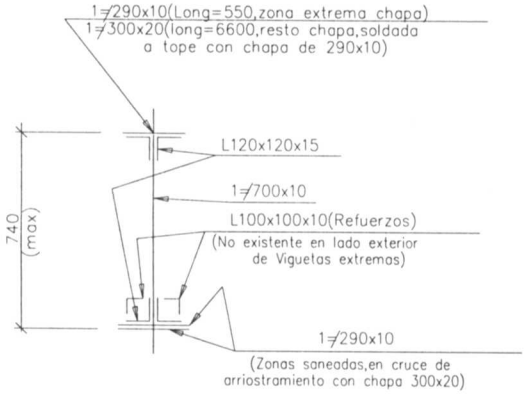

## VIGA PRINCIPAL

### SECCION TIPO

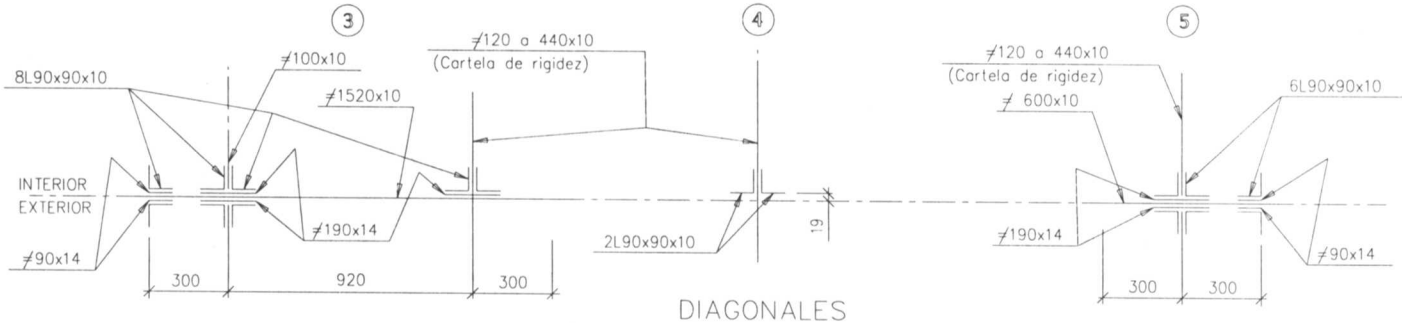



| | |
|---|---|
| 1 | 1≠390x13+1=≠440x10<br>+2L120x120x14<br>+2L100x100x10(Refuerzos) |
| 2 | 2≠390x13+1=≠440x10<br>+2L120x120x14<br>+2L100x100x10(Refuerzos) |

## VIGUETAS




## MONTANTES



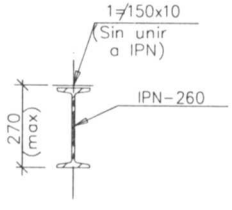

## DIAGONALES



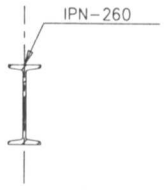

| | |
|---|---|
| 6 | 2L140x140x14 |
| 7 | 2L120x120x15 |
| 8 | 2L120x120x13 |
| 9 | 2L120x120x12 |

## LARGUEROS

### VIA DERECHA




### VIA IZQUIERDA




| | VIGAS PRINCIPALES (mm) | MONTANTES (mm) | DIAGONALES (mm) | VIGUETAS (mm) | LARGUEROS (mm) | ARRIOSTRA-MIENTOS (mm) |
|---|---|---|---|---|---|---|
| ROBLONES | Ø 22 | Ø 22 | Ø 22 | Ø 22 | —— | —— |
| CARTELAS | ≠10 | —— | ≠15<br>≠12<br>≠10 | —— | —— | ≠ 9 |

TECNOLOGIA E INVESTIGACION FERROVIARIA TIFSA

Referencia: E07 / A 1

| | Data | Nom | Signatura |
|---|---|---|---|
| Dibuixat | ABRIL-1991 | C.LOMA | |
| Comprovat | ABRIL-1991 | A.G.NOTARIO | A.G.N. |
| Aprovat | ABRIL-1991 | J.BATANERO | J.B. |

Ferrocarrils de la Generalitat de Catalunya

Instal.lacions Fixes

ESCALA: 1:20 1:40

LINEA DE BARCELONA A MANRESA

PUENTE CARRETERA DE VIC. P.K.60/720.

SECCIONES

SERVEI: OBRES

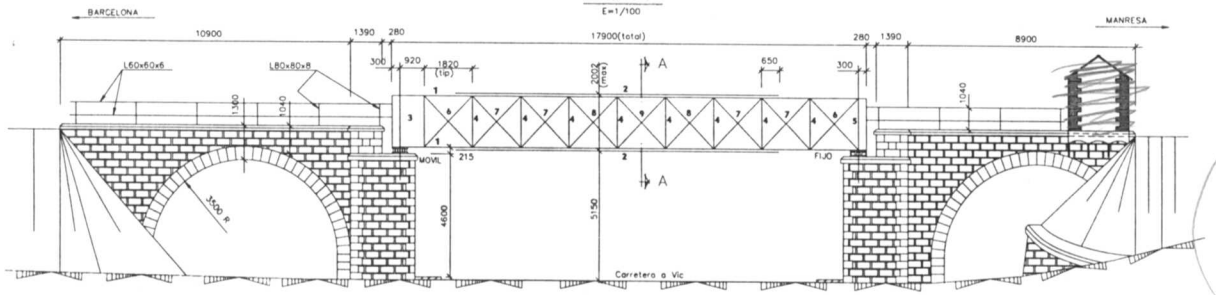
PLANOL N. º 1 2-0100-004 03

Substitueix

Substituit

CIESA

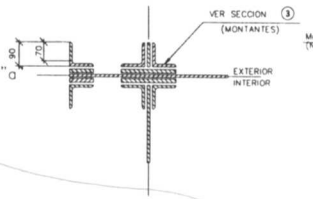
## ALZADO
E=1/100



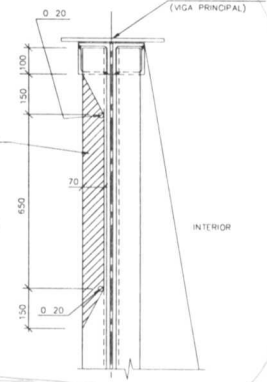

## TOMAS DE MUESTRAS
E=1/10

vale

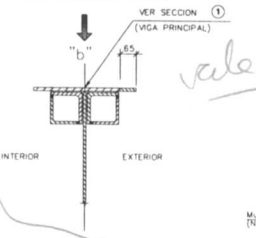
### Nos V1 Y V2




### VISTA POR "a"

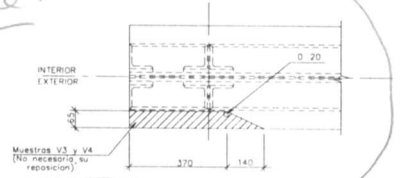



### Nos V3 Y V4

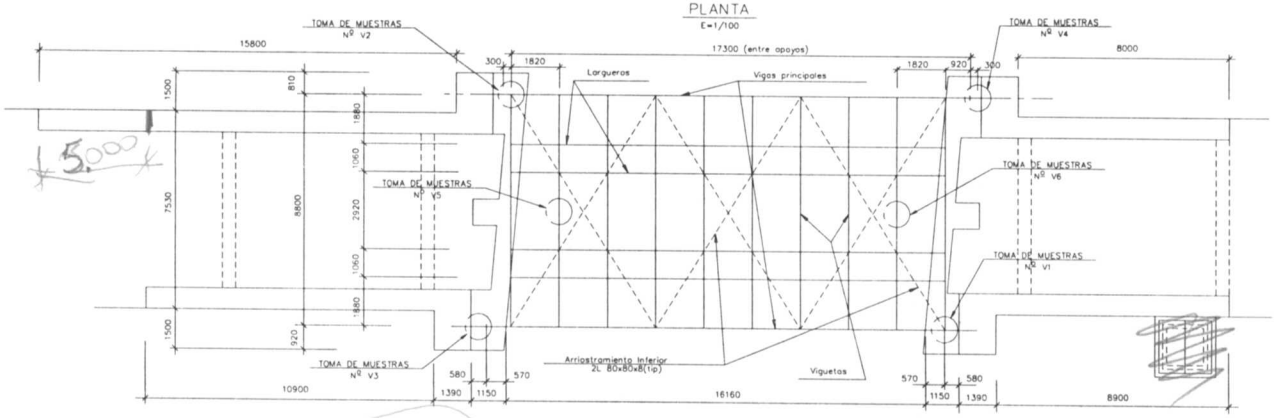



vale

### VISTA POR "b"

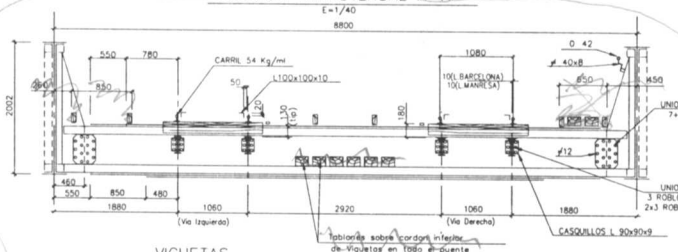



## PLANTA
E=1/100



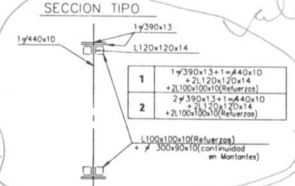

5.000

## SECCION TRANSVERSAL A-A
E=1/40



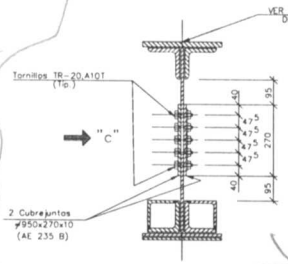

## VIGA PRINCIPAL
E=1/20

### SECCION TIPO

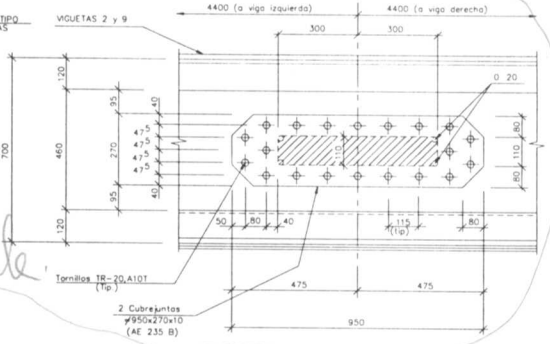



vale

## Nos V5 Y V6

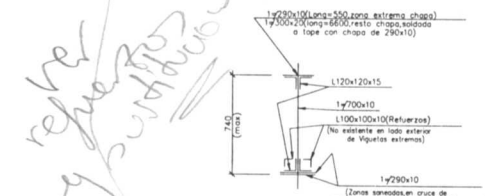



### VISTA POR "c"




vale

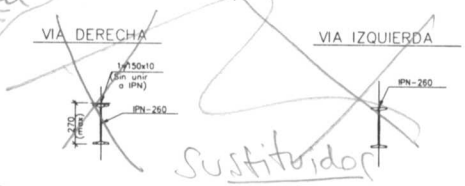
## VIGUETAS
E=1/20




Ver refuerzos y sustitución

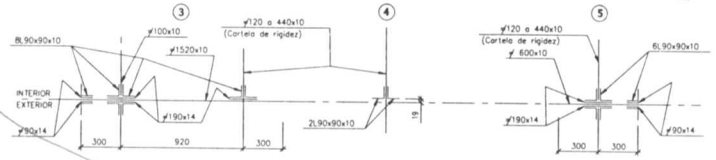
sustituido por trames

## LARGUEROS
E=1/20

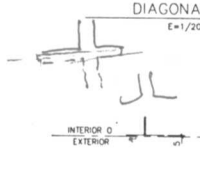



Sustituidos

## MONTANTES
E=1/20




## DIAGONALES
E=1/20




| | |
|---|---|
| 6 | 2L140x140x14 |
| 7 | 2L120x120x15 |
| 8 | 2L120x120x13 |
| 9 | 2L120x120x12 |

vale, ver refuerzos y sustituciones

### DATOS DE ENSAYOS DEL MATERIAL:

1.- ENSAYOS MECANICOS:

| | | V1 | V2 | V3 | V4 | V5 | V6 |
|---|---|---|---|---|---|---|---|
| L.E.(Kp/cm )² | | 2990 | 3330 | 3140 | 3440 | 2730 | 2870 |
| Rotura R(kp/cm )² | | 3850 | 4550 | 4120 | 6330 | 3710 | 3820 |
| Δl(%) | | 37,5 | 33,8 | 31,1 | 24,4 | 35,0 | 36,2 |
| Resilencia mínima a +20 | ° C | 3,3 | 5,8 | 6,8 | 1,5 | 6,2 | 6,5 |
| (Kgm/cm²) | 0° C | 0,8 | 1,8 | 4,8 | 0,8 | 5,0 | 6,8 |
| | -20° C | 0,6 | 0,7 | 3,5 | 0,5 | 4,0 | 3,2 |
| Desgarre a traccion(Kp/cm ) | | 2580 | 3190 | 3290 | 4690 | 2600 | 3190 |
| Doblado correcto 180 | ° | 2e | 2e | 2e | 3,5e | 2e | 2e |

2.- ANALISIS QUIMICO(%):

| | V1 | V2 | V3 | V4 | V5 | V6 |
|---|---|---|---|---|---|---|
| C | 0,075 | 0,075 | 0,100 | 0,440 | 0,120 | 0,120 |
| S | 0,040 | 0,038 | 0,040 | 0,040 | 0,039 | 0,037 |
| Mn | 0,480 | 0,480 | 0,560 | 0,590 | 0,710 | 0,500 |
| P | 0,045 | 0,040 | 0,040 | 0,045 | 0,043 | 0,040 |
| Si | 0,100 | 0,080 | 0,230 | 0,180 | 0,220 | 0,090 |
| Ceq. | 0,175 | 0,173 | 0,224 | 0,563 | 0,267 | 0,217 |

3.- CONCLUSIONES:

El conjunto de muestras 1,2,3,5y6 pueden clasificarse como A-310-B s/UNE 36-080-85.

La muestra 4 corresponde a un acero tipo F-1141 s/UNE 36-011-75, siendo solo soldable bajo requerimientos especiales.

NOTAS –

1.- COTAS EN MILIMETROS

| | Data | Nom | Signatura |
|---|---|---|---|
| Dibuixat | NOVIEMBRE-1991 | C.LOMA | |
| Comprovat | NOVIEMBRE-1991 | A.GNOTARIO | |
| Aprovat | NOVIEMBRE-1991 | J.BATANERO | |

Ferrocarrils de la Generalitat de Catalunya
Instal·lacions Fixes

TECNOLOGIA E INVESTIGACION FERROVIARIA RFSA
Referencia: ED7 / R

ESCALA: 1:100 / 1:40 / 1:20 / 1:10

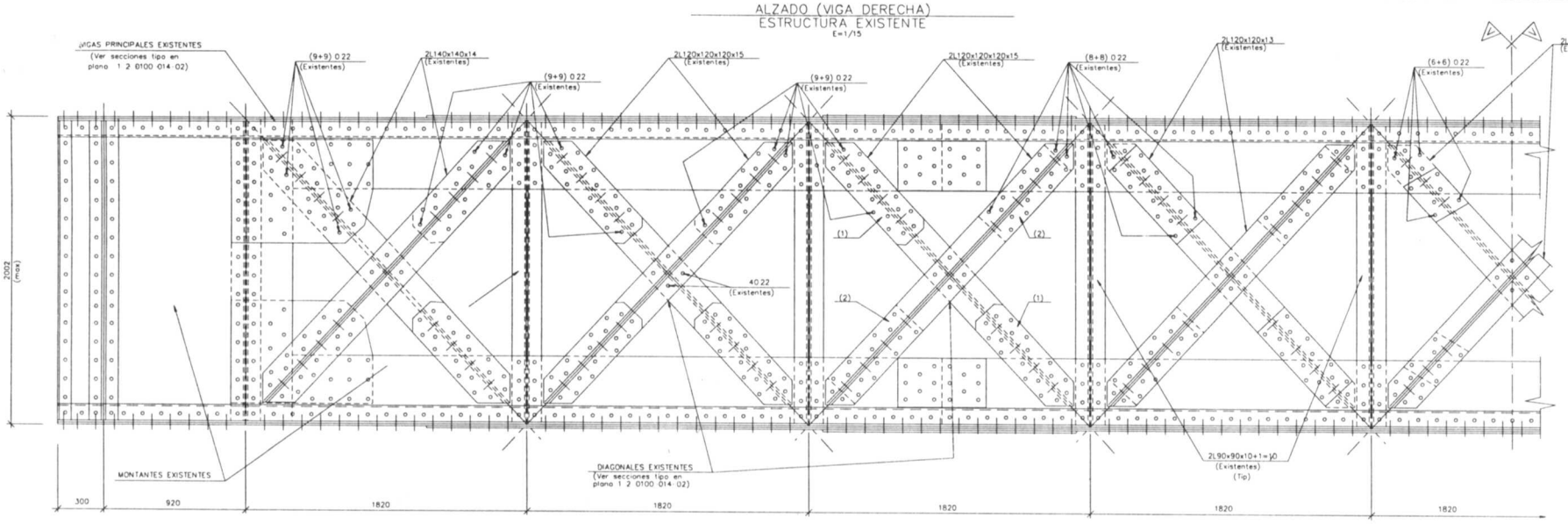
PROYECTO DE REHABILITACION DEL PUENTE METALICO
CARRETERA DE VIC. P.K.60/720.
LINEA DE BARCELONA A MANRESA.
DEFINICION GEOMETRICA INICIAL

SERVEI: OBRES

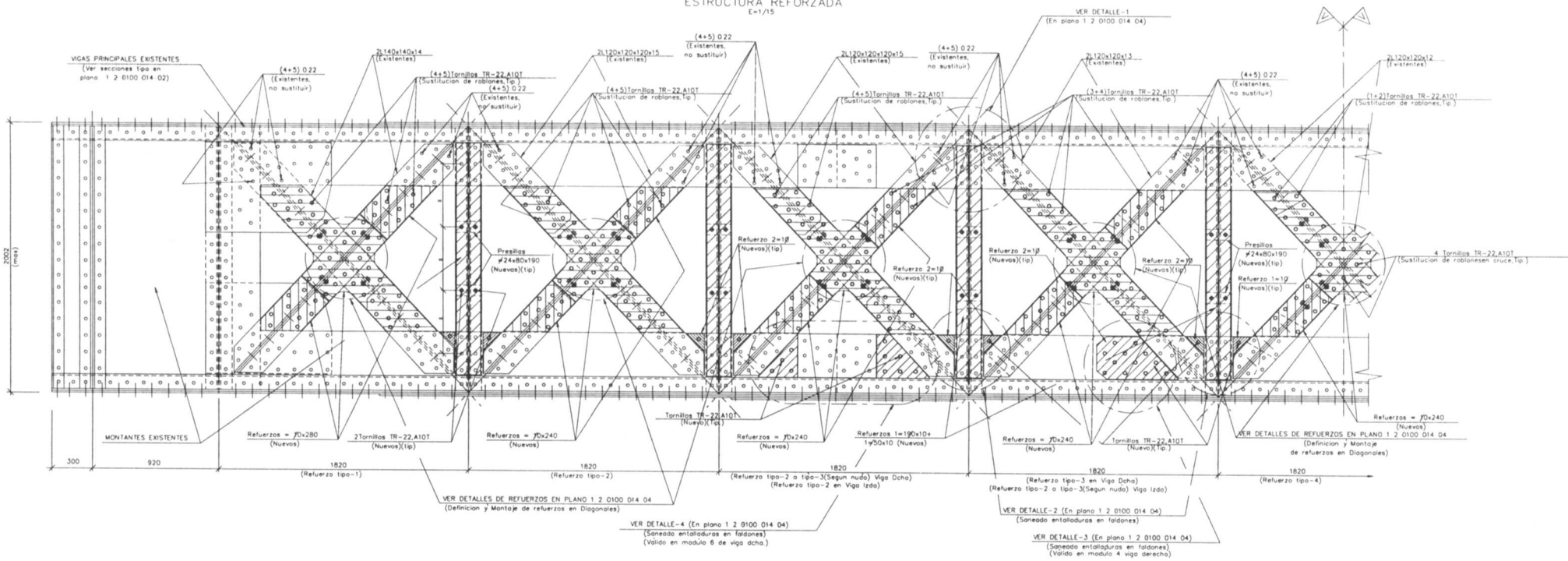
PLANOL: N. 4 1 2 0100 014 02

Substituïx a: | Substituït per:

## ALZADO (VIGA DERECHA)
## ESTRUCTURA EXISTENTE
E=1/15




## ALZADO (VIGA DERECHA)
## ESTRUCTURA REFORZADA
E=1/15




NOTA.-
-LA ZONA SOMBREADA CON ▨ INDICA LA SITUACION DE LOS NUEVOS REFUERZOS.

NOTAS.-
1.- COTAS EN MILIMETROS.
2.- VER ESTE PLANO CONJUNTAMENTE CON EL NUMERO 1 2 0100 014 04.
3.- VER RESTO DE NOTAS EN PLANO 1 2 0100 014 04.

| | Data | Nom | Signatura |
|---|---|---|---|
| Dibuixat | NOVIEMBRE-1991 | C.LOMA | |
| Comprovat | NOVIEMBRE-1991 | A.G.NOTARIO | |
| Aprovat | NOVIEMBRE-1991 | J.BATANERO | |

Ferrocarrils de la Generalitat de Catalunya
Instal·lacions Fixes

TECNOLOGIA E INVESTIGACION FERROVIARIA TIFSA

Referencia: EDT / R

ESCALA 1:15

PROYECTO DE REHABILITACION DEL PUENTE METALICO
CARRETERA DE VIC. P.K.60/720.
LINEA DE BARCELONA A MANRESA.
REFUERZO DE VIGAS PRINCIPALES,1 DE 2.

SERVEI: OBRES

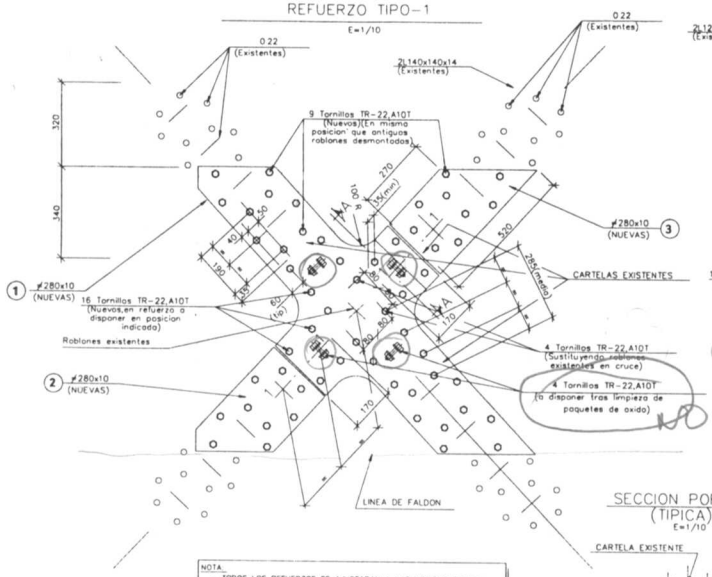
PLANOL

N. º 1 2 0100 014 03

Substituïts | Substitut

## REFUERZO TIPO-1

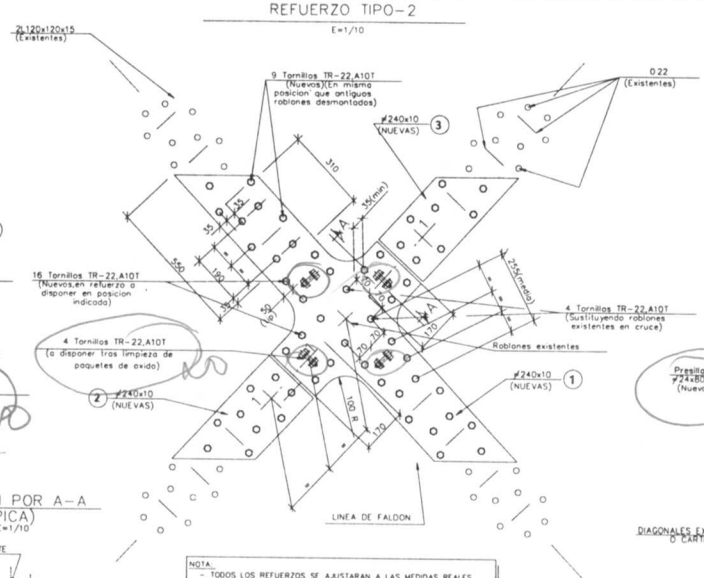
E=1/10




NOTA:
- TODOS LOS REFUERZOS SE AJUSTARAN A LAS MEDIDAS REALES DE CADA ELEMENTO;EN PLANOS FIGURAN COTAS MEDIAS DE LA ESTRUCTURA EXISTENTE

## REFUERZO TIPO-2

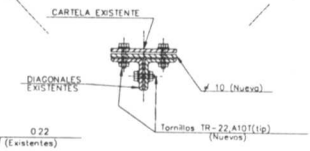
E=1/10




NOTA:
- TODOS LOS REFUERZOS SE AJUSTARAN A LAS MEDIDAS REALES DE CADA ELEMENTO;EN PLANOS FIGURAN COTAS MEDIAS DE LA ESTRUCTURA EXISTENTE

## SECCION POR A-A (TIPICA)

E=1/10

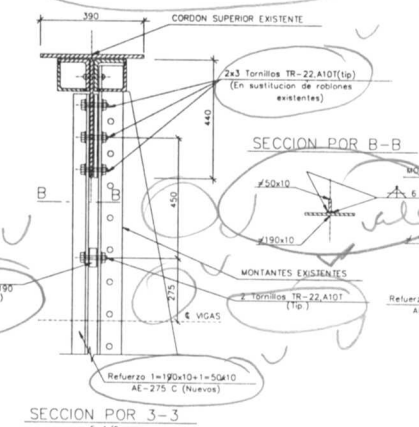



## DETALLE - 1

REFUERZO EN MONTANTES INTERMEDIOS

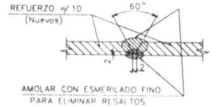
E=1/10

ALZADO-SECCION

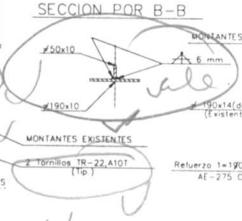



## SECCION POR 1-1

E=1/2

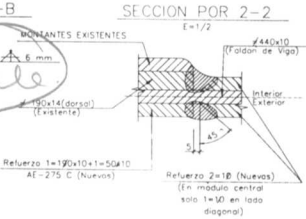



## SECCION POR B-B



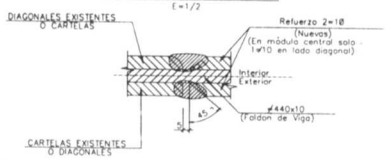

## SECCION POR 2-2

E=1/2



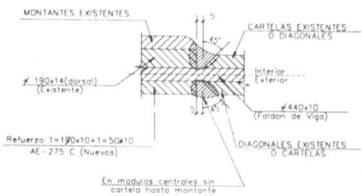

## SECCION POR 3-3

E=1/2



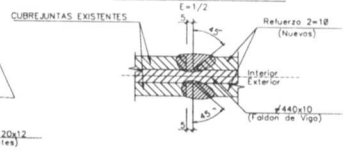

## SECCION POR 4-4

E=1/2



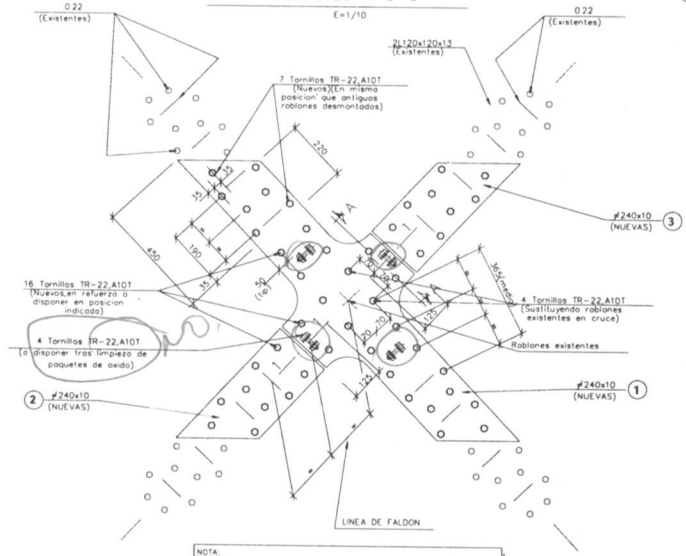

## SECCION POR 5-5

E=1/2




## REFUERZO TIPO-3

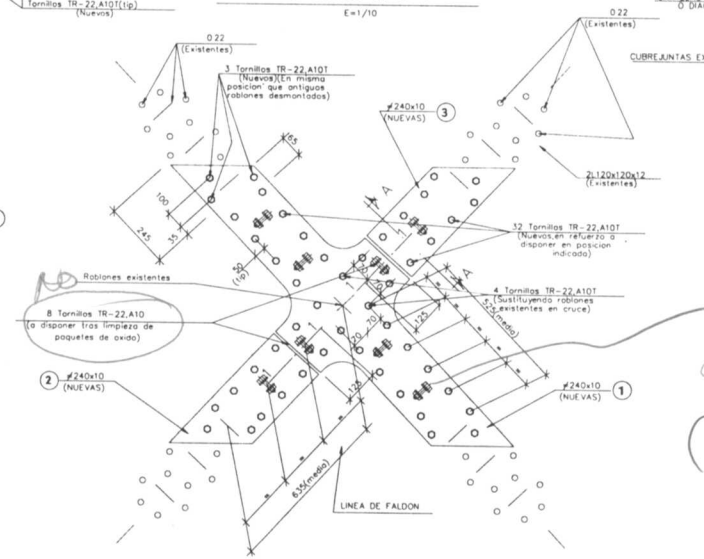
E=1/10




NOTA:
- TODOS LOS REFUERZOS SE AJUSTARAN A LAS MEDIDAS REALES DE CADA ELEMENTO;EN PLANOS FIGURAN COTAS MEDIAS DE LA ESTRUCTURA EXISTENTE

## REFUERZO TIPO-4

E=1/10




NOTA:
- TODOS LOS REFUERZOS SE AJUSTARAN A LAS MEDIDAS REALES DE CADA ELEMENTO;EN PLANOS FIGURAN COTAS MEDIAS DE LA ESTRUCTURA EXISTENTE.

Se ha repasado con soldadura (y no todas)

MONTAJE REFUERZOS DIAGONALES:

1.º.- CORTE Y RETIRADA DE ROBLONES EN CARTELAS DE DIAGONALES EXISTENTES BAJO LINEA DE FALDONES Y EN CRUCE DE DIAGONALES,SE REALIZARA POR MEDIOS MECANICOS.
2.º.- RETIRADA DE FORROS EXISTENTES,ENTRE CARTELAS Y DIAGONALES.
3.º.- COLOCACION CHAPA DE REFUERZO 1.
4.º.- COLOCACION CHAPA DE REFUERZO 2,SOLDANDO A 1 DE ACUERDO CON 1-1, HACIENDO PARA ELLO LAS TRASLACIONES PRECISAS.
5.º.- REPETIR ACTIVIDADES 3 Y 4.º,CON CHAPA DE REFUERZO 3.
6.º.- UNA VEZ REALIZADAS LAS UNIONES CORRESPONDIENTES,SE DISPONDRA LA CRUZ DE = Ø SOBRE LAS DIAGONALES RESPECTIVAS PARA PROCEDER A SU UNION CON TORNILLOS TR-22.A10T,EN LA ANTIGUA SITUACION DE ROBLONES Y NUEVOS INDICADOS.

MONTAJE REFUERZOS MONTANTES TIPO:

1.º.- CORTE Y RETIRADA DE ROBLONES DE UNION DE MONTANTE TIPO A FALDONES DE CORDONES,POR MEDIOS MECANICOS.
2.º.- DISPOSICION DE REFUERZO =190x10+=50x10 Y TORNILLOS TR-22.A10T.
3.º.- COLOCACION DE PRESILLAS =24x80x190.

REFUERZO CORDON INFERIOR VIGA DERECHA

1.º.- DISPOSICION DE FORROS INDICADOS.
2.º.- EJECUCION DE UNIONES SOLDADAS.
3.º.- TALADROS Y COLOCACION DE TORNILLOS TR-22.A10T.

NOTAS:

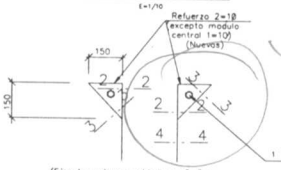
1.- COTAS EN MILIMETROS.
2.- VER PLANTA GENERAL EN PLANO 1.2.0100.014.02.
3.- VER ESTE PLANO CONJUNTAMENTE CON EL NUMERO 1.2.0100.014.03.
4.- VER CONDICIONES DE EJECUCION EN PUNTOS 3.2.3.3.3.4 Y CAPITULO 6 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.
5.- VER CONTROL DE CALIDAD DE SOLDADURAS ESPECIFICADO EN PUNTO 6.14 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.
6.- LA REALIZACION DE LOS REFUERZOS DEFINIDOS SE REALIZARA POR MODULOS, EN CORTE DE CIRCULACIONES POR AMBAS VIAS.

MATERIALES:

- ACERO EN REFUERZOS AE-275-C SEGUN UNE 36-080-85
- ACERO EN TORNILLOS A-10T SEGUN NBE-MV-107(1968)
- ELECTRODOS DE ACUERDO CON LAS CARACTERISTICAS DEL MATERIAL BASE REVESTIMIENTO PREFERIBLEMENTE BASICO,SEGUN UNE 14-003-86 Y 14-220-88

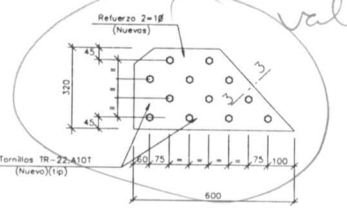
## DETALLE - 2

E=1/10



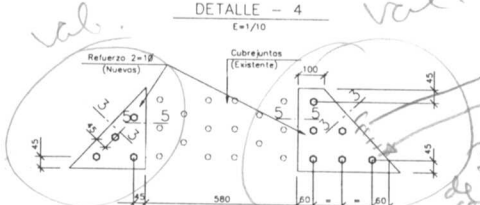

## DETALLE - 3

E=1/10




## DETALLE - 4

E=1/10




Han soldado alrededor a diagonales algunos sin cabeza tornillo (se ve espárrago)

| | Data | Nom | Signature |
|---|---|---|---|
| Dibuixat | NOVEMBRE - 1991 | C.LOMA | |
| Comprovat | NOVEMBRE - 1991 | A.GNOTARIO | |
| Aprovat | NOVEMBRE - 1991 | J.BATANERO | |

Ferrocarrils de la Generalitat de Catalunya
Instal·lacions Fixes

TECNOLOGIA E INVESTIGACIO FERROVIARIA DPTOP.
Projectista: E.D.T. / R.

ESCALA 1=10 1=2

PROYECTO DE REHABILITACION DEL PUENTE METALICO
CARRETERA DE VIC. P.K.60/720.
LINEA DE BARCELONA A MANRESA
REFUERZO DE VIGAS PRINCIPALES,2 DE 2

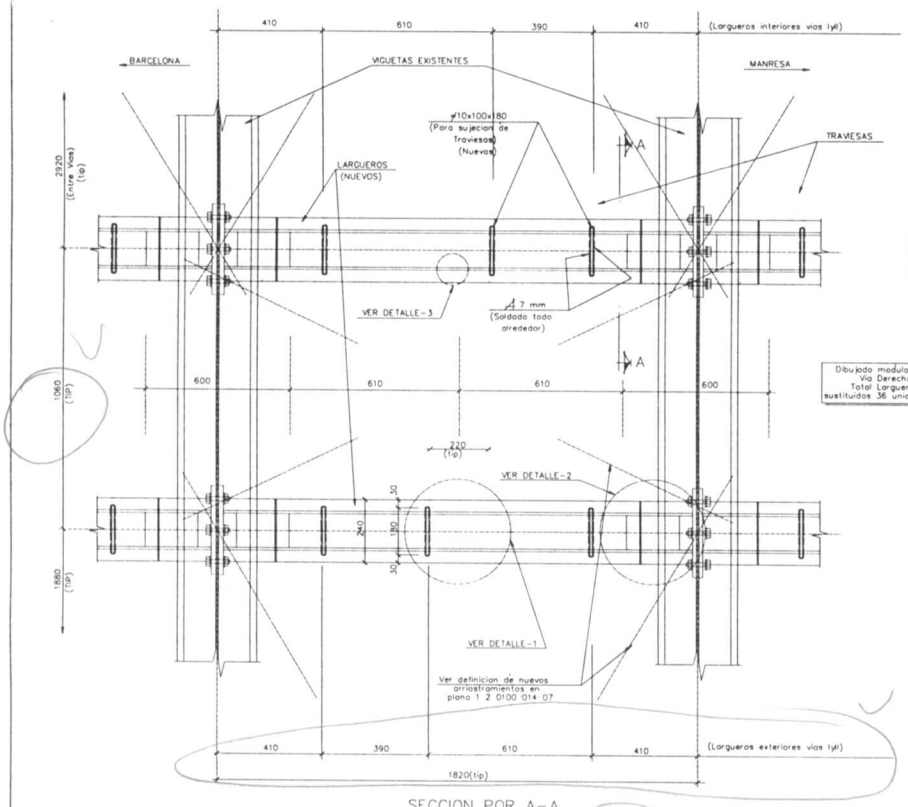
SERVEI: OBRES

PLANOL

N. º: 1.2.0100.014.04

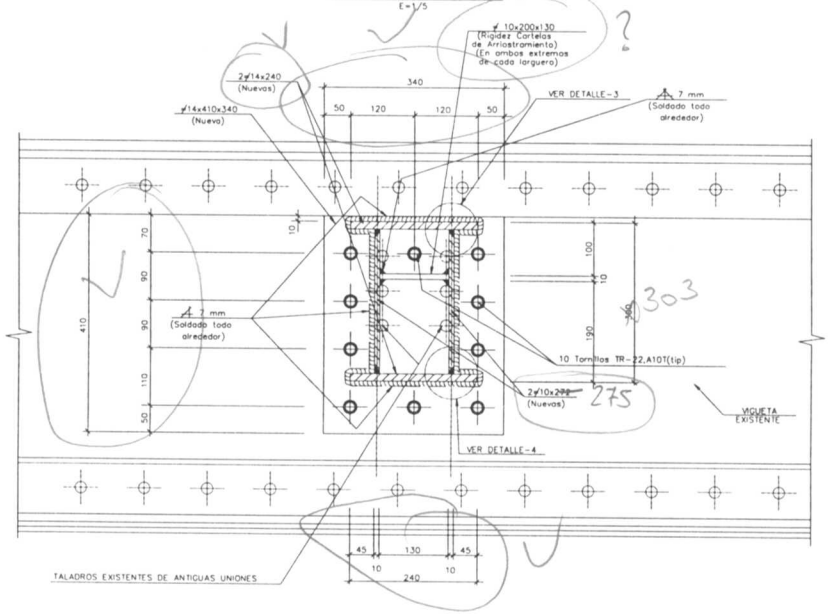
Substituirà | Substituït

## PLANTA (VIAS I Y II)
### SUSTITUCION DE LARGUEROS
E=1/10



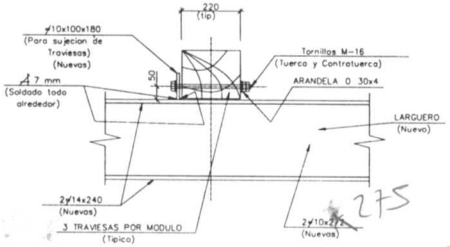

Dibujado modulo tipo
Via Derecha.
Total Largueros
sustituidos 36 unidades.

## SECCION POR A-A
E=1/5

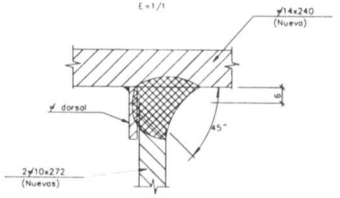



## DETALLE - 1
### SUJECION DE TRAVIESAS
E=1/10

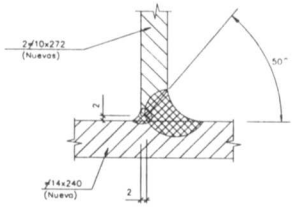
ALZADO




## DETALLE - 3
E=1/1




## DETALLE - 4
E=1/1




SINTESIS DEL PROCESO DE SUSTITUCION DE LARGUEROS:

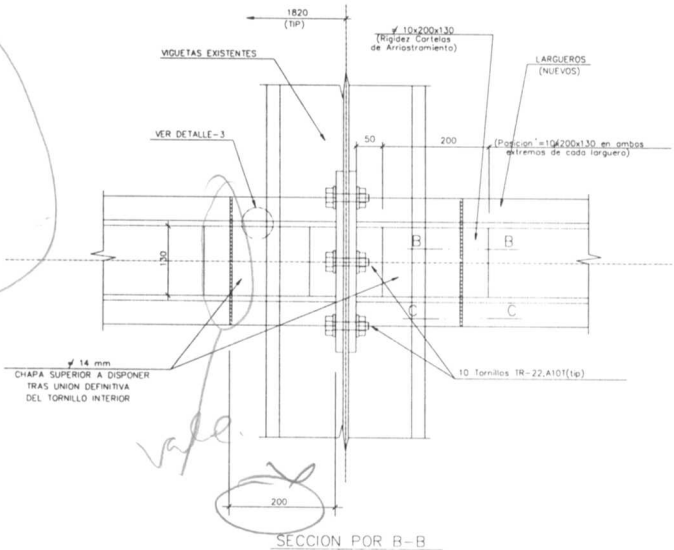
LAS OPERACIONES QUE SE RELACIONAN SE EFECTUA PRIMERO EN UNA VIA Y, UNA VEZ CONCLUIDAS,SE ACOMETERAN EN LA OTRA:

1.- RETIRADA DE FIJACIONES DE TRAVIESAS.
2.- DESMONTAJE DE LARGUEROS EXISTENTES CORTANDO PREVIAMENTE POR MEDIOS MECANICOS LOS ROBLONES DE UNION A VIGUETAS.
3.- PRESENTACION DE CHAPAS DE CIERRE 14x410x340mm EN ALMA DE VIGUETAS Y TALADRADO DE ESTAS.
4.- COLOCACION DE LARGUEROS ARMADOS EN TALLER Y SOLDADO A CHAPAS FINALES 14x410x340mm
5.- ATORNILLADO DE CHAPAS A VIGUETAS,INCLUSO TORNILLO INTERIOR.
6.- DISPOSICION DE ZONAS FINALES DE ALAS SUPERIORES 14x240x200 Y CONCLUSION DE SOLDADURAS DE OBRA.
7.- NUEVA SUJECION DE TRAVIESAS.

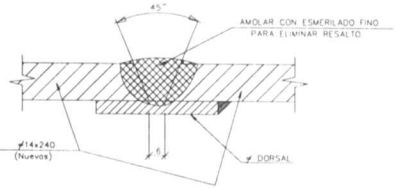
NOTA:-
-TODOS LOS INTERIORES DE LARGUEROS QUEDARAN ESTANCOS, DEBIENDO SER POR ELLO TODAS LAS SOLDADURAS MARCADAS CONTINUAS Y A TODO LO LARGO.

## DETALLE - 2
### UNION INTERIOR A VIGUETAS
E=1/5

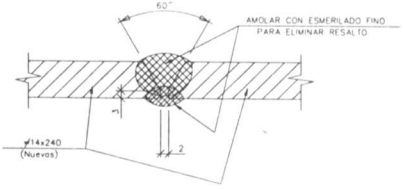
PLANTA




## SECCION POR B-B
E=1/1




## SECCION POR C-C
E=1/1




NOTAS:-
1.- COTAS EN MILIMETROS.
2.- VER PLANTA GENERAL EN PLANO 1 2 0100 014 02.
3.- SE SUSTITUYEN TODOS LOS LARGUEROS DEL TRAMO, EN TOTAL 36 UNIDADES.
4.- VER CONDICIONES DE EJECUCION EN PUNTO 3.5.Y CAPITULO 6 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.
5.- VER CONTROL DE CALIDAD DE SOLDADURAS ESPECIFICADO EN PUNTO 6.14 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.

MATERIALES:-
- ACERO EN LARGUEROS AE-275-C SEGUN UNE 36-080-85.
- ACERO EN TORNILLOS UNION A VIGUETAS A10T SEGUN NBE-MV-107(1968).
- ACERO EN TORNILLERIA DE SUJECION DE TRAVIESAS A4T SEGUN NBE-MV-106(1968).
- ELECTRODOS: DE ACUERDO CON LAS CARACTERISTICAS DEL MATERIAL BASE REVESTIMIENTO PREFERIBLE BASICO SEGUN UNE 14-003-86 Y 14-220-88.

| | Data | Nom | Signatura |
|---|---|---|---|
| Dibuixat | NOVIEMBRE-1991 | C.LOMA | |
| Comprovat | NOVIEMBRE-1991 | A.G.NOTARIO | |
| Aprovat | NOVIEMBRE-1991 | J.BATANERO | |

Ferrocarrils de la Generalitat de Catalunya
Instal·lacions Fixes

TECNOLOGIA I INVENCION (TECNOMAN) TIFSA

Referencia: EQT / R

ESCALA 1:10 1:5 1:1

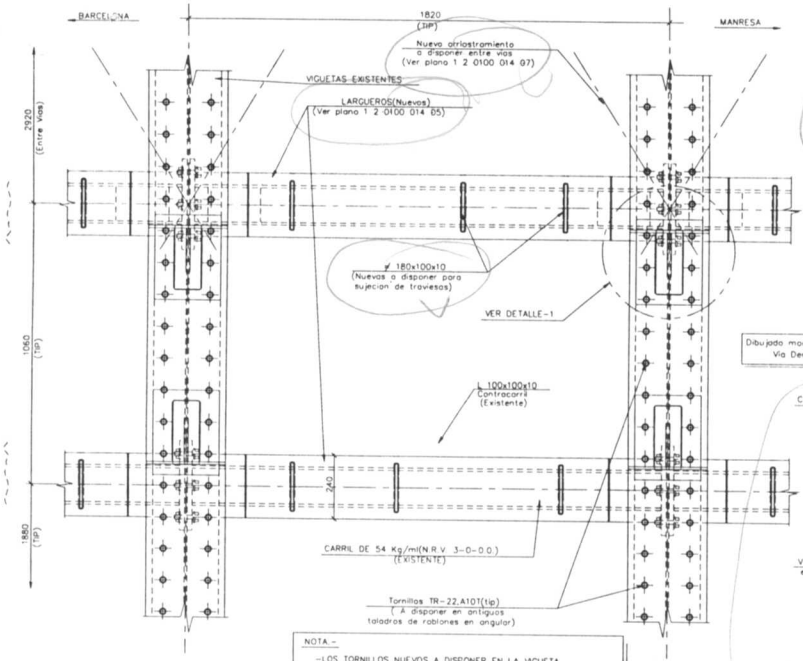
PROYECTO DE REHABILITACION DEL PUENTE METALICO
CARRETERA DE VIC P.K.60/720.
LINEA DE BARCELONA A MANRESA.
SUSTITUCION DE LARGUEROS.

SERVEI: OBRES

PLANOL N. 9 1 2 0100 014 05

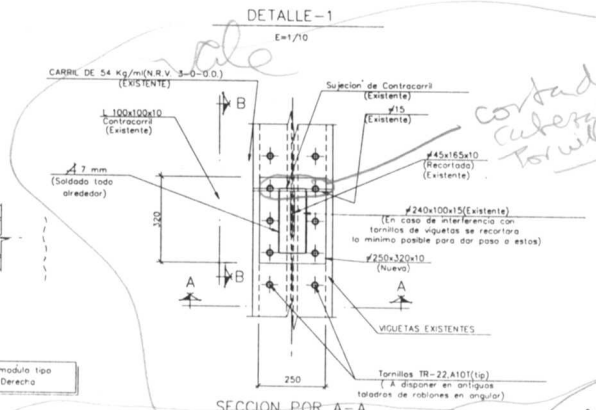
Substitueix | Substituit

# PLANTA (VIAS I Y II)
## REPARACION DE VIGUETAS
E=1/10

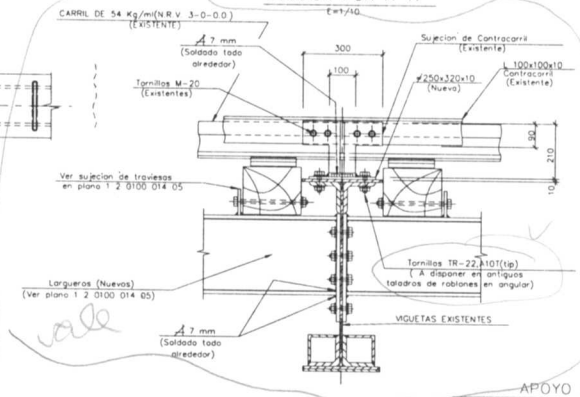



Dibujado modulo tipo Via Derecha

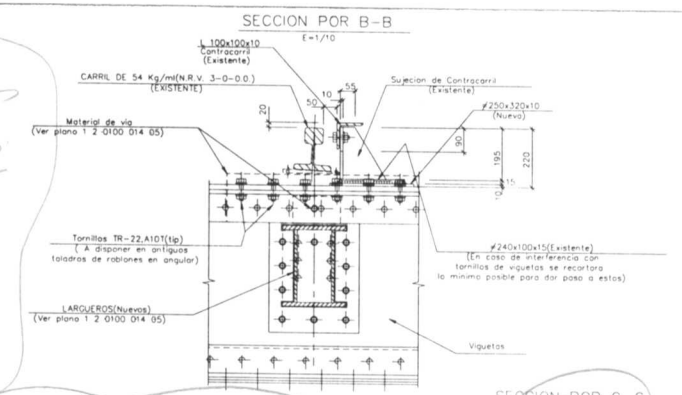
## DETALLE-1
E=1/10



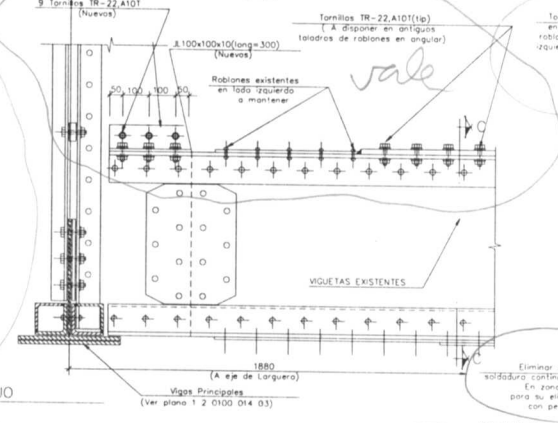

## SECCION POR A-A
E=1/10



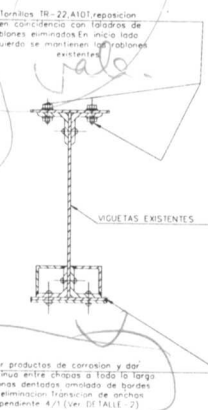

## SECCION POR B-B
E=1/10




## DETALLE UNION VIGUETA A VIGA
E=1/10




## SECCION POR C-C
E=1/10

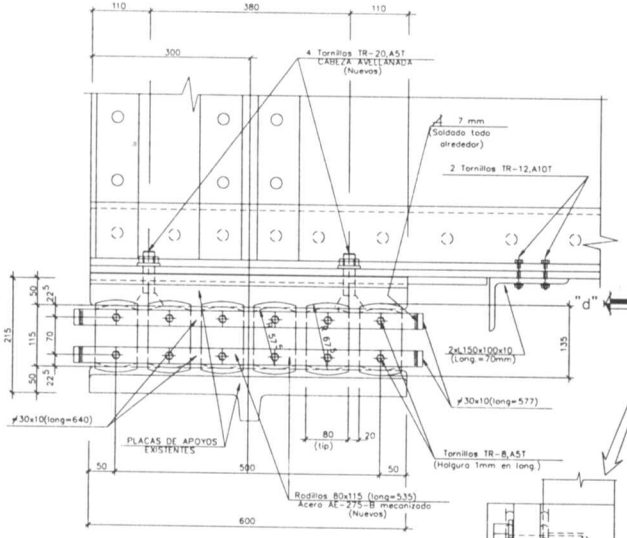



## DETALLE-2
E=1/10

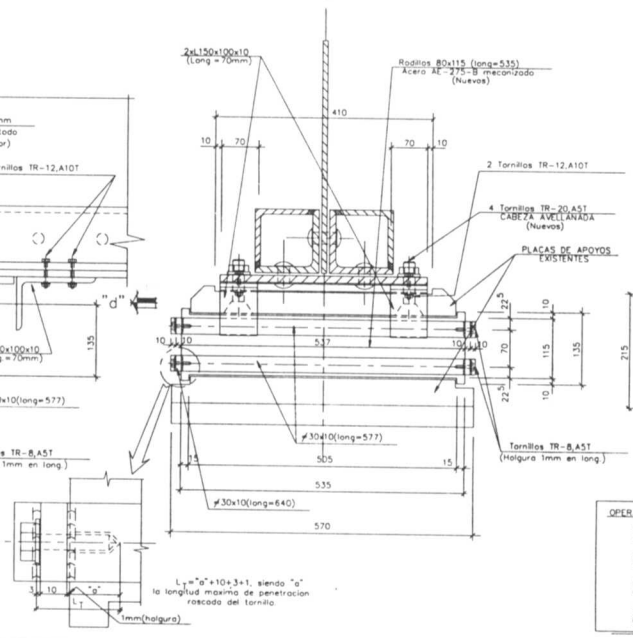



# APOYO MOVIL
## SUSTITUCION DE RODILLOS

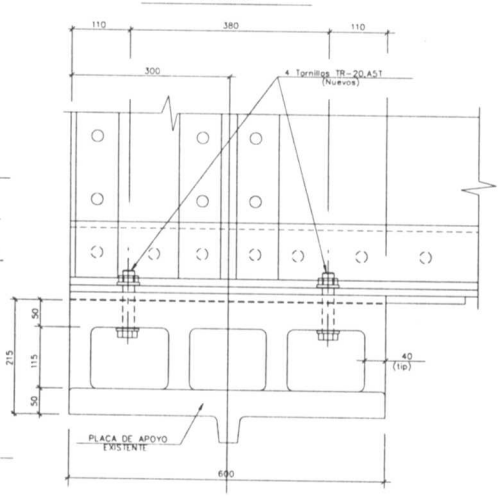
### ALZADO
E=1/5




### VISTA POR "d"
E=1/5




### ALZADO




APOYO FIJO
E=1/5

## OPERACIONES DE REVISION DE APOYOS.

1 – RETIRADA DE TORNILLOS UNION A VIGAS EN CASO DE APOYOS FIJOS.
2 – APEO Y LEVANTE DEL APOYO CORRESPONDIENTE.
R=201.Y COEFICIENTE DE SEGURIDAD > 2.
3 – RETIRADA DE TORNILLOS EN CASO DE APOYO MOVIL.
4 – LIMPIEZA DE SUPERFICIES,INCLUSO DE CONTACTO APOYO-VIGA Y APLICACION DEL SISTEMA DE PINTURA DE PROTECCION,HASTA IMPRIMACION.
5 – DISPOSICION DE NUEVOS TORNILLOS DE UNION A VIGAS.
6 – DISPOSICION DE NUEVOS JUEGOS DE RODILLOS Y TOPES EN CASO DE APOYO MOVIL. REGLAJE PARA SITUACION NEUTRA A 12 °C.
7 – RETIRADA DE APEOS.
8 – COMPLETAR SISTEMA DE PINTURA Y ENGRASE.

## OPERACIONES DE REPARACION DE VIGUETAS:

1 – ELIMINACION DE ELEMENTOS SOLDADOS ALA SUPERIOR,INCLUSO SOPORTES DE CONTRACARRILES.
2 – DISPOSICION DE TORNILLOS DE ALTA RESISTENCIA TR-22,A10t EN TALADROS DE ANGULARES ALA SUPERIOR Y NUEVAS SUJECIONES DE CONTRACARRILES.
3 – DISPOSICION L100x100x10 mm DE REFUERZO UNION A CARTELAS RIGIDEZ LADO IZQUIERDO.
4 – AMOLADO DE BORDES ALA INFERIOR PARA ELIMINAR DENTADOS,CONTINUIDAD GEOMETRICA Y TRANSICIONES DE ANCHO CON PENDIENTE MAXIMA 4/1.
5 – LIMPIEZA DE PRODUCTOS DE CORROSION ENTRE BORDES DE CHAPAS ALA INFERIOR Y SOLDADURA CONTINUA A TODO LO LARGO ENTRE CHAPAS.

NOTAS.-

1.- COTAS EN MILIMETROS.
2.- VER PLANTA GENERAL EN PLANO 1 2 0100 014 02
3.- SE REFUERZAN TODAS LAS VIGUETAS DEL TRAMO. EN TOTAL 10 UNIDADES.
4.- VER CONDICIONES DE EJECUCION EN PUNTO 3.6(VIGUETAS),3.9(APOYOS) Y EN CAPITULO 6 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.
5.- VER CONTROL DE CALIDAD DE SOLDADURAS ESPECIFICADO EN PUNTO 6.14 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.

MATERIALES.-

- ACERO EN CALIDAD AE-275 GRADO B EN PERFILES Y C EN CHAPAS SEGUN UNE 36-080-85.
- ACERO EN TORNILLOS UNION VIGUETAS Y TOPES DE APOYOS A10t SEGUN NBE-MV-107(1968)
- ACERO EN TORNILLERIA DE SUJECION DE APOYOS A VIGAS Y RODILLOS A5t SEGUN NBE-MV-106(1968)
- ELECTRODOS DE ACUERDO CON LAS CARACTERISTICAS DEL MATERIAL BASE REVESTIMIENTO PREFERIBLE BASICO SEGUN UNE 14-003-86 Y 14-220-88.

| | Data | Nom | Signatura |
|---|---|---|---|
| Dibuixat | NOVIEMBRE-1991 | C.LOMA | |
| Comprovat | NOVIEMBRE-1991 | A.G.NOTARIO | |
| Aprovat | NOVIEMBRE-1991 | J.BATANERO | |

Ferrocarrils de la Generalitat de Catalunya
Instalacions Fixes

TECNOLOGIA E INVESTIGACION FERROVIARIA TIFSA

Referencia: EST / 8

ESCALA 1:10 1:20 1:5

PROYECTO DE REHABILITACION DEL PUENTE METALICO
CARRETERA DE VIC,P.K.60/720
LINEA DE BARCELONA A MANRESA.
REPARACION DE VIGUETAS Y REVISION DE APOYOS

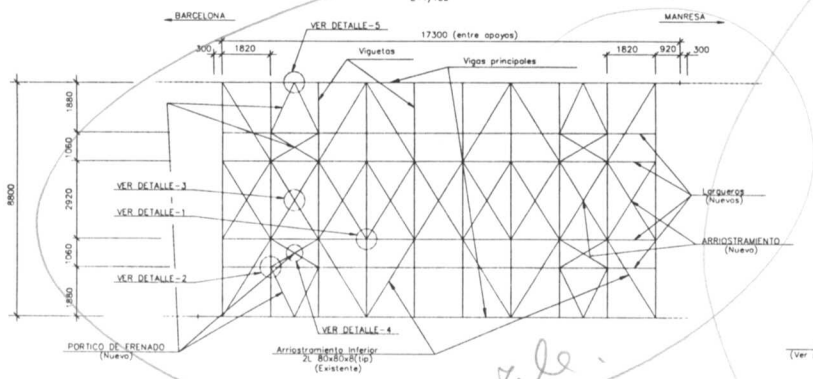
SERVEI: OBRES

PLANOL

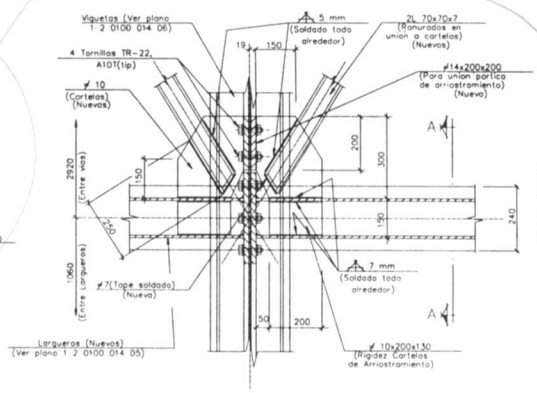
N. 1 2 0100 014 06

Substituirà | Substituit

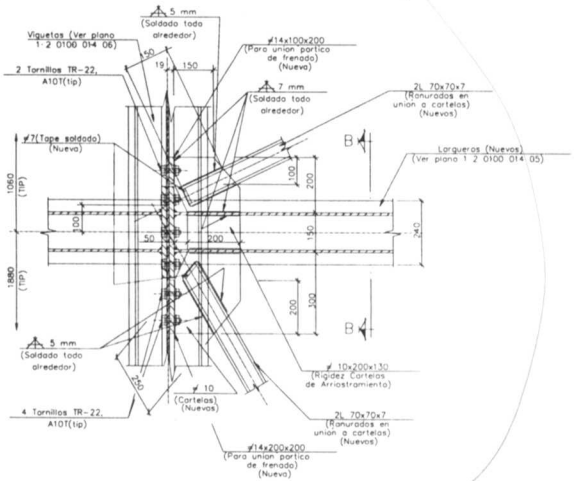
## PLANTA (SITUACION DETALLES)
E=1/100



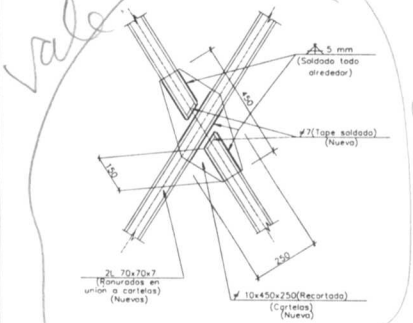

## DETALLE-1
E=1/10



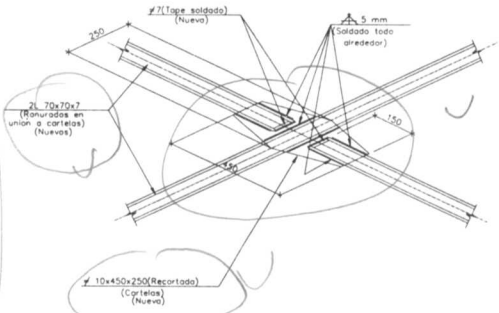

## DETALLE-2
E=1/10



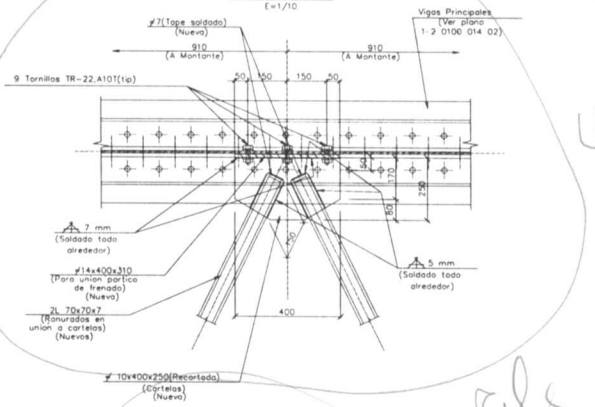

## DETALLE-3
E=1/10




## DETALLE-4
E=1/10



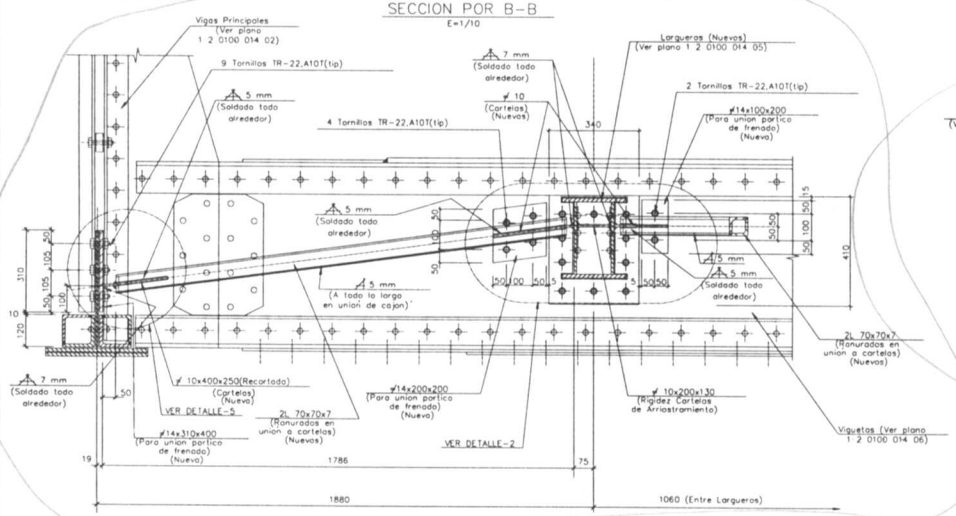

## DETALLE-5
E=1/10



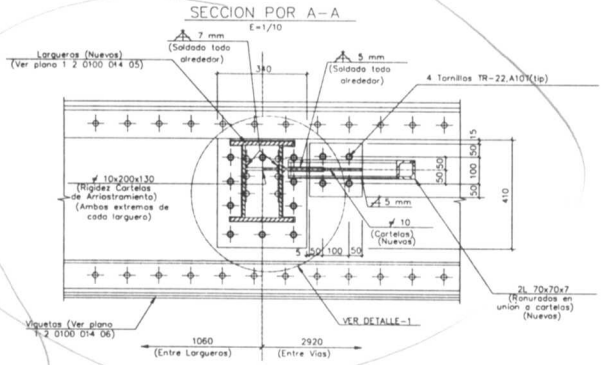

NOTA.-
- TODOS LOS L70x70x7 EN CAJON QUEDARAN CON INTERIOR ESTANCO,DEBIENDO SER POR ELLO LAS SOLDADURAS DE UNION ENTRE ELLOS Y A CARTELAS CONTINUAS Y A TODO LO LARGO.

NOTAS.-
1 - COTAS EN MILIMETROS
2 - VER CONJUNTAMENTE CON PLANOS 1·2-0100 014 02/03/05 Y 06
3 - VER CONDICIONES DE EJECUCION EN PUNTOS 3.7.3.8 Y CAPITULO 6 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.
4 - VER CONTROL DE CALIDAD DE SOLDADURAS ESPECIFICADO EN PUNTO 6.14 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES

## SECCION POR B-B
E=1/10




## SECCION POR A-A
E=1/10




MATERIALES.-
- ACERO EN ARRIOSTRAMIENTOS AE-275 GRADO B EN PERFILES Y C EN CHAPAS, SEGUN UNE 36-080-85.
- ACERO EN TORNILLOS UNION A VIGUETAS Y VIGAS A10t SEGUN NBE-MV-107(1968)
- ELECTRODOS:DE ACUERDO CON LAS CARACTERISTICAS DEL MATERIAL BASE REVESTIMIENTO PREFERIBLE BASICO SEGUN UNE 14-003-86 Y 14-220-88.

| | | Data | Nom | Signatura |
|---|---|---|---|---|
| TECNOLOGIA I GESTIO DE PROJECTES, TIPSA | Dibuixat | NOVIEMBRE-1991 | C.LOMA | |
| | Comprovat | NOVIEMBRE-1991 | A.G.NOTARIO | |
| | Aprovat | NOVIEMBRE-1991 | J.BATANERO | |

Referencia: E07 / R

Ferrocarrils de la Generalitat de Catalunya
Instal·lacions Fixes

ESCALA 1:100 1:10

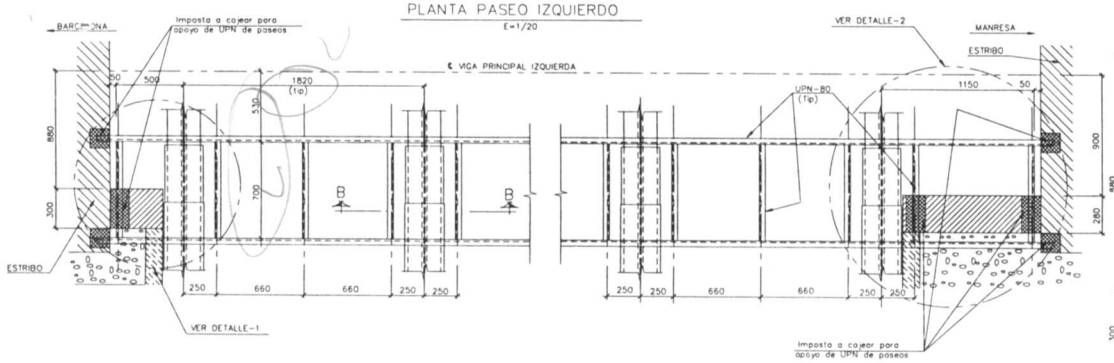
PROYECTO DE REHABILITACION DEL PUENTE METALICO
CARRETERA DE VIC, P.K.60/720.
LINEA DE BARCELONA A MANRESA.
NUEVOS ARRIOSTRAMIENTOS CONTRAVIENTO Y DE FRENADO.

SERVEI: OBRES

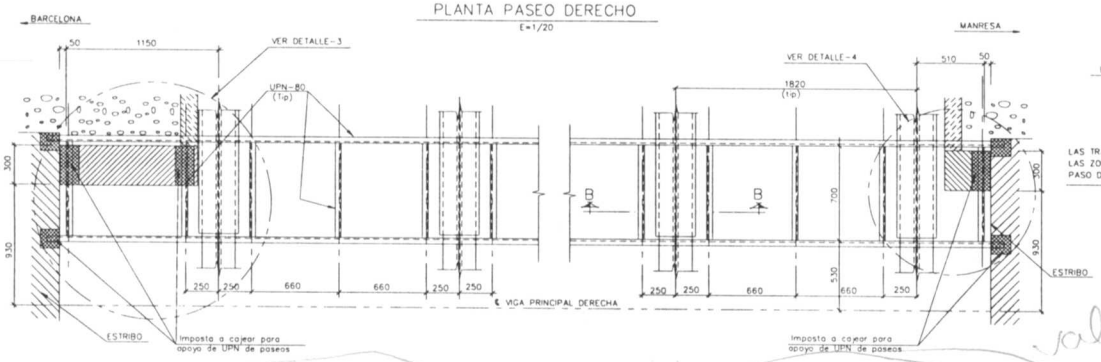
PLANOL N. 1·2 0100 014 07

Substituïx | Substituït

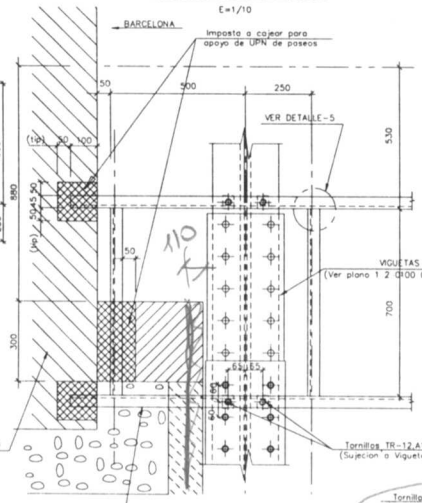
## PLANTA PASEO IZQUIERDO
E=1/20



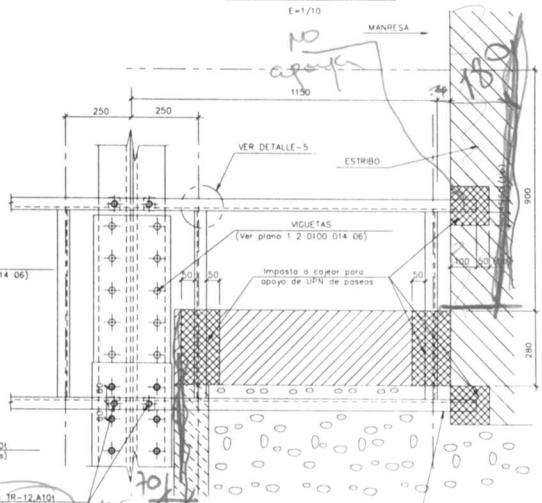

## PLANTA PASEO DERECHO
E=1/20




## DETALLE-1
E=1/10




## DETALLE-2
E=1/10



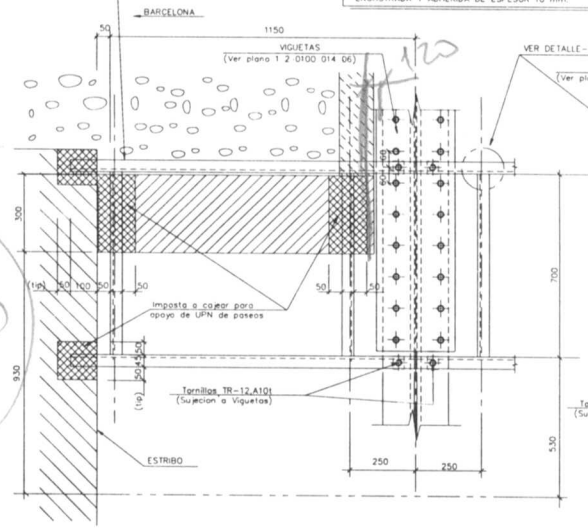

Tornillos TR-12.A10t (Sujecion a Viguetas)

LAS TRAVIESAS SE RECORTARAN EN LAS ZONAS DE AFECTADAS POR EL PASO DE LAS UPN DE LOS PASEOS.

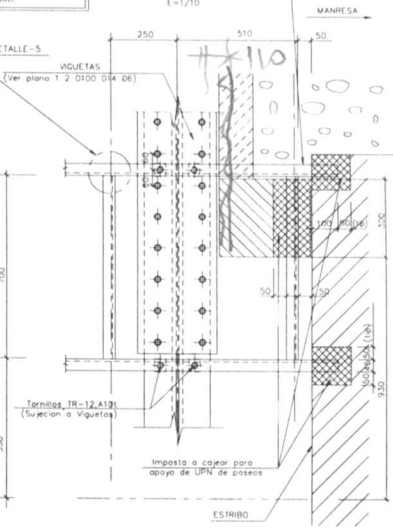
NOTA.-
LAS IMPOSTAS SE CAJEAN PARA PASO Y APOYO DE LA ESTRUCTURA SOPORTE DE PASEOS,MANTENIENDO LA COTA SUPERIOR DE ESTOS.FONDO CON PLACA DE NEOPRENO ENCASTRADA Y ADHERIDA DE ESPESOR 10 mm.

LAS TRAVIESAS SE RECORTARAN EN LAS ZONAS DE AFECTADAS POR EL PASO DE LAS UPN DE LOS PASEOS

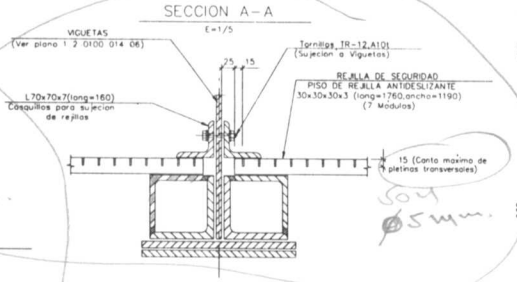
## DETALLE-3
E=1/10



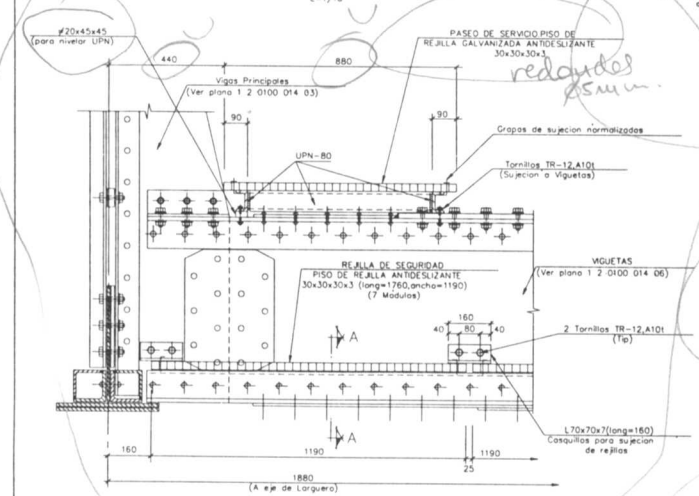

## DETALLE-4
E=1/10



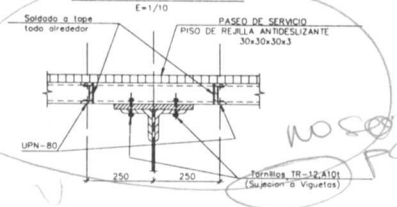

## SECCION A-A
E=1/5



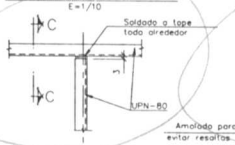

## PASEOS DE SERVICIO ALZADO-SECCION
E=1/10



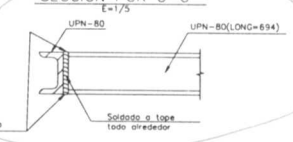

## SECCION POR B-B
E=1/10




## DETALLE-5
E=1/10




## SECCION POR C-C
E=1/5




NOTA.-
-LAS ZONAS MARCADAS CON ▩ SON LAS ZONA DE IMPOSTA A CAJEAR

NOTA.-
- LOS PISOS DE REJILLAS ANTIDESLIZANTES DE 30x30x30x3mm. SE MONTARAN TRAS LA APLICACION GENERAL DEL SISTEMA DE PROTECCION MEDIANTE PINTURA, DANDO POSTERIORMENTE LOS RETOQUES DEL MISMO QUE SEAN PRECISOS.

NOTAS.-
1.- COTAS EN MILIMETROS.
2.- VER PLANTA GENERAL EN PLANO 1 2 0100 014 02.
3.- VER CONDICIONES DE EJECUCION EN PUNTOS 3.10 y 3.11 Y EN CAPITULO 6 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.
4.- VER CONTROL DE CALIDAD DE SOLDADURAS ESPECIFICADO EN PUNTO 6.14 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.

MATERIALES.-
- ACERO EN CALIDAD AE-275 GRADO B EN PERFILES Y C EN CHAPAS SEGUN UNE 36-080-85
- ACERO EN TORNILLOS UNION VIGUETAS Y TOPES DE APOYOS A10t SEGUN NBE-MV-107(1968)
- ELECTRODOS: DE ACUERDO CON LAS CARACTERISTICAS DEL MATERIAL BASE REVESTIMIENTO PREFERIBLE BASICO SEGUN UNE 14-003-86 Y 14-220-88

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|---|---|---|---|
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| Comprovat | NOVIEMBRE-1991 | A.G.NOTARIO | |
| Aprovat | NOVIEMBRE-1991 | J.BATANERO | |

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Referencia: E07 / IR

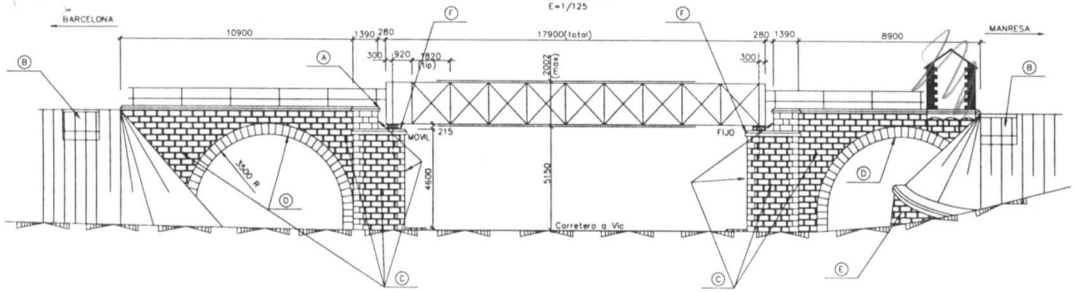
ESCALA 1:10 1:20 1:5

PROYECTO DE REHABILITACION DEL PUENTE METALICO
CARRETERA DE VIC, P.K.60/720.
LINEA DE BARCELONA A MANRESA.
PASEOS DE SERVICIO Y PISO INFERIOR DE PROTECCION

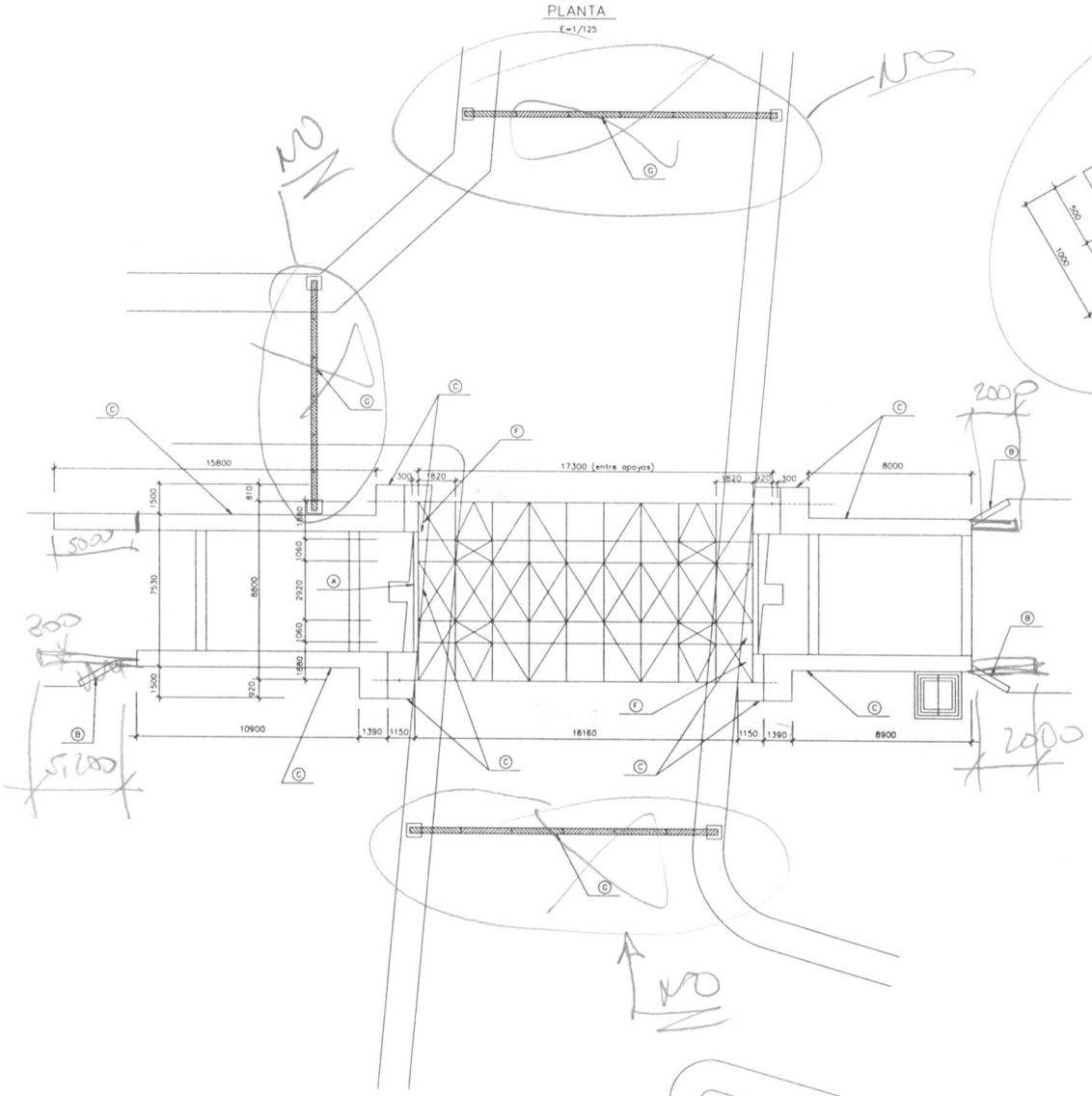
SERVEI: OBRES
PLANOL
N. º 1 2 0100 014 08

Substituïx a: Substituït per:

## ALZADO
E=1/125

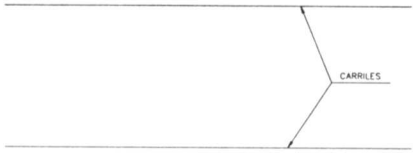


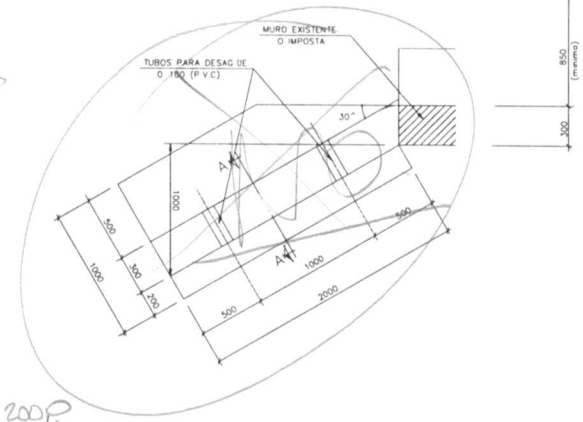

## PLANTA
E=1/125



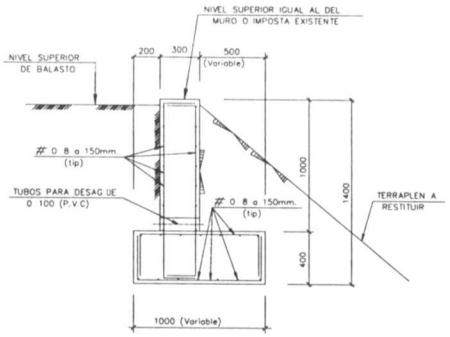

## MUROS CONTINUACION ESTRIBOS
E=1/20

### PLANTA




## SECCION POR A-A




## REPARACION DE OBRAS DE FABRICA Y PORTICOS DE GALIBO

(A) - CAJEADO MURO GUARDABALASTO.

1.-RETIRADA HILADA DE SILLARES SUPERIOR Y RECOLOCACION CON HOLGURA MINIMA DE 6 cm. RESPECTO A VIGUETA EXTREMA.
2.-PICADO PARA CAJEADO A NIVEL DEL ALA INFERIOR DE LA VIGUETA EXTREMA PARA DAR HOLGURA INDICADA.

(B) - CONTINUACION DE MUROS DE ESTRIBOS.

1.-EXCAVACION Y MEDIDAS PRECISAS PARA GARANTIZAR ESTABILIDAD DE LAS ZONAS DE VIA AFECTADAS.
2.-ENCOFRADO,COLOCACION DE ARMADURAS Y PASOS DE DESAG DE.
3.-HORMIGONADO Y VIBRADO,COLORANTE EN MASA PARA MANTENER LA TONALIDAD DE LA OBRA.
4.-DOBLE IMPRIMACION DE TRASDOS A BASE DE ASFALTOS O BETUNES ASFALTICOS.
5.-RELLENO AMBOS LADOS Y COMPACTACION.

(C) - REPARACION DE MUROS DE ESTRIBOS.

1.-DESBROCE VEGETACION QUE AFLORE Y ADOSADA HASTA DISTANCIA 3 m. DEL PIE DE LOS PARAMENTOS.
2.-DEMOLICION,A JUICIO DE F.G.C,DE LA CASETA DE SERVICIO EN LATERAL DERECHO ESTRIBO MANRESA.
3.-LIMPIEZA DE PARAMENTOS VERTICALES Y HORIZONTALES CON CHORRO AGUA-ARENA A PRESION.
4.-REPARACION DE JUNTAS ABIERTAS Y LAVADAS Y REGENERACION DE ZONAS METEORIZADAS CON MORTERO DE REPARACION,SIN RETRACCION, COLOREADO EN MISMA TONALIDAD QUE LA OBRA ORIGINAL.

(D) - REHABILITACION DE BOVEDAS.

1.-LIMPIEZA DEL INTRADOS CON CHORRO DE AGUA-ARENA A PRESION.
2.-ELIMINACION DE DESPRENDIDOS MEDIANTE PICADO CON CINCEL Y CEPILLADO CON CEPILLO DE PUAS DE ACERO.
3.-ACONDICIONAMIENTO DE DESAG DES EXISTENTES Y EJECUCION DE SIMETRICOS, Ø 110mm. Y GARGOLA 150mm. ENRASADOS A TRASDOS Y ALCACHOFA,BRIDA O TAPON PERFORADOS.
4.-INYECCION CON RESINA EPOXI A BAJA PRESION DE GRIETAS EXISTENTES.
5.-REPARACION DE ZONAS DEGRADADAS CON MORTERO DE REGENERACION Y APLICACION PREVIA DE ADHESIVO EPOXI.
6.-APLICACION FINAL DE DOS CAPAS DE PINTURA O LECHADA A BASE DE CEMENTO Y POLIMEROS MODIFICADOS.

(E) - REPARACION DE MURO DE PIE DE TERRAPLEN.

1.-REALIZACION DE ACTIVIDADES INDICADAS EN C.
2.-RECONSTRUCCION DE ZONAS DE MURO DETERIORADAS RESTITUYENDO EN LAS MISMAS LA SECCION Y GEOMETRIA ORIGINAL.
3.-EJECUCION DE DOS FILAS DE MECHINALES AL TRESBOLILLO A 0,80 m Y 1,80 m. DESDE CORONACION,DISTANCIADOS EN CADA FILA 3,00 m CON MISMOS CRITERIOS QUE DESAG DES EN ARCOS.

(F) - LIMPIEZA DE CORONACIONES.

1.-LIMPIEZA FINAL DE ALTARES DE APOYO CON CHORRO DE AGUA-ARENA A PRESION O MEDIOS MANUALES Y SOPLADO POR AIRE A PRESION.

(G) - DISPOSICION DE PORTICOS DE GALIBO.

1.-EJECUCION DE CIMENTACIONES PRECISAS.
2.-MONTAJE DE PORTICOS DE SE REALIZACION DE GALIBOS COMERCIALES,PARA ALTURA LIMITE 4,70 m.
3.-RESTAURACION DE ACERAS AFECTADAS.

MATERIALES.-

1.-CONTROL DE EJECUCION DE LA OBRA NORMAL (EH-88).
2.-COEFICIENTE DE MAYORACION DE LAS ACCIONES $\gamma_f = 1,6$.
3.-EMPALMES Y SOLAPES NO DEFINIDOS EXPRESAMENTE SEGUN EH-88.
4.-RECUBRIMIENTOS DE 3 cm.
5.-HORMIGON: TIPO H-200,CONTROL NORMAL,COEFICIENTE DE MAYORACION $\gamma_c = 1,5$(EH-88).
6.-ARMADURAS: TIPO AEH-500N,CONTROL NORMAL,COEFICIENTE DE MINORACION 1,15.
7.-TERRENO BAJO NIVEL INFERIOR DE CIMIENTO CON TENSION MEDIA DE AL MENOS 1,0 Kg/cm².

NOTAS.-

1.-COTAS EN MILIMETROS.
2.-VER CONDICIONES DE EJECUCION EN PUNTOS 3.13 A 3.19 Y CAPITULO 8 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.
3.-MATERIALES NO EXPRESAMENTE INDICADOS VER CAPITULO 8 DEL PLIEGO DE PRESCRIPCIONES TECNICAS PARTICULARES.

TECNOLOGIA E INVESTIGACION FERROVIARIA TIFSA
Referencia: EOT / R

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| Comprovat | NOVIEMBRE-1991 | A.G.NOTARIO | |
| Aprovat | NOVIEMBRE-1991 | J.BATANERO | |

Ferrocarrils de la Generalitat de Catalunya
Instal·lacions Fixes

ESCALA 1:125 1:20

PROYECTO DE REHABILITACION DEL PUENTE METALICO
CARRETERA DE VIC. P.K 60/720.
LINEA DE BARCELONA A MANRESA.
REPARACION DE OBRAS DE FABRICA Y PORTICOS DE GALIBO.

SERVEI: OBRES
PLANOL
N.º 1 2 0100 014 09

Substituïx: Substituït:

# ANNEX NÚM. 5: DEFINICIÓ GEOMÈTRICA

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 15/01/2024 | DJS | | |
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ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| Totes | Creació del document |
| | |
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| | |

NOM FITXER : 240115 PMAN-FGC-PED-DEFINICIÓ GEOMÈTRICA-V00

**ÍNDEX**

1 INTODUCCIÓ ..... 1

2 DEFINICIÓ GEOMÈTRICA ..... 1

# 1 INTODUCCIÓ

L'objecte del present annex és l'exposició de les característiques que defineixen el traçat del Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya.

# 2 DEFINICIÓ GEOMÈTRICA

El pont objecte del projecte de reparació se situa al PK 60+720 de la carretera de Vic al terme municipal de Manresa, Barcelona.

És un pont metàl·lic isostàtic amb 17,9 m de longitud i 8,8 m d'amplada. El pont es constituït per les bigues principals són gelosies a Cruz de Sant Andreu, amb sustentació isostàtica i longitud entre suports de 17,3 m. Consten de 9 mòduls de 1,82 m, amb diagonals creuades a tots ells. El seu cantell màxim és de 2,002 m i la separació entre els seus eixos de 8,8 m.

Donada que el projecte actual es tracte d'un projecte de reparació es preveu que no es necessari aportar material de traçat ja que les actuacions sobre el pont no resulten canvis respecte a la seva definició geomètrica.

# ANNEX NÚM. 6: REPLANTEIG

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 15/01/2024 | DJS | | |
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ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| Totes | Creació del document |
| | |
| | |
| | |

NOM FITXER : 240115 PMAN-FGC-PED-REPLANTEIG-V00

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2 REPLANTEIG ..... 1

# 1 INTRODUCCIÓ

L'objecte del present annex és traslladar les mesures i altres elements indicats al plànols al terreny on s'executarà el Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya.

# 2 REPLANTEIG

No es preveu necessari donar les coordenades dels punts de replanteig proposats ja que es tracta de un projecte de reparació, en què els parcel·laris de l'ocupació temporal proposat per a les provisions de l'obra es plantegen distribuir en terrenys el propietari dels quals són la FGC (la part superior del pont) i l'Ajuntament de Manresa (la part inferior del pont).

# ANNEX NÚM. 7: ESTRUCTURES

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 00 | 29/01/2024 | ICA | | |
| 01 | 14/03/2014 | ICA | | |
| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| 4 | Verificacions per 55 km/h |
| 4.5 | Fatiga biga longitudinal |
| | |
| | |

NOM FITXER : ANNEX 7 PMAN-FGC-PED-ESTRUCTURES-V01.DOCX

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# 1 OBJECTE

Al present annex d'estructures del pont metàl·lic sobre la carretera de Vic de la línia Llobregat-Anoia de FGC es presenta la avaluació estructural del pont y les intervencions necessàries per a la seva reparació.

L'abast del projecte de rehabilitació a nivell estructural és el següent:

a) Avaluació del pont per al trànsit dels trens previstos per FGC. Concretament, s'ha previst el trànsit de locomotores de les sèries 254 i 257 i tremuges de la sèrie 62000.
b) Avaluació del pont tenint en compte l'acció del vent.
c) Proposta de reparacions necessàries per a complir amb les càrregues anteriorment indicades.
d) Proposta de reparacions d'elements amb un grau de deterioració elevada.

Els càlculs corresponents a l'avaluació del pont i les propostes de reparació s'indiquen al llarg d'aquest document.

# 2 DESCRIPCIÓ DEL PONT I PROPOSTA DE REHABILITACIÓ

## 2.1 DESCRIPCIÓ DEL PONT ACTUAL

El pont sobre la carretera de Vic de FGC al PK 60+720, es troba a la carretera de Vic al terme municipal de Manresa, Barcelona. Data de l'any 1924 i ha servit durant gran part de la seva vida per al trànsit de vagons carregats de potassa des de les mines de Súria.

És un pont de estructura metàl·lica, el pont té un únic vanol (isostàtic) amb longitud de 17,9m i 8,8m d'amplada.

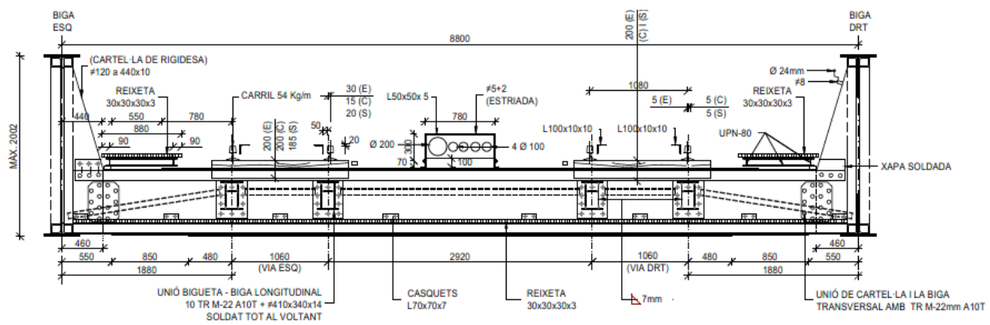



*Figura 1 Secció transversal*

El pont es constituït per les bigues principals són gelosies a Cruz de Sant Andreu, amb sustentació isostàtica i longitud entre recolzaments de 17,3 m. Consten de 9 mòduls de 1,82 m, amb diagonals creuades a tots ells. El seu cantell màxim és de 2,002 m i la separació entre els seus eixos de 8,8 m. Els cordons estan constituïts per seccions a "T", invertida la inferior, i són variables en anar entrant xapes de reforç. Tant el superior com l'inferior estan reforçats amb perfils angulars simples. Els muntants estan constituïts per xapes i angulars. Les diagonals estan formades per parells d'angulars de diferents mides units entre si per xapes d'ànima. Les unions entre els diferents elements són reblonades. Hi ha cartells als nusos superiors extrems i a les unions amb les biguetes i elements d'arriostraments.

La posició del tauler és inferior en relació amb les bigues principals. Les biguetes tenen una longitud teòrica de 8,8 m i estan modulades cada 1,82 m, coincidint amb els muntants de les bigues principals. Són bigues armades d'ànima plena, constituïdes per xapes i quatre angulars, amb angulars de reforç a les ales inferiors que no és existent al costat exterior de les biguetes extremes. Tenen secció variable amb un cantell màxim de 0,74 m, al centre de va, i cantell mínim de 0,72 m en els recolzaments. Les unions amb les bigues principals són roblonades i es realitzen a través de les cartelles de rigidesa dels muntants.

Els bigues longitudinals originals han estat substituïts per bigues al calaix. La separació transversal entre eixos és de 1,060 m, sent 1,880 m la distància entre la biga longitudinals exterior i la biga principal, per a ambdues vies, finalment, la separació entre els bigues longitudinals interiors és de 2,92 m. Tenen una llum de 1,82 m i 0,303 m de cantell. S'uneixen a les biguetes mitjançant cargols d'alta resistència a través de casquets d'angular. La unió entre els diferents elements es realitza mitjançant reblons.

El pont disposa d'un arriostrament horitzontal contravent entre les dues bigues, amb modulació cada tres mòduls de biga, a nivell del seu cordó inferior, constituït per una gelosia a la Creu de Sant Andreu.

A més, recentment, s'ha disposat un arriostrament contravent nou entre els bigues longitudinals interiors de cada via, resolt també mitjançant una gelosia a Cruz de San Andrés, modulada igual que les biguetes del tauler.

Finalment, hi ha pòrtics de frenada disposats en els mòduls 2 i 8, resolts mitjançant mòduls a "K" entre el la biga longitudinal exterior i el cordó inferior de la biga principal adjacent, i per mòduls a Cruz de San Andrés entre els bigues longitudinals dels mòduls afectats.

Totes les unions són reblonades, excepte a les diagonals de l'arriostrament inferior reforçades. Les unions es fan a través de cartel·les, presentant excentricitat totes les diagonals.

El pont també disposa de dues passejades de servei interiors a les bigues principals que han estat producte de les feines de renovació. A més, s'han disposat pòrtics de suport de canonades a la zona d'entrevies, cobertes per una xapa estriada que dóna lloc a un tercer passeig.

La xapa de pis és metàl·lica estriada, i està reblonada als perfils que les sustenten. Existeix unes baranes als passeigs laterals.



*Figura 2 Fotografia del pont*

Els estreps del pont presenten paraments frontals plans de maçoneria carejada amb carreus en cantonades i imposta de coronació. Els paraments laterals són murs envoltats de la mateixa tipologia que els frontals. Amb l'existència de dos passos inferiors, en ambdós estreps. Els murs guardabalast són de carreuat, a l'estrep d'entrada, i de formigó, al de sortida. Les coronacions de suports són de carreuat.

Els aparells de suport fixos es troben a l'estrep de sortida. La biga s'uneix a una peça metàl·lica alleugerida que descansa sobre la coronació dels suports. Els mòbils estan a l'estrep d'entrada i compten amb una peça esfèrica que permet el moviment i una base que recolza sobre la coronació. Les bigues estan unides amb quatre cargols a la peça superior dels aparells.

## 2.2 ESTAT ACTUAL DEL PONT

Durant la realització del present projecte s'ha realitzat la inspecció de l'estructura, que serveix per a complementar la ja realitzada per INECO i que es va reflectir en el seu *INFORME DE LA PROVA DE CÀRREGA DEL PONT METÀL·LIC DEL PONT SOBRE LA CARRETERA DE VIC DEL PK 60+720 DE LA LÍNIA LLOBREGAT-ANOIA DE FGC, I* que data d'octubre de 2022.

Les principals deficiències trobades en el pont han estat:

- Perforacions en l'ànima de les bigues transversals de diafragma. Poden arribar a afectar la capacitat estructural de les biguetes pel que han de ser reparades a curt termini.

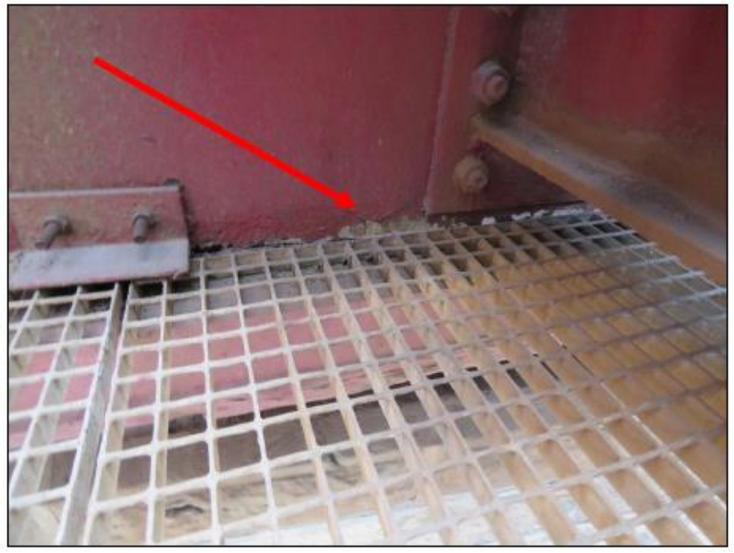


*Figura 3 Perforacions en l'anima de les bigues transversals (Font: Ineco)*

- Reblons saltats a causa de paquets d'hidròxid entre xapes a l'ala inferior de biguetes i oxidació en les xapes.

L'avaluació realitzada en aquest document mostra que la capacitat estructural de les biguetes és suficient sense tenir en compte les xapes de reforç inferior, però la seva esperança de vida és limitada.



*Figura 4 Oxidació en les bigues transversals*

- Arriostraments inferiors doblegats. D'acord amb els càlculs interns realitzats, si no es té en compte l'acció del arriostrament inferior altres elements se sobrecarreguen, la qual cosa porta a l'incompliment en diversos d'ells. Per tant s'ha de reposar aquests arriostraments. A més, es mostrarà en aquest annex que la seva capacitat estructural és insuficient. També algunes de les xapes de connexió estan deteriorats i s'han de substituir.



*Figura 5 -Arriostraments inferiors doblegats*

- Existeix una fissura en la diagonal del cinquè mòdul de la biga dreta. Si bé els roblons han detingut la seva progressió, ha de ser reparada.



*Figura 6 Fissura en diagonal (Font: Ineco)*

- Algunes soldadures estan fissurades.
- Els aparells de recolzament estan en un estat acceptable. No obstant això, presenten oxidacions i pèrdues de greix, per la qual cosa han de sotmetre's a manteniment per a assegurar el seu adequat comportament.
- Els murs dels estreps i buits d' aproximació de carreuat presenten defectes habituals en aquesta tipologia, però que no revesteixen gravetat, com ara pintades, eflorescències, separació de les juntes, trencament de carreus en coronació o fissures.
- Les voltes de les obertures d'aproximació s'han arrebossat, i presenten importants humitats, la qual cosa ha deteriorat greument l'arrebossat. També hi ha humitats en els murs.
- Els extrems dels murs també s'han arrebossat, i en alguns d'ells han aparegut fissures.
- La part superior dels murs guarda balast és en formigó. Algunes de les armadures es troben actualment exposades.

## 2.3 PROPOSTES DE REPARACIÓ

Prenent com a punt de partida l'estat actual del pont s'han proposat diverses millores per incrementar la seguretat estructural del pont existent i afavorir- la conservació.

Pel que fa a l'estructura metàl·lica, les reparacions proposades són:

- S'ha de reparar l'ànima de les bigues d'estrep, ja que hi ha perforacions. Per això es proposa accedir des de sota del tauler i retirar les L que cobrin l'ànima i les xapes inferiors. Posteriorment es talla la zona malmesa i es remulla amb soldadura. A més, i per evitar, en la mesura del possible, la presència de soldadures en elements antigues, es proposa reblar els perfils en L i les xapes per uns de nous. Finalment, s'ha comprovat que aquesta connexió té problemes de capacitat estructural, per la qual cosa es proposa el seu reforç.
- Es proposa substituir les xapes de l' ala inferior de totes les bigues transversals a causa del seu avançat estat de deteriorament. A causa dels problemes d' accessibilitat als perns, i per tal de simplificar la reparació, es proposa que la nova xapa se soldi a les L existents. Per això, la xapa serà més estreta que les L, 230 mm, i de gruix idèntic a la suma de les dues, 20 mm.
- S' han de substituir els arriostraments inferiors per uns de major capacitat, ja que els actuals no compleixen amb la normativa. Per això es proposa reblar els perfils actuals L 70x10 per uns L 90x10. A més, s' ha de verificar l' estat de les xapes de connexió i reblar-les si és necessari.
- Per a la reparació de la fissura existent en la diagonal, es proposa la tècnica d'adossar xapes als costats, ja que és el recomanat en aquest tipus de estructures roblonades.
- Es recomana realitzar les tasques habituals de manteniment en recolzaments: neteja, aplicació de greix i remull de proteccions.

- Finalment, és important en aquesta mena d'estructures assegurar la seva durabilitat mitjançant l'aplicació d'un tractament anticorrosiu adequat. Per a això, primerament s'ha de netejar el pont amb doll de sorra, deixant al descobert l'estructura metàl·lica i eliminant l'òxid. Posteriorment s'ha d'inspeccionar l'estructura per a identificar soldadures degradades i altres possibles fissures en elements metàl·lics. Aquests desperfectes s'han de reparar seguidament. I finalment, es pot aplicar la nova capa de pintura. Es proposa que la pintura aquest preparada per a un ambient agressiu (Classe C5) i que tingui una durabilitat alta (Més de 15 anys).

Pel que fa als vanols d' aproximació en carreuat, les principals reparacions proposades són:

- Reparació dels arrebossats en les voltes. Es proposa primerament la seva neteja mitjançant doll a pressió. Seguidament s'instal·laran drenis californians per a millorar el drenatge dels murs i evitar futures humitats. A més, es reparessin les zones deteriorades dels arrebosats. Finalment, s'apliqués una pintura de protecció.
- També s'han de reparar els altres arrebossats, ja que presenten algunes fissures.
- Alguns carreus estan trencats i altres presenten fissures. A més, algunes juntes entre carreus estan degradades. S'han de reparar.
- En l'extrem exterior del mur del costat Barcelona s'ha després un carreu. S'ha de reposar el seu volum.
- Algunes armadures en els murs guarda balast estan exposades. Es recomana sanejar el formigó en aquestes zones.
- Finalment, es proposa la neteja dels murs, ja que presenten pintades i eflorescències.

# 3 BASES DE CÀLCUL

## 3.1 NORMATIVA I BIBLIOGRAFIA DE REFERÈNCIA

Els projectes de rehabilitació de estructures han de complir amb el que s'estableix en el Codi estructural que va entrar en vigor el 10 de novembre de 2021:

- Codi Estructural (R.D. 470/2021, de 29 de juny).

El Codi Estructural permet en el seu article 3 l'ús dels Eurocodis per al dimensionament i comprovació de les estructures, per la qual cosa s'empraran aquestes normes a aquest efecte:

- UNE-EN 1990: Eurocódigo 0
- UNE-EN 1991-1-1: Eurocódigo 1: Acciones en estructuras. Parte 1-1: Acciones generales.
- UNE-EN 1991-1-4: Eurocódigo 1: Acciones en estructuras. Parte 1-4: Acciones de viento.
- UNE-EN 1991-1-5: Eurocódigo 1: Acciones en estructuras. Parte 1-5: Acciones térmicas.
- UNE-EN 1991-1-6: Eurocódigo 1: Acciones en estructuras. Parte 1-6: Acciones durante la ejecución.
- UNE-EN 1991-2: Eurocódigo 1: Acciones en estructuras. Parte 2: Cargas de tráfico en puentes.
- UNE-EN 1992-1: Eurocódigo 2: Proyecto de estructuras de hormigón. Parte 1: Reglas generales.
- UNE-EN 1992-2: Eurocódigo 2: Proyecto de estructuras de hormigón. Parte 2: Puentes de hormigón.
- UNE-EN 1993-1-1: Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-1: Reglas generales y reglas para edificios.
- UNE-EN 1993-1-5: Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-5: Placas cargadas en su plano.
- UNE-EN 1993-1-8: Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-8: Uniones.
- UNE-EN 1993-1-9: Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-9: Fatiga.
- UNE-EN 1993-1-10: Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-10: Tenacidad de fractura y resistencia transversal.
- UNE-EN 1993-2: Eurocódigo 3: Proyecto de estructuras de acero. Parte 2: Puentes.

No obstant això, per a fabricació, execució i control de qualitat regirà l'indicat en el Codi estructural i la normativa europea. Amb la finalitat d'harmonitzar totes dues normatives s'empraran les següents guies d'aplicació elaborades per la Direcció General de Carreteres del MITMA:

- Guia per a les especificacions tècniques del formigó.
- Guia per a les especificacions tècniques de les armadures.
- Guia per a la determinació de longituds d' ancoratge i encavalcament d’armadures passives.

- Guia per a la determinació de recobriments en estructures de formigó

Cal assenyalar que els Eurocodis estructurals, vigents no cobreixen totalment el projecte de reforç d'estructures existents, atès que es refereixen a processos d'accions, fabricació, execució i control de qualitat realitzats en l'àmbit de la normativa europea actual. En tractar-se d'un pont existent, les condicions dels materials, execució, control de materials i detalls no es van realitzar en els elements del pont existent en aquestes condicions, i per tant els Eurocodis han de ser complementats amb criteris específics de reparació i rehabilitació de ponts metàl·lics, essent un dels principals àmbits el de les verificacions a fatiga de l'estructura metàl·lica i també les verificacions d'elements totalment o parcialment comprimits, àmbits en els quals ha evolucionat més l'estat de l'art, normativa i coneixements en les darreres dècades.

Per aquest motiu es complementaran els Eurocodis estructurals amb les següents guies i publicacions:

- Assessment of Existing Steel Structures - Recommendations for Estimation of the Remaining Fatigue Life – JRC/ECCS. KÜHN B.; LUKIC M.; NUSSBAUMER A.; GÜNTHER H.P.; HELMERICH R.; HERION S.; KOLSTEIN M.H.; WALBRIDGE S.; ANDROIC B.; DIJKSTRA O.; BUCAK Bucak. Febrero de 2008.
- Design and evaluation of Steel Bridge for Fatigue and Fracture. Reference Manual. National Highway Institute. FHWA-NHI. December 2016.
- ISO 13822:2010 Bases for design of structures — Assessment of existing structures. 2010.
- Guia per al projecte davant de fatiga de ponts metàl·lics i mixtos de carretera. MITMA. 2022.

Complementàriament es consideraran altres publicacions i guies no especificades anteriorment si s'identifica com a necessari durant la realització dels treballs i considera convenient.

En tractar-se d'un pont ferroviari, s'emprarà la *Instrucción sobre las Inspecciones Técnicas en los Puentes de Ferrocarril (ITPF-05).*

Finalment, per a la definició de sistemes de pintat se seguirà el recollit en ISO 12944.

## 3.2 MATERIALES

### 3.2.1 Materials existents

**Acer Estructural**

El pont està compost d'acers de dos tipus:

- Acer assimilable a un S 235. Es va emprar en el projecte original de l'estructura.
- Acer assimilable a un S 275. S'ha emprat en els successius reforços que s'han realitzat en l'estructura.

### 3.2.2 Materials nous

En els treballs de reparació s'ha previst la utilització dels materials següents:

**Acer estructural**

Les noves xapes de reforç estructural seran del tipus:

- S 275 J0. fyk=275 MPa.
- S 355 J0. fyk=355 MPa.

### 3.2.3 Durabilitat

La verificació del Estat Límit de Durabilitat del present Projecte per als elements de nova construcció es farà mitjançant el compliment dels diferents requeriments especificats en el capítols 9 i 19 del Codi estructural.

### 3.2.4 Ambients considerats

Per prevenir la corrosió de l'estructura s'han considerat els següents ambients

**Acero**

Atès que el pont dóna servei a les mines de potassa de Súria, i a les successives reparacions que han estat necessàries a causa de la corrosió al pont, es considera que el pont es troba en un entorn amb una atmosfera agressiva. Per tant, segons la taula 80.1a del Codi Estructural es considera una classe d'exposició molt alta "C5".

### 3.2.5 Vida útil

El pont data de 1924, per la qual cosa pràcticament es pot considerar un pont centenari. Això suposa que ha excedit la vida útil per a la qual va ser projectada, per la qual cosa la vida romanent s'ha de calcular a partir d'estudis específics. Concretament, la vida dels ponts metàl·lics està marcada en molts casos per la vida dels seus detalls de fatiga. Per aquest motiu, es realitzarà un estudi de fatiga per conèixer la vida del pont.

Els nous elements seran projectats per a una vida útil dependent de la vida esperada del pont.

## 3.3 ACCIONS

### 3.3.1 Càrregues permanents

En el càlcul del tauler es consideraran les següents accions permanents:

**Pes propi de l'estructura.**

- Es considerarà un pes de 78.5 kN/m3 per a l'acer estructural. A més, la densitat anterior s'ha multiplicat per un factor de 1.075 per tenir en compte elements d'acer secundaris que no s'inclouen en el model.

**Pes del material de la via.**

- Es considerarà un pes de travesses, carrils i contracarrils de 5.2 kN/m per via, la qual cosa suposa 2.6 kN/m per biga longitudinal.

**Passejos de servei.**

- Es considerarà un pes de 0.5 kN/m repartits en un ample de 0.88 m a cada costat.

**Canalitzacions.**

- Es considera un pes de 1.5 kN/m a causa de les canalitzacions longitudinals actuant puntualment al centre de cada bigueta transversal. És a dir, a cada bigueta actua una càrrega puntual de 2.7 kN al centre.

**Tramex inferior.**

- Es considera un pes de 0.5 kN/m actuant en tota la longitud de cada bigueta transversal.

### 3.3.2 Càrrega viva

Per al càlcul de la càrrega viva s'han tingut en compte tant accions verticals com accions horitzontals. Ambdues es descriuen a continuació:

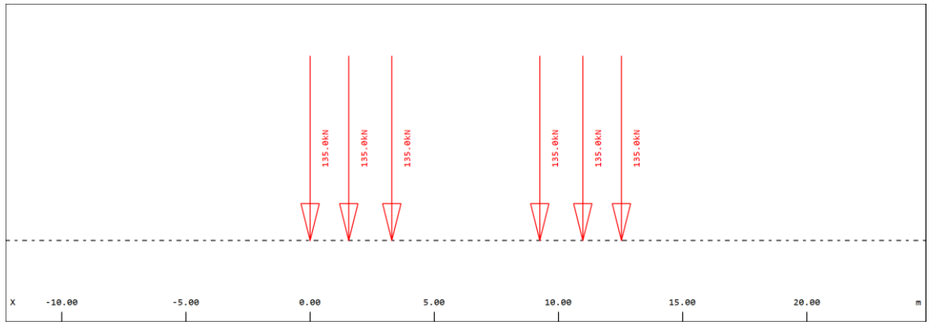
**Accions verticals.**

D'acord amb la informació facilitada per FGC, sobre la línia està previst que transitin trens de passatgers i trens de mercaderies. Atès que el pes dels trens de mercaderies és habitualment molt superior al dels trens de passatgers, s'han considerat en aquest cas únicament trens de mercaderies.

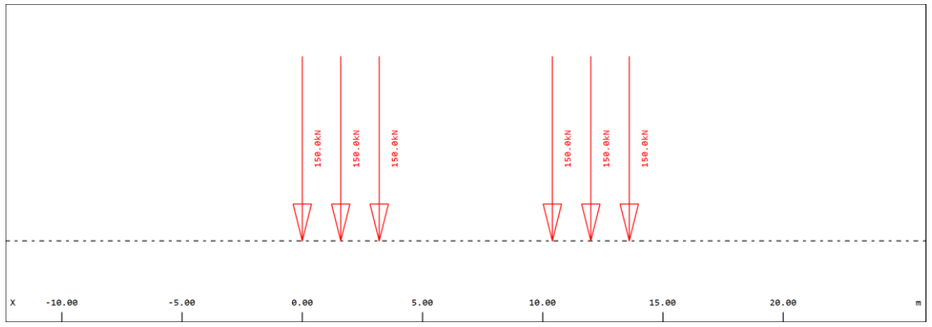
Està previst que transitin locomotores de les sèries 254 i 257. A més, aquestes locomotores arrosseguen tremuges de la sèrie 62000. Les característiques d'aquests tres vehicles es mostren a continuació:

Se han considerado un total de ocho trenes distintos actuando sobre el puente. Sus características se resumen a continuación:

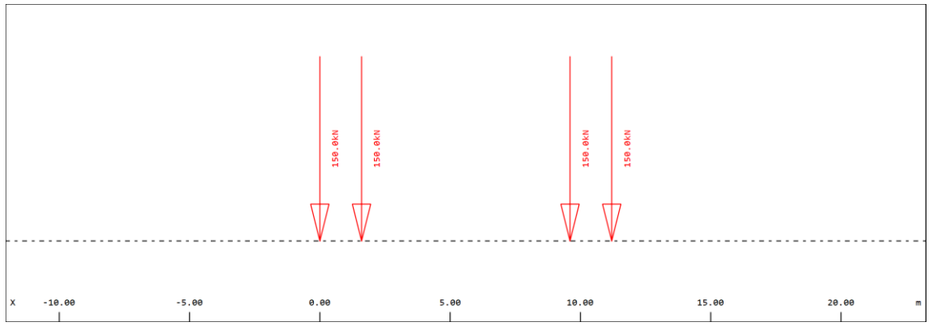
- Locomotora Sèrie 254
  - Pes per eix: 135 kN
  - Distribució del eixos: 1.556-1.733-5.958-1.733-1.556 m
  - Separació entre eixos de locomotores: 3.81 m.




- Locomotora Sèrie 257
  - Pes per eix: 148.4 kN
  - Distribució del eixos: 1.6-1.6-7.2-1.6-1.6 m
  - Separació entre eixos de locomotores: 3.20 m.




- Tremuja 62000
  - Pes per eix: 150 kN (Màxim segons fitxa tècnica, encara que el pes total màxim total és 44.7 t, la qual cosa no es considera del costat de la seguretat)
  - Distribució del eixos: 1.6-8.0-1.6 m
  - Separació entre eixos de locomotores: 2.43 m.



A més, els vehicles anteriors s'han combinat per tenir en compte els efectes al pont sumant diverses unitats. Les combinacions considerades han estat:

- Dues locomotores de la Sèrie 254.
- Dues locomotores de la Sèrie 257.
- Dues tremuges.
- Una locomotora de la Sèrie 254 arrossegant una tremuja.
- Una locomotora de la Sèrie 257 arrossegant una tremuja.

D'acord amb l'Eurocodi, els vehicles anteriors s'han de multiplicar per un coeficient d'impacte. El seu càlcul es mostra a continuació. S'ha considerat que la velocitat màxima és de 55 km/h.

**PROYECTO:** PONT MANRESA
**PUENTE:** CTRA VIC
**FECHA:** 14-Mar-24

**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

**CÁLCULO DE COEFICIENTE DE IMPACTO EN PUENTES DE FFCC**

DATOS

| | | | |
|---|---|---|---|
| L | 17.30 | m | *Luz del puente* |
| $S_V$ | 1.82 | m | *Separación entre viguetas* |
| $f_0$ | 9.44 | Hz | *Freciencia propia de flexión del puente* |

CÁLCULO DE COEFICIENTES DE IMPACTO

| | | | | | | |
|---|---|---|---|---|---|---|
| | $V_{max}$ | 10 | 40 | 55 | km/h | *Velocidad de proyecto* |
| | $V_{max}$ | 2.78 | 11.11 | 15.28 | m/s | *Velocidad de proyecto* |
| | r | 1.00 | 1.00 | 1.00 | | *B.11* |
| | a | 0.126 | 0.505 | 0.694 | | |
| **Viga principal** | | | | | | |
| *Longitud determinante* | $L_\phi$ | 17.300 | 17.300 | 17.300 | m | |
| | K | 0.009 | 0.034 | 0.047 | | *B.10* |
| | φ' | 0.009 | 0.035 | 0.049 | | *B.9* |
| | φ'' | 0.035 | 0.139 | 0.191 | | *B.12* |
| *Coeficiente* | ϕ | 1.04 | 1.17 | 1.24 | | *B.8* |
| **Viga transversal** | | | | | | |
| *Longitud determinante* | $L_\phi$ | 3.640 | 3.640 | 3.640 | m | |
| | K | 0.040 | 0.162 | 0.222 | | *B.10* |
| | φ' | 0.042 | 0.193 | 0.285 | | *B.9* |
| | φ'' | 0.027 | 0.108 | 0.149 | | *B.12* |
| *Coeficiente* | ϕ | 1.07 | 1.30 | 1.43 | | *B.8* |
| **Viga diafragma** | | | | | | |
| *Longitud determinante* | $L_\phi$ | 3.600 | 3.600 | 3.600 | m | |
| | K | 0.041 | 0.163 | 0.225 | | *B.10* |
| | φ' | 0.043 | 0.195 | 0.289 | | *B.9* |
| | φ'' | 0.027 | 0.108 | 0.148 | | *B.12* |
| *Coeficiente* | ϕ | 1.07 | 1.30 | 1.44 | | *B.8* |
| **Largueros** | | | | | | |
| *Longitud determinante* | $L_\phi$ | 5.460 | 5.460 | 5.460 | m | |
| | K | 0.027 | 0.108 | 0.148 | | *B.10* |
| | φ' | 0.028 | 0.121 | 0.174 | | *B.9* |
| | φ'' | 0.032 | 0.127 | 0.174 | | *B.12* |
| *Coeficiente* | ϕ | 1.06 | 1.25 | 1.35 | | *B.8* |

A més del coeficient d'impacte, s'ha considerat una excentricitat de la via de ±0.082 m.

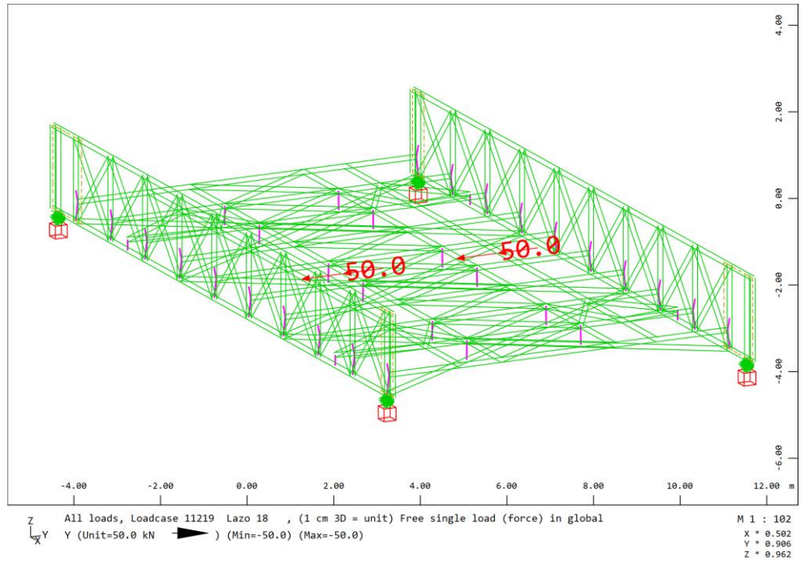
Cal indicar que no es considera l'acció accidental del descarrilament per la presència de contracarrils.

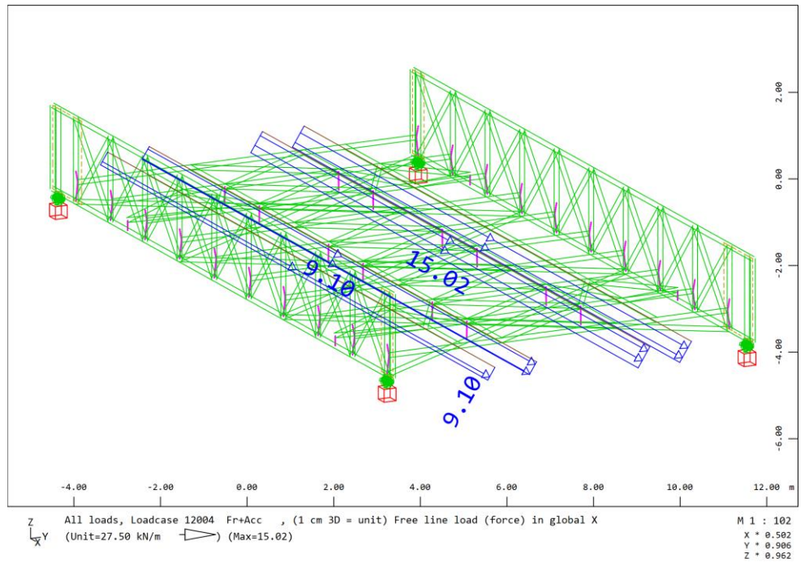
**Accions horitzontals.**

Si han considerat les forces d'acceleració, frenat i llaç.

El frenat s'ha considerat segons Eurocodi com a 33 kN/m multiplicat per 0.91, que és el coeficient α de via estreta. El coeficient anterior també es multiplica l'acceleració de 20 kN/m. Ambdues càrregues s'han suposat actuant en cada biga longitudinal, per la qual cosa finalment s'ha pres l'acceleració com a 9.1 kN/m per biga longitudinal i el frenat com a 15 kN/m per biga longitudinal. Pel que fa a la simultaneïtat, es considera que pot actuar un frenat i una acceleració simultàniament.

La força de llaç s'ha calculat com dues càrregues puntuals de 50 kN actuant en transversal a cada biga longitudinal.



### 3.3.3 Vent

Es considera l'efecte del vent prenent els següents valors.

**PROYECTO:** PONT MANRESA CRTA VIC
**DOCUMENTO:**
**ELEMENTO:**
**FECHA:** 10-Jan-24

**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

ACCIONES DE VIENTO - EN1991-1-4:2018

ACCION DEL VIENTO SOBRE PUENTES

| | | | |
|---|---|---|---|
| Zona | C | | *Zona Geográfica - Fig AN.1 EN1991-1-4:2018* |
| Entorno | III | | *Categoría del terreno - Tabla 4.1 EN1991-1-4:2018* |
| $v_{b,0}$ | 29.0 | m/s | *Valor fundamental de la velocidad básica del viento - AN.2 4.2(1)P Nota 2* |
| $c_{dir}$ | 1.0 | | *Factor direccional - AN.2 4.2(2)P* |
| $c_{season}$ | 1.0 | | *Factor estacional - AN.2 4.2(2)P* |
| T | 100 | años | *Período de retorno. Para situaciones temporales de construcción ver EN 1991-1-6* |
| $c_{prob}$ | 1.04 | | *Coeficiente probabilidad - EN 1991-1-4:2018 4.2(2)P NOTA 4* |
| $v_b$ | 30.1 | m/s | *Velocidad básica del viento a 10m de altura para T - EN 1991-1-4:2018 4.2(2)P* |
| $q_b$ | 0.567 | kN/m$^2$ | *Presión correspondiente a la velocidad básica del viento - EN 1991-1-4:2018 4.5 NOTA 1* |
| $k_r$ | 0.215 | | *Factor del terreno - EN 1991-1-4:2018 4.3.2* |
| $z_0$ | 0.300 | m | *Longitud de la rugosidad -EN 1991-1-4:2018 4.3.2 Tabla 4.1* |
| $z_{min}$ | 5.000 | m | *EN 1991-1-4:2018 4.3.2 Tabla 4.1* |
| z | 5 | m | *Altura desde el punto mas bajo del suelo hasta el centro geométrico del tablero, sin contar barreras ni tráfico.* |
| $c_r(z)$ | 0.61 | | *Factor de rugosidad - EN 1991-1-4:2018 4.3.2* |
| $c_0(z)$ | 1.00 | | *Coeficiente topográfico - EN 1991-1-4:2018 4.3.1* |
| $v_m$ | 18.2 | m/s | *Velocidad media del viento a una altura z(m) - EN 1991-1-4:2018 4.3.1* |
| ρ | 1.25 | kg/m$^3$ | *Densidad del aire. AN.2 4.5(1)* |
| $I_v$ | 0.355 | | *Intensidad de la turbulencia a una altura z(m) - EN 1991-1-4:2018 4.4. Se adopta factor de turbulencia kl=1,00* |
| $q_b(z)$ | 0.73 | kN/m$^2$ | *Presión correspondiente a la velocidad de pico del viento* |
| $c_s c_d$ | 1.00 | | *Factor amplificación dinámica. En tableros normales de menos de 40m de luz cscd=1. EN 1991-1-4:2018 8.2(NOTA 2)* |

FUERZA DEL VIENTO EN LA DIRECCION TRANSVERSAL SIN TRAFICO (METODO SIMPLIFICADO)

| | | | |
|---|---|---|---|
| d | 1.80 | m | *Canto del tablero* |
| b | 8.80 | m | *Ancho del tablero* |
| α1 | 0.00 | ° | *Ángulo de la superficie sobre la que actúa el viento con respecto a la vertical* |
| | 1.00 | | *Coeficiente reductor debido al ángulo* ***α1. EN 1991-1-4:2018 8.3.1(2)*** |
| p | 0.00 | ° | *Peralte* |
| | 1.00 | | *Coeficiente amplificador debido al peralte. EN 1991-1-4:2018 8.3.1(3)* |
| | *Parapeto abierto o barrera de seguridad abierta* | | *Tipo de parapeto o barrera de seguridad* |
| | **Si el parapeto está abierto en menos del 50% considerarlo sólido.* | | |
| | *Ambos lados* | | *Localización parapetos/barreras* |
| d1 | 1.00 | m | *Altura parapeto* |
| $d_{tot,sin\ trafico}$ | 2.40 | m | *Canto a considerar para el cálculo de $A_{ref,x}$ Fig 8.5* |
| $b/d_{tot}$ | 3.67 | | |
| $c_{f,x0}$ | 1.40 | | *Factor de carga de viento sin considerar flujo de cola - EN 1991-1-4:2018 8.3.1* |
| $c_{f,x}$ | 1.40 | | *Factor de carga de viento - EN 1991-1-4:2018 8.3.1* |
| $c_e$ | 1.28 | | *Factor de exposición - EN 1991-1-4:2018 4.5* |
| C | 1.79 | | *Factor de carga de viento - EN 1991-1-4:2018 8.3.2* |
| $A_{ref,x}$ | 2.40 | m$^2$/m | *Area de referencia por metro* |
| **$F_{w,x}$** | **2.44** | **kN/m** | *Fuerza del viento transversal* |
| **$q_{w,x}$** | **1.02** | **kN/m$^2$** | *Presión del viento transversal* |

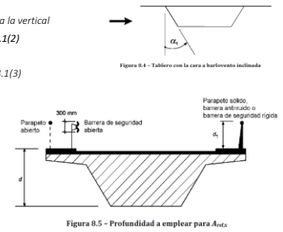


Figura 8.5 – Profundidad a emplear para $A_{ref,x}$

### 3.3.4 Temperatura

No se ha considerado la acción de la temperatura al tratarse de una estructura isostática.

## 3.4 HIPÓTESIS DE COMBINACIÓ D'ESFORÇOS

S'han considerat les combinacions d'accions recollides a la Norma EN1990, basades en la teoria d'Estats Límit Últims per a les diferents situacions de càlcul de l'estructura.

### 3.4.1 Estats Límit Últims

Les hipòtesi de càlcul considerades són:

- **SITUACIONS PERSISTENTS O TRANSITÒRIES**

$$\Sigma \gamma_{Gj}\ G_{kj} + \Sigma \gamma_{Gj}\ G^*_{kj} + \gamma_{Q1}\ Q_{k1} + \Sigma \gamma_{Qi}\ \Psi_{0i}\ Q_{ki} \qquad j \geq 1 \quad i > 1$$

- **SITUACIONS ACCIDENTALS**

$$\Sigma \gamma_{Gaj}\ G_{kj} + \Sigma \gamma_{Gj}\ G^*_{kj} + \gamma_A\ A_k + \Psi_{11}\ Q_{k1} + \Sigma\ \gamma_{Qi}\ \Psi_{2i}\ Q_{ki} \qquad j \geq 1 \qquad i > 1$$

- **SITUACIONS ACCIDENTALS AMB SISME**

$$\Sigma\ G_{kj} + \Sigma \gamma_{Gj}\ G^*_{kj} + \gamma_i\ A_{Ed} + \Sigma\ \gamma_{Qi}\ \Psi_{2i}\ Q_{ki} \qquad j \geq 1 \qquad i > 1$$

On:

G = Valor característic de les càrregues permanents.

G* = Valor característic de les càrregues permanents de valor no constant.

$Q_{k1}$ = Valor característic de la càrrega variable dominant.

$A_k$ = Valor característic de la acció accidental

$A_{eq}$ = Valor característic de la acció sísmica.

Els coeficients de seguretat i de combinació d'accions emprats es defineixen a la EN1990.

### 3.4.2 Estats Límit de Servei

Les hipòtesi de càlcul considerades són:

- **COMBINACIÓ CARACTERÍSTICA**

$$\Sigma \gamma_{Gj}\ G_{kj} + \Sigma \gamma_{Gj}\ G^*_{kj} + \gamma_{Q1}\ Q_{k1} + \Sigma \gamma_{Qi}\ \Psi_{0i}\ Q_{ki} \qquad j \geq 1 \quad i > 1$$

- **COMBINACIÓ FREQÜENT**

$$\Sigma \gamma_{Gaj}\ G_{kj} + \Sigma \gamma_{Gj}\ G^*_{kj} + \Psi_{11}\ Q_{k1} + \Sigma\ \gamma_{Qi}\ \Psi_{2i}\ Q_{ki} \qquad j \geq 1 \qquad i > 1$$

- **COMBINACIÓ CASI PERMANENT**

$$\Sigma\ G_{kj} + \Sigma \gamma_{Gj}\ G^*_{kj} + \Sigma\ \gamma_{Qi}\ \Psi_{2i}\ Q_{ki} \qquad j \geq 1 \qquad i > 1$$

### 3.4.3 Coeficients de seguretat i combinació

| Acción | | Efecto | |
|---|---|---|---|
| | | Favorable | Desfavorable |
| Permanente ($G$) $\gamma_G$ | Peso propio | $\gamma_{G,inf} = 1$ | $\gamma_{G,sup} = 1,35$ |
| | Carga muerta | $\gamma_{G,inf} = 1$ | $\gamma_{G,sup} = 1,35$ |
| | Otras presolicitaciones | 1 | 1 |
| | Reológicas | $1^{1) 2)}$ | $1,35^{1) 2)}$ |
| | Rozamiento de apoyos deslizantes | 1 | 1,35 |
| | Empuje del terreno | 1 | 1,35 |
| | Empuje hidrostático del agua intersticial[3)] | $\gamma_{G,inf} = 1$ | $\gamma_{G,sup} = 1,35$ |
| | Asientos | $\gamma_{Gset} = 0$ | $\gamma_{Gset} = 1,20 / 1,35^{1) 2) 4)}$ |
| Pretensado ($P$) $\gamma_p$ | Pretensado $P_1$ | $\gamma_p = 1$ | $\gamma_p = 1 / 1,20^{5)} / 1,30^{6)}$ |
| | Pretensado $P_2$ | $\gamma_p = 1$ | $\gamma_p = 1,35$ |
| Variable ($Q$) $\gamma_Q$ | Sobrecarga de uso en puentes de carretera y pasarelas | 0 | 1,35 |
| | Sobrecarga de uso en puentes de ferrocarril | 0 | $1,45^{7)}$ |
| | Sobrecarga de uso en rellenos de trasdós de muros o estribos[8)] | 0 | 1,50 |
| | Sobrecargas de construcción | 0 | 1,35 |
| | Acciones climáticas | 0 | $1,50^{1) 2)}$ |
| | Empuje hidrostático del agua libre | 0 | 1,35 |
| | Empuje hidrodinámico del agua | 0 | 1,50 |

| Acciones | | $\psi_0$ | $\psi_1$ | $\psi_2$[4)] |
|---|---|---|---|---|
| Componentes individuales de las acciones del tráfico[5)] | Modelo de carga 71 | 0,80 | [1)] | 0 |
| | SW/0 | 0,80 | [1)] | 0 |
| | SW/2 | 0 | 1,00 | 0 |
| | Tren sin carga | 1,00 | – | – |
| | Alta velocidad (HSLM*) | 1,00 | 1,00 | 0 |
| | Arranque y frenado<br>Fuerzas centrífugas<br>Fuerzas de interacción debidas a la deformación bajo cargas de tráfico verticales | Las componentes individuales de las acciones del tráfico en situaciones de proyecto en las que las cargas de tráfico se consideran como única acción (multidireccional) dominante, y no como grupos de cargas, deberían usar los mismos valores de los factores $\psi$ que los adoptados para las cargas verticales concomitantes | | |
| | Fuerzas de lazo | 1,00 | 0,80 | 0 |
| | Cargas en vías peatonales no públicas | 0,80 | 0,50 | 0 |
| | Trenes reales | 1,00 | 1,00 | 0 |
| | Empuje horizontal de tierras debido a la sobrecarga del tráfico | 0,80 | [1)] | 0 |
| | Efectos aerodinámicos | 0,80 | 0,50 | 0 |
| Otras acciones | Efectos aerodinámicos | 0,80 | 0,50 | 0 |
| | Carga de mantenimiento en paseos de servicio | 0,80 | 0,50 | 0 |
| Fuerzas del viento[2)] | $F_{Wk}$ | 0,75 | 0,50 | 0 |
| | $F_W^{**}$ | 1,00 | 0 | 0 |
| Acciones térmicas[3)] | $T_k$ | 0,60 | 0,60 | 0,50 |
| Cargas de nieve | $Q_{Sn,k}$ (durante la ejecución) | 0,8 | – | 0 |
| Cargas de construcción | $Q_c$ | 1,0 | – | 1,0 |

# 4 CÀLCUL DEL TAULER

## 4.1 INTRODUCCIÓ

En aquest apartat es mostra el càlcul del tauler. A més d'una breu descripció del model, aquest apartat s'ha dividit en tres subapartats:

- Avaluació del tauler davant càrregues estàtiques. En aquest punt s'estudia la combinació de càrregues segons la normativa i es realitza l'avaluació estructural.
- Avaluació del tauler davant càrregues de fatiga. De manera complementària al càlcul estàtic, s'ha avaluat el pont enfront de fatiga emprant el mètode del dany acumulat, ja que la fatiga és important en ponts de ferrocarril.
- Càlcul d'elements deteriorats. S'ha estudiat en les bigues transversals com afecta l'elevada degradació que presenten. També s'inclou el càlcul de la reparació de la fissura.

## 4.2 MODEL DE CÀLCUL

Per poder obtenir els esforços en els elements del tauler s'ha desenvolupat un model de càlcul a Sofistik.

Tots els elements del model, amb l'excepció de recolzaments i ànima extrema de la biga, han estat modelats emprant elements tipus barra. Per a la placa extrema s'han considerat elements tipus d'actuació. A més, totes les connexions es consideren rígides.

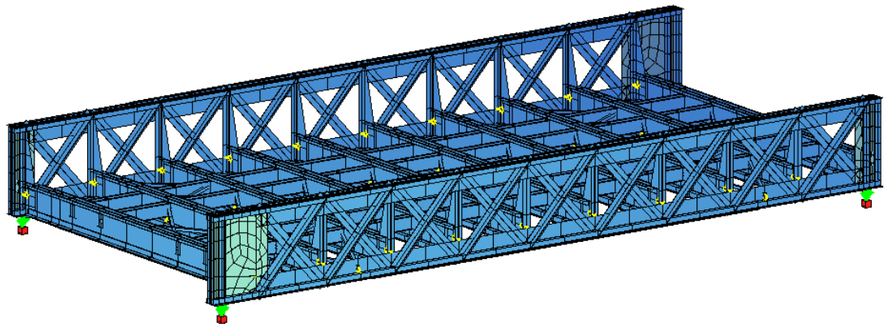


*Figura 7 Model de càlcul*

La descripció més detallada del model de càlcul incloent nodes i seccions es mostra en l'Apèndix 1: Model de càlcul.

## 4.3 AVALUACIÓ DEL TAULER DAVANT CÀRREGUES ESTÀTIQUES

S'han calculat les esforços considerant la combinació de l'Eurocodi. S'han tingut en compte les següents càrregues i factors :

- Càrregues permanents. ϒ=1.35
- Vehicles V=55 km/h. ϒ=1.45 ψ=1.00
- Frenat i acceleració. ϒ=1.45 ψ=1.00
- Llaç. ϒ=1.45 ψ=1.00
- Vent. ϒ=1.50 ψ=0.75

En primer lloc, es mostrarà el càlcul de les tensions en gelosies principals, bigues transversals i bigues longitudinals. En el cas del cordó superior, s'estudiaran els efectes derivats de la seva possible inestabilitat en el següent apartat. També es mostrarà el càlcul dels arriostraments. Finalment, es resumirà el càlcul de dos connexions representatives.

### 4.3.1 Càlcul de tensions.

La majoria de les seccions elements que componen el pont es poden categoritzar com a classe 1, 2 o 3. Únicament el cordó superior de la gelosia principal es considera que pot ser classe 4. Per això, s'han calculat les tensions al pont en règim elàstic degudes a la combinació d'ELU.

Les tensions es resumeixen a continuació:

| Resumen | | | |
|---|---|---|---|
| **Sección** | **$\sigma_{Ed}$** | **FS** | **¿Cumple?** |
| Cordón Inferior | 204.1 MPa | 1.05 | SI |
| Cordón superior | -149.2 MPa | 1.43 | SI |
| Montantes | 163.5 MPa | 1.31 | SI |
| Diagonal | -164.2 MPa | 1.30 | SI |
| Viga transversal | 126.8 MPa | 1.68 | SI |
| Viga diafragma | -214.7 MPa | 0.99 | Aceptable |
| Larguero | -124.4 MPa | 1.72 | SI |

El factor de seguretat s'ha obtingut comparant la tensió calculada amb la tensió límit de 235 MPa dividida entre $Y_{M0}$ = 1.1.

S'observa com pràcticament tots els elements compleixen, si bé alguns estan més sol·licitats que d'altres. En el cas de la biga diafragma, si bé la seva resistència és acceptable, està previst el seu reforç.

A continuació, es mostra el càlcul per a cada vehicle.

| Vehículo Serie 254 | | | | | |
|---|---|---|---|---|---|
| **Sección** | **Barra** | **Posición** | **$\sigma_{Ed}$** | **FS** | **¿Cumple?** |
| Cordón Inferior | 400001 | 0.00 | 188.4 MPa | 1.13 | SI |
| Cordón superior | 100005 | 1.17 | -125.2 MPa | 1.71 | SI |
| Montantes | 700015 | 0.82 | 134.9 MPa | 1.58 | SI |
| Diagonal | 800016 | 1.35 | -134.8 MPa | 1.58 | SI |
| Viga transversal | 1400008 | 0.48 | 116.9 MPa | 1.83 | SI |
| Viga diafragma | 2100002 | 0.50 | -201.6 MPa | 1.06 | SI |
| Larguero | 3100017 | 0.00 | 116.7 MPa | 1.83 | SI |

| Vehículo Serie 257 | | | | | |
|---|---|---|---|---|---|
| **Sección** | **Barra** | **Posición** | **$\sigma_{Ed}$** | **FS** | **¿Cumple?** |
| Cordón Inferior | 400001 | 0.00 | 199.5 MPa | 1.07 | SI |
| Cordón superior | 100005 | 1.17 | -132.3 MPa | 1.61 | SI |
| Montantes | 700015 | 0.82 | 140.0 MPa | 1.53 | SI |
| Diagonal | 800016 | 1.35 | -138.6 MPa | 1.54 | SI |
| Viga transversal | 1400008 | 0.48 | 126.8 MPa | 1.68 | SI |
| Viga diafragma | 2100002 | 0.50 | -214.7 MPa | 0.99 | Aceptable |
| Larguero | 3100035 | 0.91 | -124.4 MPa | 1.72 | SI |

| Vehículo Tolva 62000 | | | | | |
|---|---|---|---|---|---|
| **Sección** | **Barra** | **Posición** | **$\sigma_{Ed}$** | **FS** | **¿Cumple?** |
| Cordón Inferior | 400001 | 0.00 | 187.6 MPa | 1.14 | SI |
| Cordón superior | 100005 | 1.17 | -109.2 MPa | 1.96 | SI |
| Montantes | 700015 | 0.82 | 114.1 MPa | 1.87 | SI |
| Diagonal | 800016 | 1.35 | -112.2 MPa | 1.90 | SI |
| Viga transversal | 1400008 | 0.48 | 110.1 MPa | 1.94 | SI |
| Viga diafragma | 2100002 | 0.50 | -211.1 MPa | 1.01 | SI |
| Larguero | 3100011 | 0.91 | -121.9 MPa | 1.75 | SI |

| Vehículos 2 x Serie 254 | | | | | |
|---|---|---|---|---|---|
| **Sección** | **Barra** | **Posición** | **$\sigma_{Ed}$** | **FS** | **¿Cumple?** |
| Cordón Inferior | 400001 | 0.00 | 190.5 MPa | 1.12 | SI |
| Cordón superior | 200005 | 0.91 | -136.2 MPa | 1.57 | SI |
| Montantes | 700015 | 0.82 | 146.6 MPa | 1.46 | SI |
| Diagonal | 800016 | 1.35 | -147.6 MPa | 1.45 | SI |
| Viga transversal | 1400014 | 0.00 | -112.5 MPa | 1.90 | SI |
| Viga diafragma | 2100002 | 0.50 | -201.6 MPa | 1.06 | SI |
| Larguero | 3100017 | 0.00 | 116.7 MPa | 1.83 | SI |

| Vehículos 2 x Serie 257 | | | | | |
|---|---|---|---|---|---|
| **Sección** | **Barra** | **Posición** | **$\sigma_{Ed}$** | **FS** | **¿Cumple?** |
| Cordón Inferior | 400001 | 0.00 | 204.1 MPa | 1.05 | SI |
| Cordón superior | 200005 | 0.91 | -149.2 MPa | 1.43 | SI |
| Montantes | 700015 | 0.82 | 163.5 MPa | 1.31 | SI |
| Diagonal | 800016 | 1.35 | -164.2 MPa | 1.30 | SI |
| Viga transversal | 1400014 | 0.00 | 123.3 MPa | 1.73 | SI |
| Viga diafragma | 2100002 | 0.50 | -214.7 MPa | 0.99 | Aceptable |
| Larguero | 3100011 | 0.91 | -124.4 MPa | 1.72 | SI |

| Vehículos 2 xTolva 62000 | | | | | |
|---|---|---|---|---|---|
| **Sección** | **Barra** | **Posición** | **$\sigma_{Ed}$** | **FS** | **¿Cumple?** |
| Cordón Inferior | 400001 | 0.00 | 196.4 MPa | 1.09 | SI |
| Cordón superior | 200019 | 0.91 | -129.9 MPa | 1.64 | SI |
| Montantes | 700015 | 0.82 | 140.2 MPa | 1.52 | SI |
| Diagonal | 800016 | 1.35 | -138.7 MPa | 1.54 | SI |
| Viga transversal | 1400008 | 0.48 | -120.7 MPa | 1.77 | SI |
| Viga diafragma | 2100002 | 0.50 | -209.4 MPa | 1.02 | SI |
| Larguero | 3100011 | 0.91 | -121.7 MPa | 1.75 | SI |

| Vehículo Serie 254 + Tolva 62000 | | | | | |
|---|---|---|---|---|---|
| **Sección** | **Barra** | **Posición** | **$\sigma_{Ed}$** | **FS** | **¿Cumple?** |
| Cordón Inferior | 400001 | 0.00 | 187.6 MPa | 1.14 | SI |
| Cordón superior | 200004 | 0.00 | -134.0 MPa | 1.59 | SI |
| Montantes | 700015 | 0.82 | 147.2 MPa | 1.45 | SI |
| Diagonal | 800073 | 0.00 | -146.5 MPa | 1.46 | SI |
| Viga transversal | 1400008 | 0.48 | -116.8 MPa | 1.83 | SI |
| Viga diafragma | 2100002 | 0.50 | -207.1 MPa | 1.03 | SI |
| Larguero | 3100011 | 0.91 | -121.9 MPa | 1.75 | SI |

| Vehículo Serie 257 + Tolva 62000 | | | | | |
|---|---|---|---|---|---|
| **Sección** | **Barra** | **Posición** | **$\sigma_{Ed}$** | **FS** | **¿Cumple?** |
| Cordón Inferior | 400001 | 0.00 | 202.3 MPa | 1.06 | SI |
| Cordón superior | 200004 | 0.00 | -142.4 MPa | 1.50 | SI |
| Montantes | 700015 | 0.82 | 154.7 MPa | 1.38 | SI |
| Diagonal | 800016 | 1.35 | -152.4 MPa | 1.40 | SI |
| Viga transversal | 1400008 | 0.48 | -122.5 MPa | 1.74 | SI |
| Viga diafragma | 2100002 | 0.50 | -214.7 MPa | 0.99 | Aceptable |
| Larguero | 3100035 | 0.91 | -124.4 MPa | 1.72 | SI |

Les gràfiques completes de tensions es mostren en l'apèndix 2: Tensions.

### 4.3.2 Càlcul del cordó superior

Per avaluar el risc d'inestabilitat en el cordó superior s'han calculat els modes de vinclament vinculats a la càrrega axil al cordó superior. Els resultats es mostren a continuació:

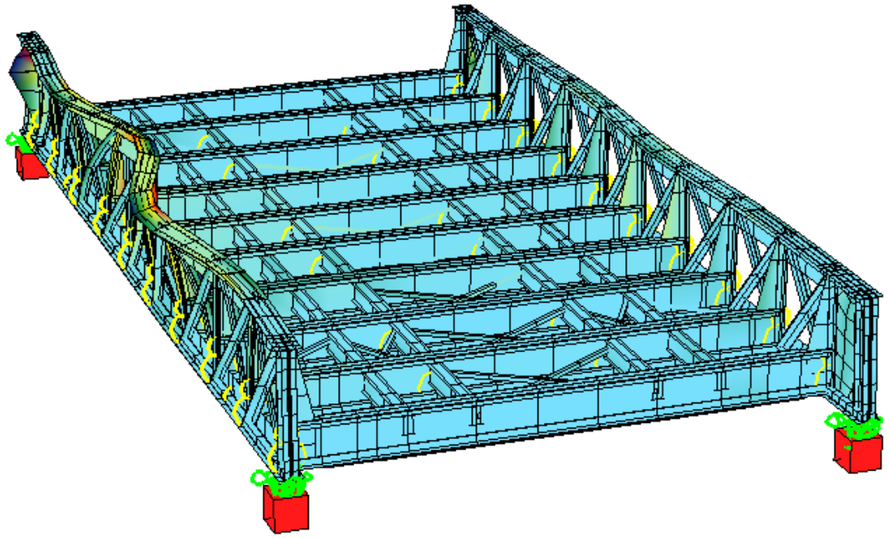
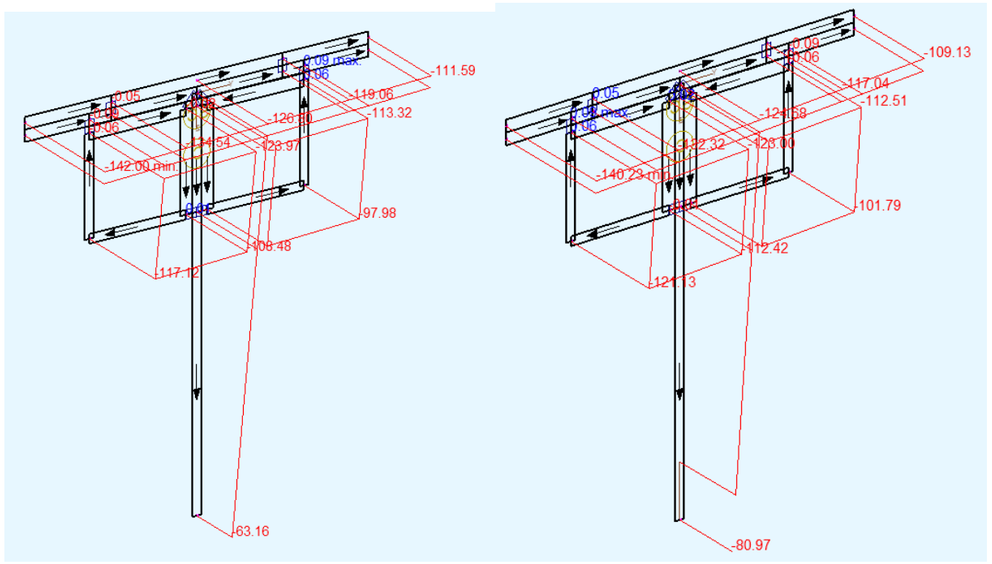


*Figura 8 Mode de vinclament*

El factor de vinclament calculat és $\alpha_{cr}$ = 19.78 > 10, per la qual cosa es poden ignorar els efectes de segon ordre segons l'apartat 5.2.1 de l'EN 1993-2.

Per tant, solo se va a calcular el cordó superior tenint en compte l'abonyec de les seccions. Aquest càlcul es realitza internament a Sofistik i es mostra a continuació per la secció més sol·licitat.




En abonyegar-se la xapa extrema, es redueix l'excentricitat de la secció i per tant les tensions també es redueixen.

### 4.3.3 Càlcul de arriostraments

El càlcul dels arriostraments s'ha realitzat de manera independent ja que la seva resistència està condicionada per l'ELU d'inestabilitat.

Els resultats es mostren a continuació:

**PROJECT:** CTRA VIC
**DOCUMENT:**
**MEMBER:** ARRIOSTRAMIENTO
**DATE:** 14-Mar-24

**Prepared by:** IC
**Checked by:**
**Approved by:**

**CÁLCULO DE PANDEO SEGÚN EN 1993-1**

**DATOS**

**Sección**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| Área metálica | A | 1960 | 1960 | 2480 | mm2 |
| Momento de inercia Eje Y | $I_y$ | 1600667 | 1600667 | 1433468 | mm4 |
| Momento de inercia Eje Z | $I_z$ | 1600667 | 1600667 | 2730667 | mm4 |
| Curva pandeo Eje Y | | b | b | c | |
| Curva pandeo Eje Z | | b | b | c | |

**Propiedades de la viga**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| Luz | L | 1720 | 2100 | 3453 | mm |
| Factor de pandeo Eje Y | $\beta_y$ | 1 | 1 | 1 | |
| Factor de pandeo Eje Z | $\beta_z$ | 1 | 1 | 1 | |

**Materiales**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| Resitencia del acero | $f_y$ | 235 | 235 | 235 | MPa |
| Módulo elástico del acero | E | 210 | 210 | 210 | GPa |
| Factor de seguridad | $\gamma_{M1}$ | 1.10 | 1.10 | 1.10 | MPa |

**CAPACIDAD**

**Eje Y**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| | $L_f$ | 1720 | 2100 | 3453 | mm |
| | EI | 336140 | 336140 | 301028 | MN.mm2 |
| Carga crítica | $N_{cr}$ | 1121.41 | 752.28 | 249.18 | kN |
| | $Af_y$ | 461 | 461 | 583 | kN |
| Esbeltez | $\lambda$ | 0.64 | 0.78 | 1.53 | |
| Factor de imperfección | $\alpha$ | 0.34 | 0.34 | 0.49 | |
| Factor de reduccion | $\chi$ | 0.82 | 0.74 | 0.31 | |
| Axil resistente | $N_{b,Rd}$ | 342 | 308 | 162 | kN |

**Eje Z**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| | $L_f$ | 1720 | 2100 | 3453 | mm |
| | EI | 336140 | 336140 | 573440 | MN.mm2 |
| Carga crítica | $N_{cr}$ | 1121.41 | 752.28 | 474.67 | kN |
| | $Af_y$ | 461 | 461 | 583 | kN |
| Esbeltez | $\lambda$ | 0.64 | 0.78 | 1.11 | |
| Factor de imperfección | $\alpha$ | 0.34 | 0.34 | 0.49 | |
| Factor de reduccion | $\chi$ | 0.82 | 0.74 | 0.48 | |
| Axil resistente | $N_{b,Rd}$ | 342 | 308 | 254 | kN |

**EVALUACIÓN**

| | | Contraviento | Frenado | Original |
|---|---|---|---|---|
| Vehículo Serie 254 | $N_{ed}$ | 151.2 | 180.5 | 203.7 |
| | FS | 2.26 | 1.71 | 0.79 |
| Vehículo Serie 257 | $N_{ed}$ | 154.1 | 184.6 | 208.9 |
| | FS | 2.22 | 1.67 | 0.77 |
| Vehículo Tolva 62000 | $N_{ed}$ | 144.7 | 171.4 | 204.4 |
| | FS | 2.36 | 1.80 | 0.79 |
| Vehículos 2 x Serie 254 | $N_{ed}$ | 154.0 | 193.6 | 203.7 |
| | FS | 2.22 | 1.59 | 0.79 |
| Vehículos 2 x Serie 257 | $N_{ed}$ | 161.2 | 198.0 | 208.9 |
| | FS | 2.12 | 1.55 | 0.77 |
| Vehículos 2 xTolva 62000 | $N_{ed}$ | 153.2 | 188.9 | 208.4 |
| | FS | 2.23 | 1.63 | 0.78 |
| Vehículo Serie 254 + Tolva 62000 | $N_{ed}$ | 152.6 | 195.1 | 206.8 |
| | FS | 2.24 | 1.58 | 0.78 |
| Vehículo Serie 257 + Tolva 62000 | $N_{ed}$ | 156.8 | 194.9 | 208.9 |
| | FS | 2.18 | 1.58 | 0.77 |

L'arriostrament inferior, que es correspon amb l'original de l'estructura, no compleix. Per tant es proposa substituir-lo per un compost per dos L 90x10. El seu càlcul es mostra a continua:

**PROJECT:** CTRA VIC
**DOCUMENT:**
**MEMBER:** ARRIOSTRAMIENTO
**DATE:** 14-Mar-24

**Prepared by:** IC
**Checked by:**
**Approved by:**

**CÁLCULO DE PANDEO SEGÚN EN 1993-1**

**DATOS**

**Sección**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| Área metálica | A | 1960 | 1960 | 3420 | mm2 |
| Momento de inercia Eje Y | $I_y$ | 1600667 | 1600667 | 2540000 | mm4 |
| Momento de inercia Eje Z | $I_z$ | 1600667 | 1600667 | 2540000 | mm4 |
| Curva pandeo Eje Y | | b | b | c | |
| Curva pandeo Eje Z | | b | b | c | |

**Propiedades de la viga**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| Luz | L | 1720 | 2100 | 3453 | mm |
| Factor de pandeo Eje Y | $\beta_y$ | 1 | 1 | 1 | |
| Factor de pandeo Eje Z | $\beta_z$ | 1 | 1 | 1 | |

**Materiales**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| Resitencia del acero | $f_y$ | 235 | 235 | 235 | MPa |
| Módulo elástico del acero | E | 210 | 210 | 210 | GPa |
| Factor de seguridad | $\gamma_{M1}$ | 1.10 | 1.10 | 1.10 | MPa |

**CAPACIDAD**

**Eje Y**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| | $L_f$ | 1720 | 2100 | 3453 | mm |
| | EI | 336140 | 336140 | 533400 | MN.mm2 |
| Carga crítica | $N_{cr}$ | 1121.41 | 752.28 | 441.53 | kN |
| | $Af_y$ | 461 | 461 | 804 | kN |
| Esbeltez | $\lambda$ | 0.64 | 0.78 | 1.35 | |
| Factor de imperfección | $\alpha$ | 0.34 | 0.34 | 0.49 | |
| Factor de reduccion | $\chi$ | 0.82 | 0.74 | 0.37 | |
| Axil resistente | $N_{b,Rd}$ | 342 | 308 | 269 | kN |

**Eje Z**

| | | Interior | Lateral | Inferior | |
|---|---|---|---|---|---|
| | $L_f$ | 1720 | 2100 | 3453 | mm |
| | EI | 336140 | 336140 | 533400 | MN.mm2 |
| Carga crítica | $N_{cr}$ | 1121.41 | 752.28 | 441.53 | kN |
| | $Af_y$ | 461 | 461 | 804 | kN |
| Esbeltez | $\lambda$ | 0.64 | 0.78 | 1.35 | |
| Factor de imperfección | $\alpha$ | 0.34 | 0.34 | 0.49 | |
| Factor de reduccion | $\chi$ | 0.82 | 0.74 | 0.37 | |
| Axil resistente | $N_{b,Rd}$ | 342 | 308 | 269 | kN |

**EVALUACIÓN**

| | | Interior | Lateral | Inferior |
|---|---|---|---|---|
| Vehículo Serie 254 | $N_{ed}$ | 151.2 | 180.5 | 203.7 |
| | FS | 2.26 | 1.71 | 1.32 |
| Vehículo Serie 257 | $N_{ed}$ | 154.1 | 184.6 | 208.9 |
| | FS | 2.22 | 1.67 | 1.29 |
| Vehículo Tolva 62000 | $N_{ed}$ | 144.7 | 171.4 | 204.4 |
| | FS | 2.36 | 1.80 | 1.32 |
| Vehículos 2 x Serie 254 | $N_{ed}$ | 154.0 | 193.6 | 203.7 |
| | FS | 2.22 | 1.59 | 1.32 |
| Vehículos 2 x Serie 257 | $N_{ed}$ | 161.2 | 198.0 | 208.9 |
| | FS | 2.12 | 1.55 | 1.29 |
| Vehículos 2 xTolva 62000 | $N_{ed}$ | 153.2 | 188.9 | 208.4 |
| | FS | 2.23 | 1.63 | 1.29 |
| Vehículo Serie 254 + Tolva 62000 | $N_{ed}$ | 152.6 | 195.1 | 206.8 |
| | FS | 2.24 | 1.58 | 1.30 |
| Vehículo Serie 257 + Tolva 62000 | $N_{ed}$ | 156.8 | 194.9 | 208.9 |
| | FS | 2.18 | 1.58 | 1.29 |

La soldadura requerida per a la connexió es calcula a continuació:

| CÁLCULO DE SOLDADURA | | | |
|---|---|---|---|
| Fuerza | $F_{w,Ed}$ | 162 | kN |
| Longitud de soldadura | d | 100 | mm |
| Profundidad del cordón | g | 7 | mm |
| Número de cordones | n | 2 | |
| Área | $A_s$ | 1400 | mm2 |
| Tensión última acero existente | $f_u$ | 410 | MPa |
| Coeficiente de correlación | $\beta_w$ | 0.85 | |
| Factor de seguridad en uniones | $\gamma_{M2}$ | 1.25 | |
| Tensión de diseño | $f_{vw,d}$ | 223 | MPa |
| Fuerza | $F_{w,Rd}$ | 312 | kN |
| | **CS** | **1.9** | ✓ |

### 4.3.4 Càlcul de connexions.

S'han avaluat les tres connexions que es consideren crítiques:

- Unió entre la biga transversal i la gelosia principal.
- Unió de les bigues longitudinals a les bigues transversals.
- Unió de les bigues longitudinals a les bigues d'estrep.

**Unió entre la biga transversal i la gelosia principal.**

Per a la determinació dels esforços en els perns s'ha emprat un model local realitzat a Sofistik.

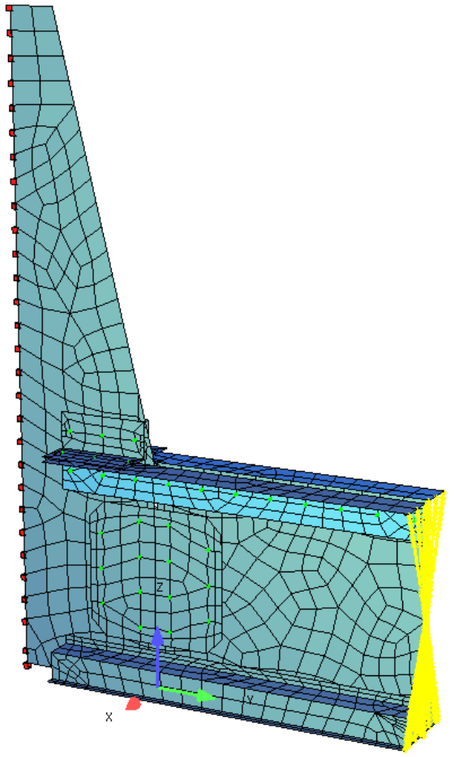
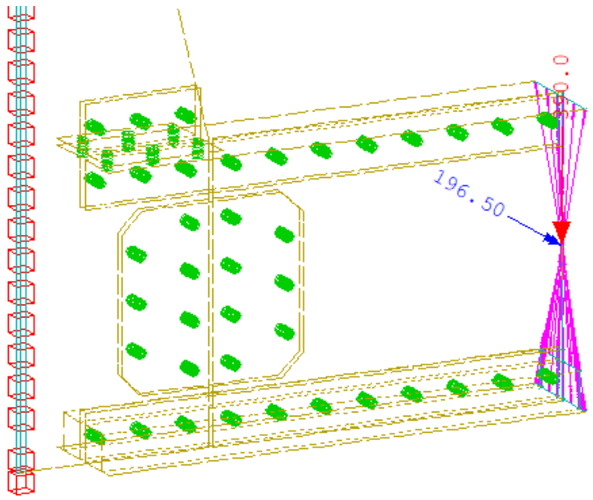



*Figura 9 Imatge del model*

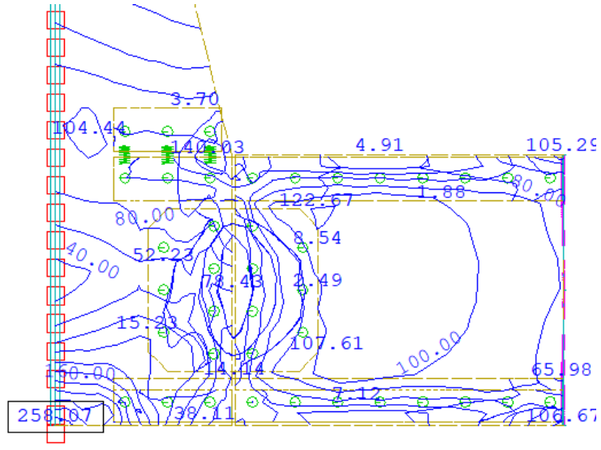
## Càrregues

Les càrregues en el model són el màxim tallant i el màxim negatiu en la connexió, ambdues alhora.




## Tensions

Les tensions en la connexió estan dins dels límits. Únicament es dóna un pic que excedeix a causa de les simplificacions del model.




## Caragols

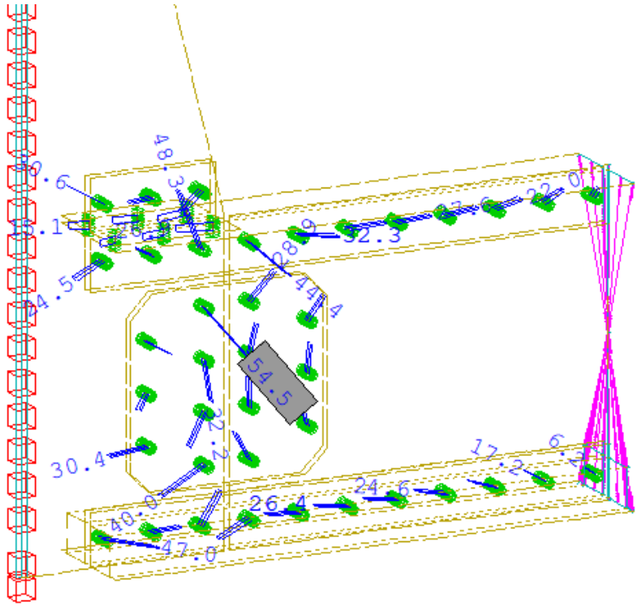
Es mostra primerament el càlcul de la capacitat dels cargols.

**CÁLCULO DE UNIÓN**

**Alas**

| | | | Inferior | Superior | |
|---|---|---|---|---|---|
| Clase del tornillo | *Supongo propiedades del acero base* | | Roblón | Roblón | |
| Espaciamiento | | p | 100 | 100 | mm |
| Pernos por fila | | n | 3 | 3 | |
| Número de filas | | n | 1 | 2 | |
| Planos de corte | | $n_p$ | 2 | 2 | |
| Espesor del ala | | t | 10 | 10 | mm |
| Espesor de la placa | | t | 10 | 10 | mm |
| Diámetro del perno | | d | 22 | 22 | mm |
| Diámetro nominal del perno | | $d_0$ | 24 | 24 | mm |
| Distancia a borde mínima | | $e_{1,2\ min}$ | 29 | 29 | mm |
| Distancia a borde máxima | | $e_{1,2\ max}$ | 80 | 80 | mm |
| Espaciamiento longitudinal entre pernos mínimo | | $p_{1\ min}$ | 53 | 53 | mm |
| Espaciamiento transversal entre pernos mínimo | | $p_{2\ min}$ | 58 | 58 | mm |
| Espaciamiento entre pernos máximo | | $p_{1,2\ max}$ | 140 | 140 | mm |
| ¿Cumple el espaciamiento? | | | ✓ | ✓ | |
| Factor dependiente del área roscada | | $\alpha_v$ | 0.6 | 0.6 | |
| Resistencia a plastificación del perno | | $f_{yb}$ | 235 | 235 | MPa |
| Resistencia a última del perno | | $f_{ub}$ | 360 | 360 | MPa |
| Tensión última del acero de base | | $f_u$ | 360 | 360 | MPa |
| Factor de seguridad en uniones | | $\gamma_{M2}$ | 1.25 | 1.25 | |
| Área del perno | | $A_b$ | 380 | 380 | mm2 |
| Resistencia a corte por el plano de cortante | | $F_{v,Rd}$ | 66 | 66 | kN |
| Espesor de relleno | | $t_p$ | 0 | 0 | mm |
| Reducción por relleno | | $\beta_p$ | 1.00 | 1.00 | |
| Longitud de la unión | | $L_j$ | 0 | 100 | mm |
| Reducción por longitud | | $\beta_{Lf}$ | 1.00 | 1.00 | |
| Resistencia a corte final por perno | | $F_{v,Rd}$ | 131 | 131 | kN |
| Factores de espaciamiento | | $\alpha_{di}$ | 1.00 | 1.00 | |
| | | $e_1$ | 30 | 30 | |
| | | $\alpha_{de}$ | 0.42 | 0.42 | |
| | | $\alpha_d$ | 0.81 | 0.81 | |
| | | $\alpha_b$ | 0.81 | 0.81 | |
| | | $k_1$ | 2.50 | 2.50 | |
| Factor de holgura | | | 0.80 | 0.80 | |
| Resistencia a aplastamiento | | $F_{b,Rd}$ | 102 | 102 | kN |
| Capacidad de los pernos | | $F_{Rd}$ | 102 | 102 | kN |

En la següent imatge s'observa que els màxims esforços en la connexió disten de la capacitat dels perns.




**Unió de les bigues longitudinals a les bigues transversals.**

El càlcul d'aquesta unió s'ha realitzat emprant el Programari IdeaStatica, que està orientat al càlcul d'unions.

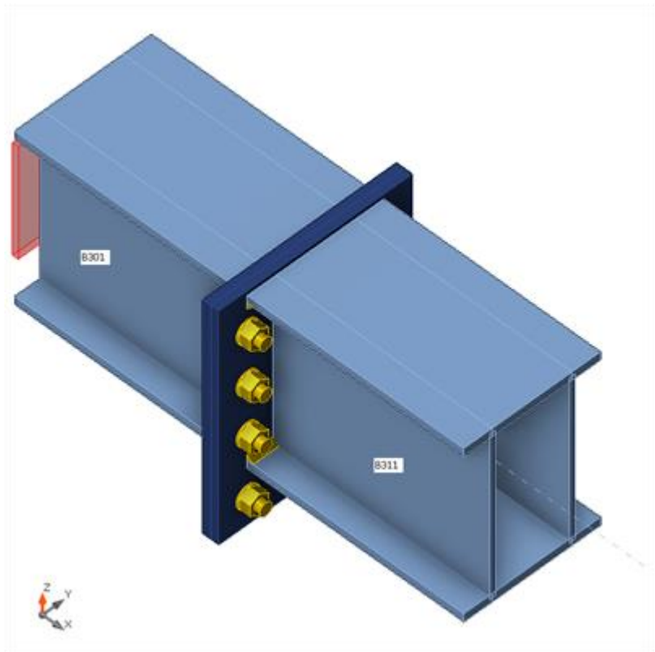
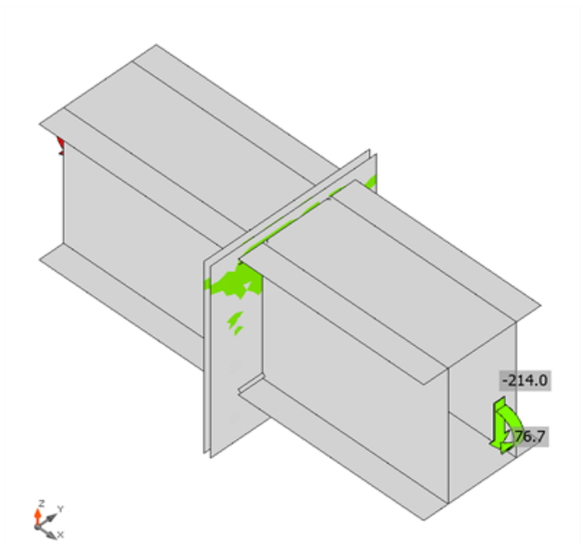



*Figura 10 Imatge del model*

El resultat de l'avaluació dels cargols es mostra a continuació:

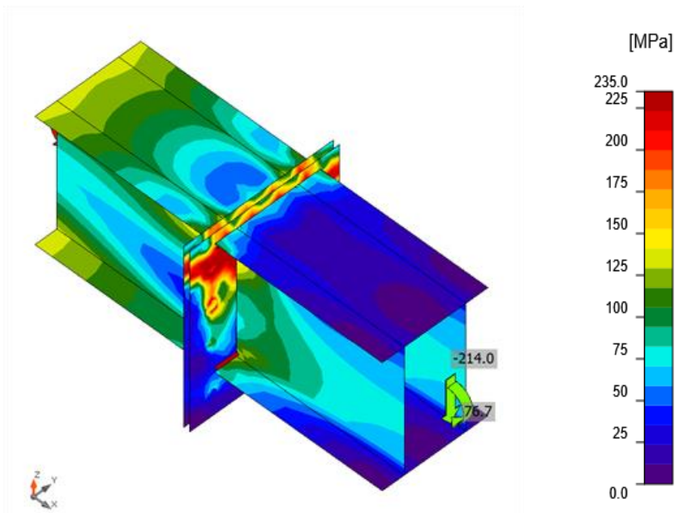
**Càrregues**

Les càrregues en el model són el màxim tallant i el màxim negatiu en la connexió, ambdues alhora.

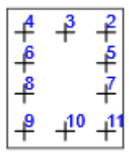



**Tensions**

Les tensions en la connexió estan dins dels límits.




**Caragols**

| Forma | Ítem | Calidad | Cargas | $F_{t,Ed}$ [kN] | $F_{v,Ed}$ [kN] | $F_{b,Rd}$ [kN] | $Ut_t$ [%] | $Ut_s$ [%] | $Ut_{ts}$ [%] | Detallado | Estado |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  | B2 | M22 10.9 - 1 | LE1 | 135.1 | 22.0 | 215.6 | 61.9 | 18.2 | 62.4 | Aceptar | OK |
| | B3 | M22 10.9 - 1 | LE1 | 138.4 | 22.4 | 215.6 | 63.4 | 18.5 | 63.8 | Aceptar | OK |
| | B4 | M22 10.9 - 1 | LE1 | 134.1 | 22.0 | 215.6 | 61.5 | 18.1 | 62.1 | Aceptar | OK |
| | B5 | M22 10.9 - 1 | LE1 | 51.5 | 22.3 | 221.8 | 23.6 | 18.4 | 35.3 | Aceptar | OK |
| | B6 | M22 10.9 - 1 | LE1 | 52.0 | 22.3 | 221.8 | 23.8 | 18.4 | 35.4 | Aceptar | OK |
| | B7 | M22 10.9 - 1 | LE1 | 10.4 | 21.9 | 221.8 | 4.8 | 18.1 | 21.5 | Aceptar | OK |
| | B8 | M22 10.9 - 1 | LE1 | 10.6 | 21.9 | 221.8 | 4.8 | 18.1 | 21.5 | Aceptar | OK |
| | B9 | M22 10.9 - 1 | LE1 | 0.8 | 19.4 | 154.0 | 0.4 | 16.0 | 16.3 | Aceptar | OK |
| | B10 | M22 10.9 - 1 | LE1 | 1.4 | 20.4 | 154.0 | 0.6 | 16.8 | 17.3 | Aceptar | OK |
| | B11 | M22 10.9 - 1 | LE1 | 0.8 | 19.4 | 154.0 | 0.4 | 16.0 | 16.3 | Aceptar | OK |

*Datos de diseño*

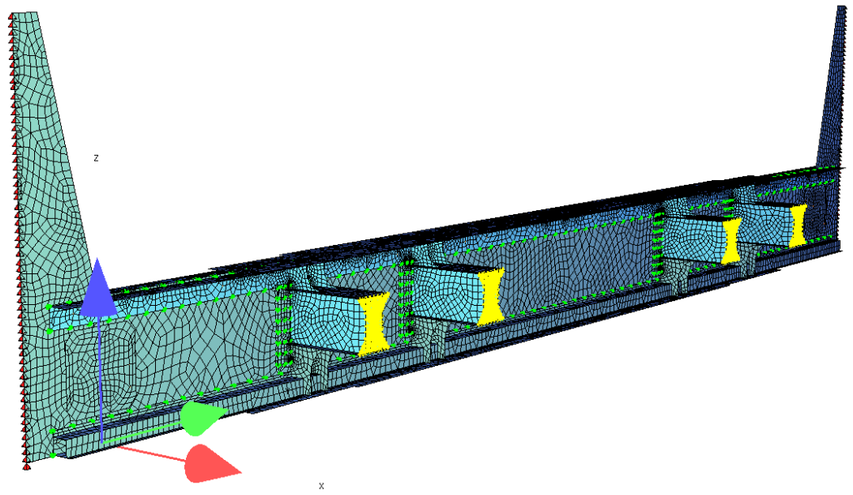
| Calidad | $F_{t,Rd}$ [kN] | $B_{p,Rd}$ [kN] | $F_{v,Rd}$ [kN] |
|---|---|---|---|
| M22 10.9 - 1 | 218.2 | 272.5 | 121.2 |

*Explicación del símbolo*

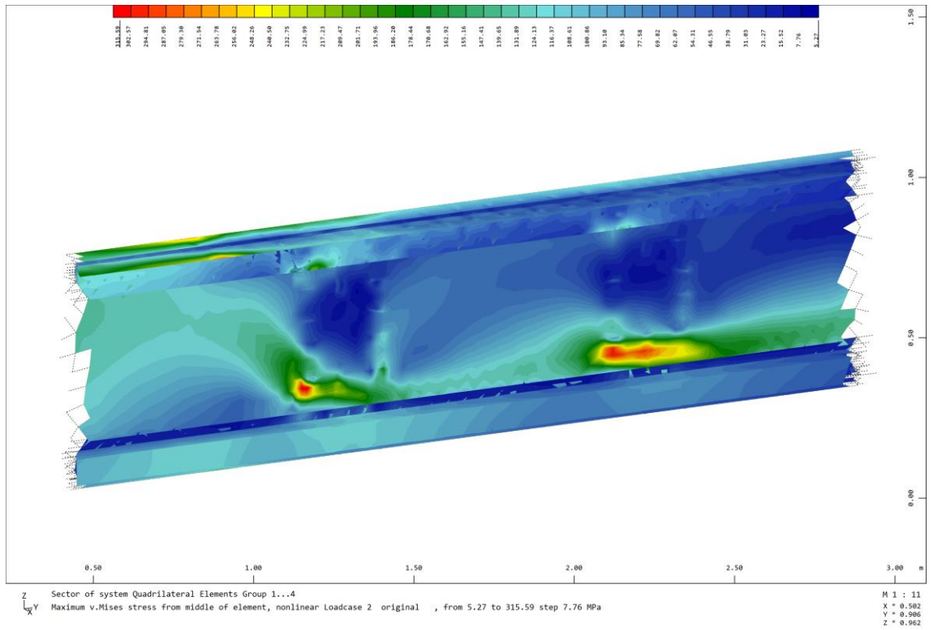
| | |
|---|---|
| $F_{t,Ed}$ | Fuerza de tracción |
| $F_{v,Ed}$ | Resultante de fuerzas cortantes en pernos Vy y Vz en planos de cortantes |
| $F_{b,Rd}$ | Resistencia al aplastamiento de la placa, según EN 1993-1-8 tab. 3.4 |
| $Ut_t$ | Utilización a tracción |
| $Ut_s$ | Utilización a cortante |
| $Ut_{ts}$ | Interacción tracción - cortante EN 1993-1-8 – Tab. 3.4 |
| $F_{t,Rd}$ | Resistencia a tracción del tornillo EN 1993-1-8 tabla. 3.4 |
| $B_{p,Rd}$ | Resistencia al punzonamiento EN 1993-1-8 – Tab. 3.4 |
| $F_{v,Rd}$ | Resistencia a cortante de los tornillos EN_1993-1-8 tabla 3.4 |

## Unió entre la biga longitudinal y la biga d'estrep.

Per a la determinació dels tensions dels xapes s'ha emprat un model local realitzat a Sofistik.

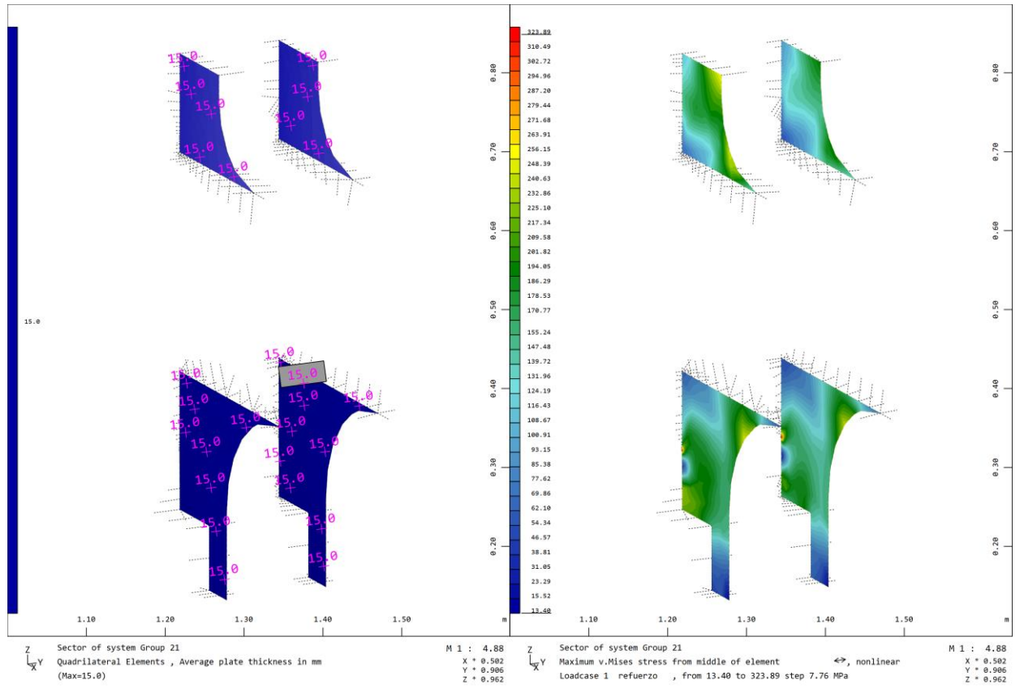



Primerament, s'ha avaluat la situació actual de les xapes de la biga diafragma.



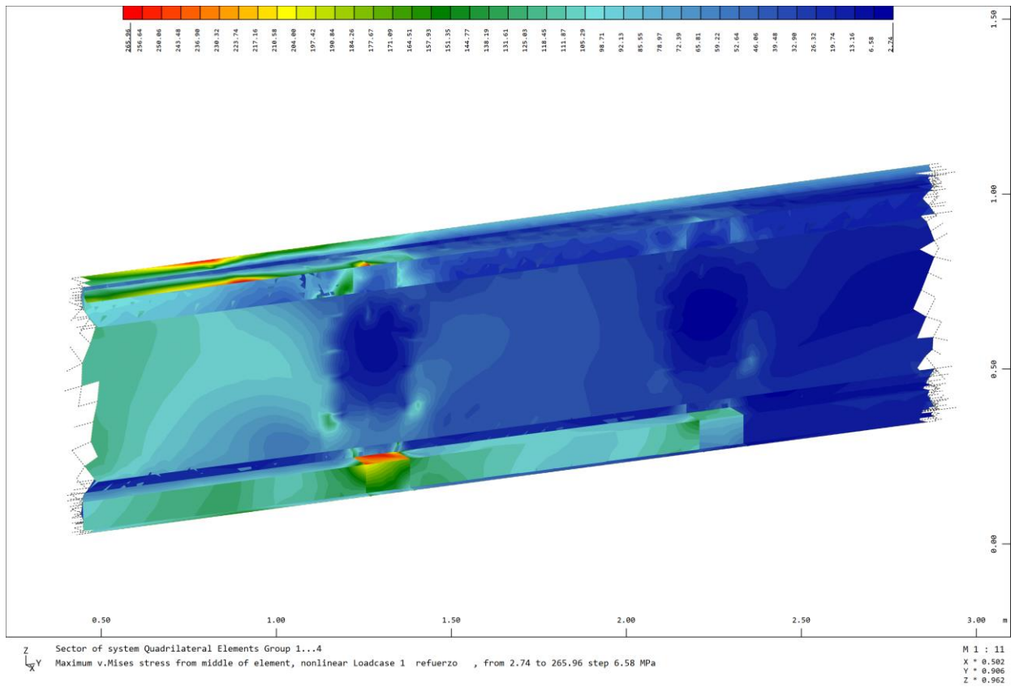

S'observa com a la zona on es localitzen les perforacions es donen uns pics de tensions que excedeixen els límits normatius. És a dir, les perforacions es poden haver iniciat a causa de fissures induïdes per un detall inadequat de la connexió. En terminologia anglesa, això es coneix com a "Distortion induced fatigue".

Per millorar aquest detall, es proposen xapes de reforç para rigiditzar la connexió. S'han considerat de 15 mm i arrodonides per millorar el seu comportament a fatiga. La seva geometria i càlcul es mostra a continuació:




La tensió màxima és 323 MPa, que és menor que 355/1.05=338 MPa.

Les tensions a la resta de xapes es redueixen substancialment com es pot veure a continuació:




Els pics de tensió es donen a la L100x100x10, i a l'ala superior.

En el cas de la L, la tensió màxima és 257 MPa, i és inferior al límit de 275/1.05=262 MPa previst en la norma.

En el cas de l'ala superior, si bé excedeix el límit de 235 MPa, la tensió calculada és inferior a la de l'estat actual, i en aquest cas no hi ha patologia associada. A més, es pot assumir certa plastificació de l'ala de la biga deguda a la dilució transversal local d'aquesta. En aquest sentit, normes com l'AASHTO indiquen que es consideri la tensió a 1/3 de l'ala per al càlcul de seccions esveltes. Per tant, el pic de tensió observat a l'ala superior també es considera admissible.

## 4.4 AVALUACIÓ DEL TAULER DAVANT CÀRREGUES DE FATIGA

### 4.4.1 Introducció.

El fenomen del trencament per fatiga es dona quan un element estructural és sotmès a l'acció reiterada d' unes càrregues inferiors a les de dimensionament de l' estructura, però que són suficientment elevades com per produir dany en l' estructura. Atès que es tracta d' una anàlisi basada en les repetició de càrregues, s' ha de suposar-se una circulació pel pont el més pròxima a la realitat possible.

D'acord amb la informació facilitada per FGC, per aquesta línia circulen tant trens de mercaderies com trens de passatgers. La seva definició i freqüència es mostra en la primera part. Posteriorment, i a partir dels trens definits anteriorment, es calcula la fatiga, com s'inclourà en la segona part.

El pont s'ha avaluat considerant el procediment del dany acumulat. Atès que és un procediment no generalitzable, s'han seleccionat tres punts crítics a partir de l'envolupant de tensions i el criteri del projectista. Son el següents:

1. Punt de màxima tensió en el cordó inferior de la gelosia principal. EN 1993-1-9 Taula 8.1 Fig. 13 Cat 50
2. Punt de màxima tensió en l'ala inferior de la biga transversal més sol·licitada. EN 1993-1-9 Taula 8.1 Fig. 13 Cat 50
3. Vèrtex interior en la unió amb la biga transversal del muntant vertical. EN 1993-1-9 Taula 8.5 Fig. 6 Cat 56

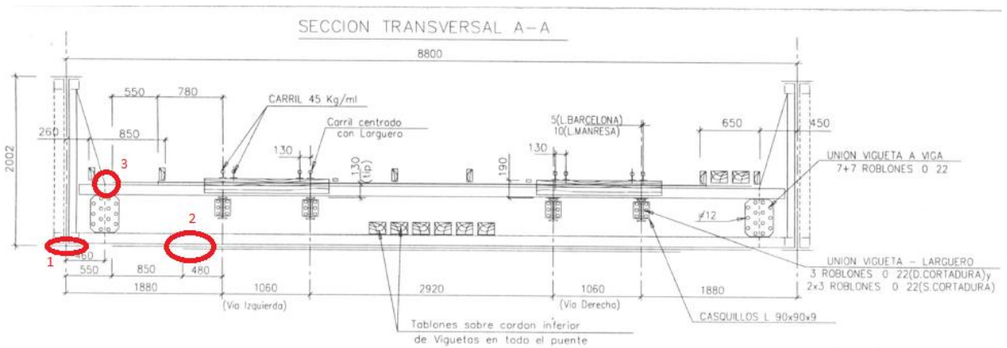



*Figura 11 Esquema de punts d'anàlisis.*

També s'ha analitzat la xapa superior de la biga longitudinal en la seva connexió amb una biga transversal.

Dels punts indicats anteriorment, els punts 1 i 2 han estat reforçats amb perfils en L l'any 1991. Per aquest motiu s'estudiarà l'estructura sense reforçar i reforçada, per a això s'empraran dos models lleugerament diferents (Sense perfils en L de reforç l'original). Més encara, la biga longitudinal es va reemplaçar en 1991, per la qual cosa no s'estudiarà en el primer període.

A més, se suposarà que fins enguany han circulat locomotores similars a les de la sèrie 254 arrossegant la potassa, mentre que d'ara endavant se suposarà que la locomotora és la de la sèrie 257.

Per tant, el càlcul s'ha dividit en tres períodes:

- 1924-1991(67 anys): Sense reforços i locomotora Sèrie 254
- 1991-2024 (33 anys): Amb reforços i locomotora Sèrie 254
- 2024-xxxx. Amb reforços i locomotora Sèrie 257

El dany final de càlcul serà el resultat dels càlculs anteriors, a més dels trens de passatgers.

### 4.4.2 Càrregas

**Permanents.**

Són les mateixes indicades per als càlculs estàtics.

**Comboi de mercaderies.**

Els passos que s'han seguit per a la definició del comboi són:

1. D'acord amb la informació facilitada per FGC, per aquesta línia transiten habitualment 3 combois transportant 2400 tones de potassa. És a dir, cada comboi transporta 800 tones.
2. La càrrega màxima de cada tremuja és de 44.7 t d'acord amb la fitxa tècnica, i la tara de 15.3 t. Per tant, cada tremuja pot transportar 29.4 t.
3. 800/29.4=27.2, per la qual cosa es prenen 28 tremuges per comboi.

Per tant, s'ha avaluat el pont considerant una locomotora, que pot ser de la sèrie 254 o 257, i 28 tremuges 62000 de 45 t de pes. També s'ha fet la mateixa avaluació considerant les tremuges buides (15 t)

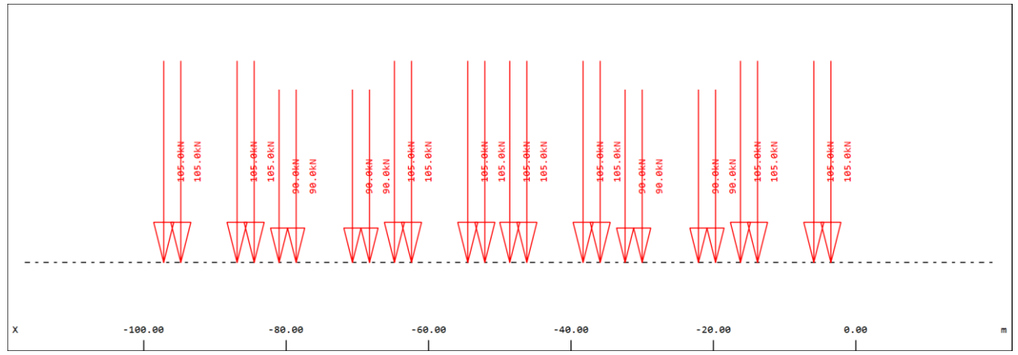
En el model de càlcul, el tren s'ha representat complet i s'ha suposat un pas d'1.88/4 m. Això implica que s'hagin calculat 900 casos per cadascun dels 4 casos

D'acord amb la informació d'FGC, el trànsit suposat és de tres trens plens diaris i tres trens buits de tornada cadascun dels 7 dies de la setmana.

**Tren de passatgers.**

El tren considerat és la sèrie 213 d'FGC . D'acord amb les dades consultades en la Wikipedia, els trens de la Sèrie 213 estan composts per 3 vagons d'aproximadament 16.2 m de longitud i pesos en buit de 36.2, 28.7 i 37 tones respectivament. Per a tenir en compte els passatgers, els pesos definitius considerats per vagó són 42, 36 i 42 tones.

Pel que fa a la distribució d'eixos, s'ha pres dels trens de fatiga del Eurocodi 1-2. Concretament el Tipus 10, corresponent a un tren metropolità, també considera una longitud de 16.2 m per vagó, per la qual cosa s'ha considerat aquesta distribució d'eixos. Aquests eixos són 4 i tenen una separació de 7.9 m entre els eixos centrals i 2.4 entre els laterals. A més, s'han considerat dues unitats per a l'anàlisi (6 vagons).




### 4.4.3 Càlcul de fatiga.

El càlcul a fatiga s' ha realitzat pel procediment del dany acumulat. Aquest procediment implica els següents passos:

1. S' obté l' historial complet de tensions per a un determinat punt de l' estructura.
2. Es filtren els punts intermedis entre pics i les tensions repetides. Així es genera l' historial de tensions simplificat només amb pics que es mostra en les gràfiques.
3. Mitjançant l' algoritme de Fryba (Vegeu Guia per al projecte davant de fatiga de ponts metàl·lics i mixtos de carretera) s' obtenen els carreres de tensió de l' historial.
4. Per simplicitat, s'agrupen els carreres de tensions en grups. Tenint en compte el llindar de dany, el límit de fatiga d' amplitud constant, i el doble de la tensió anterior, s' agrupen les tensions en grups corresponents a quarts de les tensions anteriors. Per agrupar-les es té en compte el pendent m:

$$\Delta\sigma_{eq} = \sqrt[m]{\frac{\sum n_i \cdot \Delta\sigma_i{}^m}{\sum n_i}}$$

5. Per a cada grup s' obté el nombre màxim de cicles, i es compara amb els cicles calculats. El quocient entre els termes anteriors és el dany, que es multiplica pel nombre de freqüències en el període de càlcul.
6. La suma de tots els danys és el dany total a causa del vehicle, que se suma al dels altres vehicles.

El càlcul finalment s'ha realitzat per a un total de 6 detalls de fatiga. Atès que s'ha suposat que els trens de mercaderies circulen per una via, i els de passatgers per l'altra, s'han analitzat els detalls pèssims per a trens de mercaderies i trens de passatgers. Els càlculs es resumeixen en la taula següent:

| | | 1924-1991 | 1991-2024 | 1924-2024 | Daño anual Serie 257 | Vida remanente |
|---|---|---|---|---|---|---|
| Via 1 Mercancías | Celosía | 0.103 | 0.029 | 0.132 | 1.11E-03 | 786 |
| | V. transversal | 0.305 | 0.058 | 0.363 | 2.22E-03 | 287 |
| | Montante | 0.073 | 0.038 | 0.111 | 1.42E-03 | 627 |
| | Larguero | - | 0.011 | 0.011 | 4.58E-04 | 2160 |
| Via 2 Pasajeros | Celosía | 0.174 | 0.038 | 0.212 | 1.15E-03 | 683 |
| | V. transversal | 0.200 | 0.000 | 0.200 | 0.00E+00 | ∞ |
| | Montante | 0.131 | 0.070 | 0.201 | 2.13E-03 | 376 |
| | Larguero | - | 0.027 | 0.027 | 8.09E-04 | 1203 |

S'observa la vida romanent dels detalls de fatiga és satisfactòria en tots els casos.

Els càlculs anteriors es descomponen en cada tipus de tren en les taules següents:

1924-1991 - VÍA DE MERCANCIAS

A 67 *Años*

| | Serie 254 | | Pasajeros | Total |
|---|---|---|---|---|
| | Lleno | Vacío | | |
| *Viga principal* | 0.064 | 0.039 | 0.000 | 0.103 |
| *Viga transversal* | 0.264 | 0.041 | 0.000 | 0.305 |
| *Montante* | 0.037 | 0.036 | 0.000 | 0.073 |

1924-1991 - VÍA DE PASAJEROS

A 67 *Años*

| | Serie 254 | | Pasajeros | Total |
|---|---|---|---|---|
| | Lleno | Vacío | | |
| *Viga principal* | 0.001 | 0.000 | 0.173 | 0.174 |
| *Viga transversal* | 0.000 | 0.000 | 0.200 | 0.200 |
| *Montante* | 0.000 | 0.000 | 0.131 | 0.131 |

1991-2024 - VÍA DE MERCANCIAS

A 33 *Años*

| | Serie 254 | | Pasajeros | Total |
|---|---|---|---|---|
| | Lleno | Vacío | | |
| *Viga principal* | 0.016 | 0.013 | 0.000 | 0.029 |
| *Viga transversal* | 0.049 | 0.009 | 0.000 | 0.058 |
| *Montante* | 0.019 | 0.019 | 0.000 | 0.038 |
| *Larguero* | 0.007 | 0.003 | 0.000 | 0.011 |

1991-2024 - VÍA DE PASAJEROS

A 33 *Años*

| | Serie 254 | | Pasajeros | Total |
|---|---|---|---|---|
| | Lleno | Vacío | | |
| *Viga principal* | 0.000 | 0.000 | 0.038 | 0.038 |
| *Viga transversal* | 0.000 | 0.000 | 0.000 | 0.000 |
| *Montante* | 0.000 | 0.000 | 0.070 | 0.070 |
| *Larguero* | 0.000 | 0.000 | 0.027 | 0.027 |

2024 - 2124 VÍA DE MERCANCÍAS

A 100 *Años*

| | Serie 257 | | Pasajeros | Total |
|---|---|---|---|---|
| | Lleno | Vacío | | |
| *Viga principal* | 0.065 | 0.045 | 0.000 | 0.111 |
| *Viga transversal* | 0.171 | 0.050 | 0.000 | 0.222 |
| *Montante* | 0.077 | 0.065 | 0.000 | 0.142 |
| *Larguero* | 0.027 | 0.019 | 0.000 | 0.046 |

2024 - 2124 VÍA DE PASAJEROS

A 100 *Años*

| | Serie 257 | | Pasajeros | Total |
|---|---|---|---|---|
| | Lleno | Vacío | | |
| *Viga principal* | 0.001 | 0.000 | 0.115 | 0.115 |
| *Viga transversal* | 0.000 | 0.000 | 0.000 | 0.000 |
| *Montante* | 0.000 | 0.000 | 0.213 | 0.213 |
| *Larguero* | 0.000 | 0.000 | 0.081 | 0.081 |

Els càlculs detallats es poden trobar a l'Apèndix 3: Fatiga.

## 4.5 CÀLCUL DE ELEMENTS DETERIORATS

### 4.5.1 Bigues transversals.

En aquest apartat s'estudia la influència que té el deteriorament de l'ala inferior de les biguetes transversals en l'estructura. Per això vana estudiar dos escenaris: un primer on s'ha suposat la pèrdua de les xapes adossades a l'ala inferior, i un altre on se suposa que una secció d'una biga transversal es trenca.

*4.5.1.1 Pèrdua de xapes adossades a l'ala inferior.*

En primer lloc es mostren les noves tensions i el seu factor de seguretat:

| Resumen degradación | | | | | |
|---|---|---|---|---|---|
| **Sección** | **$\sigma_{Ed,ref}$** | **$\sigma_{Ed}$** | **Variación** | **FS** | **¿Cumple?** |
| Cordón Inferior | 204.1 MPa | 201.9 MPa | -1.0% | 1.06 | SI |
| Cordón superior | -149.2 MPa | -147.3 MPa | -1.3% | 1.45 | SI |
| Montantes | 163.5 MPa | 161.6 MPa | -1.1% | 1.32 | SI |
| Diagonal | -164.2 MPa | -162.3 MPa | -1.2% | 1.32 | SI |
| Viga transversal | 126.8 MPa | 152.3 MPa | 20.1% | 1.40 | SI |
| Viga diafragma | -214.7 MPa | -228.8 MPa | 6.5% | 0.93 | Reforzar |
| Larguero | -124.4 MPa | -128.2 MPa | 3.0% | 1.67 | SI |

En general, els esforços en la gelosia principal a penes varien. No obstant això, en les bigues transversals les tensions sí que s'incrementen. No obstant això, a causa de l'ampli marge de seguretat que ja tenien les bigues aquestes continuen complint satisfactòriament.

Tanmateix, quan es calculen les càrregues de fatiga, la vida del pont disminueix dràsticament:

| | | 1924-1991 | 1991-2024 | 1924-2024 | Dany anual Serie 257 | Vida remanente |
|---|---|---|---|---|---|---|
| **Via 1 Mercancías** | **Celosía** | 0.103 | 0.029 | 0.132 | 1.11E-03 | 786 |
| | **V. transversal** | 0.305 | 0.058 | 0.363 | 8.70E-03 | 73 |
| | **Montante** | 0.073 | 0.038 | 0.111 | 1.42E-03 | 627 |

Tenint en compte les incerteses de l'estat actual i el seu estat de degradació, s'aconsella reposar aquestes xapes de reforç.

*4.5.1.2 Trencament de biga transversal.*

S'ha calculat el pont suposant el trencament d'un element d'una de les bigues transversals. La variació de resultats es mostra a continuació:

| Resumen rotura | | | | | |
|---|---|---|---|---|---|
| **Sección** | **$\sigma_{Ed,ref}$** | **$\sigma_{Ed}$** | **Variación** | **FS** | **¿Cumple?** |
| Cordón Inferior | 204.1 MPa | 203.1 MPa | -0.5% | 1.05 | SI |
| Cordón superior | -149.2 MPa | -168.1 MPa | 12.6% | 1.27 | SI |
| Montantes | 163.5 MPa | 170.5 MPa | 4.3% | 1.25 | SI |
| Diagonal | -164.2 MPa | -162.1 MPa | -1.3% | 1.32 | SI |
| Viga transversal | 126.8 MPa | -136.3 MPa | 7.5% | 1.57 | SI |
| Viga diafragma | -214.7 MPa | -212.2 MPa | -1.2% | 1.01 | SI |
| Larguero | -124.4 MPa | -199.7 MPa | 60.5% | 1.07 | SI |

S'observa com l'estructura segueix complint malgrat el trencament de l'element.

### 4.5.2 Reparació de fissura.

El dimensionament s'ha realitzat per capacitat, prenent concretament la capacitat d'una de les ales de la L. (120x12).

**CÁLCULO DE REFUERZO**

| | | | |
|---|---|---|---|
| **Cálculo del área** | | | |
| Área bruta ala existente | A | 1440 | mm2 |
| Diámetro del perno | d | 22 | mm |
| Holgura | g | 2 | mm |
| Diámetro nominal del perno | $d_0$ | 24 | mm |
| Área neta existente | $A_{net}$ | 1152 | mm2 |
| Tensión de plastificación acero existente | $f_{ye}$ | 235 | MPa |
| Tensión última acero existente | $f_{ue}$ | 360 | MPa |
| Fuerza | $F_{ed}$ | 338 | kN |
| Tensión de plastificación | $f_y$ | 355 | MPa |
| Tensión última | $f_u$ | 490 | MPa |
| Área bruta requerida | A | 953 | mm2 |
| Área neta requerida | $A_{net}$ | 691 | mm2 |
| Ancho del refuerzo | b | 90 | mm |
| Espesor del refuerzo | t | 12 | mm |
| Área bruta de refuerzo | A | 1080 | mm2 |
| Área neta de refuerzo | $A_{net}$ | 792 | mm2 |
| | **CS** | **1.1** | ✓ |
| **Cálculo de pernos** | | | |
| | | **Inferior** | |
| Clase del tornillo | | 10.9 | |
| Espaciamiento | p | 200 | mm |
| Pernos por fila | n | 4 | |
| Número de filas | n | 1 | |
| Planos de corte | $n_p$ | 1 | |
| Espesor del ala | t | 12 | mm |
| Espesor de la placa | t | 12 | mm |
| Diámetro del perno | d | 22 | mm |
| Diámetro nominal del perno | $d_0$ | 24 | mm |
| Distancia a borde mínima | $e_{1,2\ min}$ | 29 | mm |
| Distancia a borde máxima | $e_{1,2\ max}$ | 88 | mm |
| Factor dependiente del área roscada | $\alpha_v$ | 0.5 | |
| Resistencia a plastificación del perno | $f_{yb}$ | 900 | MPa |
| Resistencia a última del perno | $f_{ub}$ | 1000 | MPa |
| Tensión última del acero de base | $f_u$ | 360 | MPa |
| Factor de seguridad en uniones | $\gamma_{M2}$ | 1.25 | |
| Área del perno | $A_b$ | 380 | mm2 |
| Resistencia a corte por el plano de cortante | $F_{v,Rd}$ | 152 | kN |
| Espesor de relleno | $t_p$ | 0 | mm |
| Reducción por relleno | $\beta_p$ | 1.00 | |
| Longitud de la unión | $L_j$ | 0 | mm |
| Reducción por longitud | $\beta_{Lf}$ | 1.00 | |
| Resistencia a corte final por perno | $F_{v,Rd}$ | 152 | kN |
| Factores de espaciamiento | $\alpha_{di}$ | 1.00 | |
| | $e_1$ | 50 | |
| | $\alpha_{de}$ | 0.69 | |
| | $\alpha_d$ | 0.92 | |
| | $\alpha_b$ | 1.00 | |
| | $k_1$ | 2.50 | |
| Factor de holgura | | 0.80 | |
| Resistencia a aplastamiento | $F_{b,Rd}$ | 152 | kN |
| Coeficiente de seguridad a deslizamiento | $\gamma_{M3}$ | 1.25 | |
| Fuerza de pretensado | $F_{p,C}$ | 266 | kN |
| Coeficiente dependiente del agujero | $k_s$ | 0.85 | |
| Coeficiente de fricción | $\mu$ | 0.50 | |
| Resistencia a deslizamiento | $Fs_{rRd,ser}$ | 90 | kN |
| Capacidad de los pernos | $F_{Rd}$ | 362 | kN |
| Fuerza | $F_{Ed}$ | 338 | kN |
| | **CS** | **1.1** | ✓ |

## 5 CONCLUSIONS

Es resumeixen en aquest apartat les principals conclusions de l'avaluació:

- La capacitat portant dels elements de les bigues principals, bigues transversals i bigues longitudinals és satisfactòria en tots els casos. El càlcul de fatiga d'aquests elements també ha estat satisfactori.
- Les bigues transversals presenten un estat de degradació elevat. Tanmateix, la capacitat dels bigues transversals es suficient tenint en compte fins i tot la pèrdua de les xapes de reforç de les ales. També s'ha comprovat que en cas de trencament d'una biga transversal el pont té capacitat de redistribució suficient.
- Els arriostraments inferiors estan doblegats i a més no tenen capacitat suficient. S'han de substituir per dos L90x10.

# APÈNDIX 1: MODEL DE CÀLCUL

Pont Carretera Vic
Datos y materiales

**Design Code**

EuroNorm: EN 1993-1-1:2005 Design of steel structures (Europe) V 2023
Snow load zone : 1

**National Defined Parameters**

| Reference of parameter in design code | Value |
|---|---|
| safety coefficient γ-M0 for structural steel EN 1993-1-1 6.1 | 1.000¹ |
| safety coefficient γ-M1 for structural steel EN 1993-1-1 6.1 | 1.000¹ |
| safety coefficient γ-M2 for structural steel EN 1993-1-1 6.1 | 1.250¹ |

¹ national defined parameter taken from the INI-files

**Materials**

| Mat | Classification |
|---|---|
| 1 | S 235 (EN 1993) |
| 2 | S 275 (EN 1993) |

**Mat 1 S 235 (EN 1993)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Young's modulus | E | 210000 | [N/mm2] | Safetyfactor | | 1.00 | [-] |
| Poisson's ratio | μ | 0.30 | [-] | Yield stress | fy | 235.00 | [MPa] |
| Shear modulus | G | 80769 | [N/mm2] | Compressive yield | fyc | 235.00 | [MPa] |
| Compression modulus | K | 175000 | [N/mm2] | Tensile strength | ft | 360.00 | [MPa] |
| Nominal Weight | γ | 84.4 | [kN/m3] | Compressive strength | fc | 360.00 | [MPa] |
| Mean density | ρ | 7850.0 | [kg/m3] | Ultimate strain | | 100.00 | [o/oo] |
| Elongation coefficient | α | 1.20E-05 | [1/K] | relative bond coeff. | | 0.00 | [-] |
| max. thickness | t-max | 40.00 | [mm] | EN 1992 bond coeff. | k1 | 0.00 | [-] |
| Safety sectional design | γ-M0 | 1.00 | [-] | Hardening modulus | Eh | 0.00 | [MPa] |
| Safety stability design | γ-M1 | 1.00 | [-] | Proportional limit | fp | 235.00 | [MPa] |
| Safety rupture | γ-M2 | 1.25 | [-] | Dynamic allowance | σ-dyn | 0.00 | [MPa] |

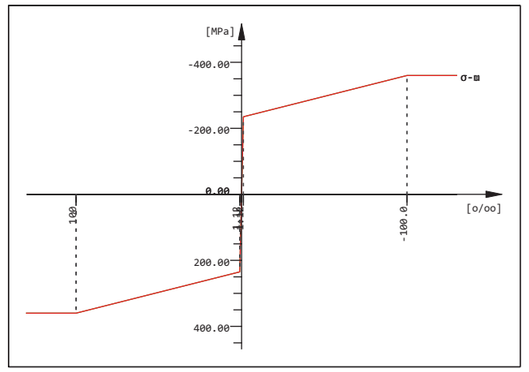
| Stress-Strain for serviceability | ε[o/oo] | σ-m[MPa] | E-t[N/mm2] |
|---|---|---|---|
| Is also extended beyond the | 1000.000 | 360.00 | 0 |
| defined stress range | 100.000 | 360.00 | 0 |
| | 1.119 | 235.00 | 1264 |
| | 0.000 | 0.00 | 210000 |
| | -1.119 | -235.00 | 1264 |
| | -100.000 | -360.00 | 0 |
| | -1000.000 | -360.00 | 0 |
| | Safetyfactor | | 1.00 |

| Stress-Strain for ultimate load | ε[o/oo] | σ-u[MPa] | E-t[N/mm2] |
|---|---|---|---|
| Is also extended beyond the | 1000.000 | 360.00 | 0 |
| defined stress range | 100.000 | 360.00 | 0 |
| | 1.119 | 235.00 | 1264 |
| | 0.000 | 0.00 | 210000 |
| | -1.119 | -235.00 | 1264 |
| | -100.000 | -360.00 | 0 |
| | -1000.000 | -360.00 | 0 |
| | Safetyfactor | | 1.00 |

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Pont Carretera Vic
Datos y materiales




**Mat 2 S 275 (EN 1993)**

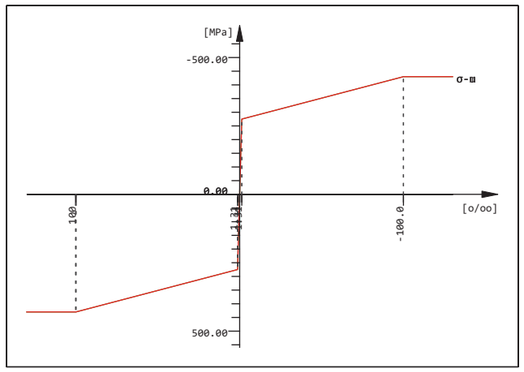
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Young's modulus | E | 210000 | [N/mm2] | Safetyfactor | | 1.00 | [-] |
| Poisson's ratio | μ | 0.30 | [-] | Yield stress | fy | 275.00 | [MPa] |
| Shear modulus | G | 80769 | [N/mm2] | Compressive yield | fyc | 275.00 | [MPa] |
| Compression modulus | K | 175000 | [N/mm2] | Tensile strength | ft | 430.00 | [MPa] |
| Nominal Weight | γ | 84.4 | [kN/m3] | Compressive strength | fc | 430.00 | [MPa] |
| Mean density | ρ | 7850.0 | [kg/m3] | Ultimate strain | | 100.00 | [o/oo] |
| Elongation coefficient | α | 1.20E-05 | [1/K] | relative bond coeff. | | 0.00 | [-] |
| max. thickness | t-max | 40.00 | [mm] | EN 1992 bond coeff. | k1 | 0.00 | [-] |
| Safety sectional design | γ-M0 | 1.00 | [-] | Hardening modulus | Eh | 0.00 | [MPa] |
| Safety stability design | γ-M1 | 1.00 | [-] | Proportional limit | fp | 275.00 | [MPa] |
| Safety rupture | γ-M2 | 1.25 | [-] | Dynamic allowance | σ-dyn | 0.00 | [MPa] |

| Stress-Strain for serviceability | ε[o/oo] | σ-m[MPa] | E-t[N/mm2] |
|---|---|---|---|
| Is also extended beyond the | 1000.000 | 430.00 | 0 |
| defined stress range | 100.000 | 430.00 | 0 |
| | 1.310 | 275.00 | 1571 |
| | 0.000 | 0.00 | 210000 |
| | -1.310 | -275.00 | 1571 |
| | -100.000 | -430.00 | 0 |
| | -1000.000 | -430.00 | 0 |
| | Safetyfactor | | 1.00 |

| Stress-Strain for ultimate load | ε[o/oo] | σ-u[MPa] | E-t[N/mm2] |
|---|---|---|---|
| Is also extended beyond the | 1000.000 | 430.00 | 0 |
| defined stress range | 100.000 | 430.00 | 0 |
| | 1.310 | 275.00 | 1571 |
| | 0.000 | 0.00 | 210000 |
| | -1.310 | -275.00 | 1571 |
| | -100.000 | -430.00 | 0 |
| | -1000.000 | -430.00 | 0 |
| | Safetyfactor | | 1.00 |

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Datos y materiales




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Pont Carretera Vic
Secciones

**Design Code**

EuroNorm: EN 1993-1-1:2005 Design of steel structures (Europe) V 2023
Snow load zone : 1

**Materials**

| Mat | Classification |
|---|---|
| 1 | S 235 (EN 1993) |
| 2 | S 275 (EN 1993) |

**Cross-sections static properties**

| SNo | Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|---|
| | MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 1 | 2.0030E-02 | 1.060E-02 | 2.132E-04 | 0.0 | 0.0 | 210000 | 169.0 | |
| | | 5.974E-05 | 6.056E-03 | 1.265E-04 | 82.3 | 37.1 | 80769 | (BEAM) | |
| | = | Cordon 1 | | | | | | | |
| 2 | 1 | 2.5100E-02 | 1.478E-02 | 2.499E-04 | 0.0 | 0.0 | 210000 | 211.8 | |
| | | 6.826E-05 | 6.597E-03 | 1.907E-04 | 63.0 | 21.8 | 80769 | (BEAM) | |
| | = | Cordon 2 | | | | | | | |
| 6 | 1 | 1.0248E-02 | 5.842E-03 | 1.789E-05 | 0.0 | 0.0 | 210000 | 86.5 | 4.408E-05 |
| | | 2.184E-06 | 2.745E-03 | 4.408E-05 | -32.9 | -7.6 | 80769 | (BEAM) | 1.789E-05 |
| | = | Diagonal 6 | | | | | | | |
| 7 | 1 | 9.1500E-03 | 5.258E-03 | 1.182E-05 | 0.0 | 0.0 | 210000 | 77.2 | 2.899E-05 |
| | | 2.156E-06 | 2.535E-03 | 2.899E-05 | -30.0 | -8.3 | 80769 | (BEAM) | 1.182E-05 |
| | = | Diagonal 7 | | | | | | | |
| 8 | 1 | 8.3020E-03 | 4.813E-03 | 1.063E-05 | 0.0 | 0.0 | 210000 | 70.1 | 2.662E-05 |
| | | 1.580E-06 | 2.231E-03 | 2.662E-05 | -28.3 | -7.0 | 80769 | (BEAM) | 1.063E-05 |
| | = | Diagonal 8 | | | | | | | |
| 9 | 1 | 7.8720E-03 | 4.590E-03 | 1.001E-05 | 0.0 | 0.0 | 210000 | 66.4 | 2.544E-05 |
| | | 1.335E-06 | 2.078E-03 | 2.544E-05 | -27.5 | -6.3 | 80769 | (BEAM) | 1.001E-05 |
| | = | Diagonal 9 | | | | | | | |
| 11 | 1 | 1.5630E-02 | 1.060E-02 | 3.529E-05 | 0.0 | 0.0 | 210000 | 131.9 | 1.265E-04 |
| | | 5.960E-05 | 5.195E-03 | 1.265E-04 | 43.5 | 37.1 | 80769 | (BEAM) | 3.529E-05 |
| | = | Cordon 1 | | | | | | | |
| 31 | 1 | 6.0200E-03 | 2.441E-03 | 9.941E-06 | -32.3 | -16.4 | 210000 | 50.8 | |
| | | 3.458E-06 | 3.612E-03 | 5.386E-06 | 0.0 | 0.0 | 80769 | (BEAM) | |
| | = | Montante 3 EX | | | | | | | |
| 32 | 1 | 1.4060E-02 | 5.161E-03 | 2.843E-05 | 0.0 | 0.0 | 210000 | 118.6 | |
| | | 1.017E-05 | 3.880E-03 | 2.776E-05 | 0.0 | 0.0 | 80769 | (BEAM) | |
| | = | Montante 3 P | | | | | | | |
| 33 | 1 | 7.3300E-03 | 2.580E-03 | 8.027E-06 | 0.0 | 0.0 | 210000 | 61.9 | 1.388E-05 |
| | | 1.549E-06 | 1.967E-03 | 1.388E-05 | -38.4 | -20.2 | 80769 | (BEAM) | 8.027E-06 |
| | = | Montante 3 I1 | | | | | | | |
| 34 | 1 | 1.0530E-02 | 2.580E-03 | 1.866E-04 | 0.0 | 0.0 | 210000 | 88.9 | |
| | | 1.655E-06 | 4.623E-03 | 1.388E-05 | -117.6 | -20.2 | 80769 | (BEAM) | |
| | = | Montante 4 I2 | | | | | | | |
| 41 | 1 | 6.9500E-03 | 3.572E-03 | 1.207E-05 | 0.0 | 0.0 | 210000 | 58.6 | |
| | | 7.821E-07 | 2.836E-03 | 1.160E-05 | -27.7 | -8.1 | 80769 | (BEAM) | |
| | = | Montante 4 1 | | | | | | | |
| 42 | 1 | 1.0270E-02 | 3.572E-03 | 2.007E-04 | 0.0 | 0.0 | 210000 | 86.7 | |
| | | 8.928E-07 | 5.712E-03 | 1.160E-05 | -113.5 | -8.1 | 80769 | (BEAM) | |
| | = | Montante 4 I | | | | | | | |
| 43 | 1 | 8.1870E-03 | 3.572E-03 | 4.092E-05 | 0.0 | 0.0 | 210000 | 69.1 | |
| | | 8.234E-07 | 3.916E-03 | 1.160E-05 | -52.0 | -8.1 | 80769 | (BEAM) | |
| | = | Montante 4 I | | | | | | | |
| 51 | 1 | 1.4360E-02 | 5.161E-03 | 3.297E-05 | 0.0 | 0.0 | 210000 | 121.2 | |
| | | 1.018E-05 | 4.179E-03 | 2.776E-05 | -2.6 | 0.0 | 80769 | (BEAM) | |
| | = | Montante 5 A1 | | | | | | | |
| 52 | 1 | 1.7560E-02 | 5.161E-03 | 2.902E-04 | 0.0 | 0.0 | 210000 | 148.2 | |
| | | 1.029E-05 | 5.982E-03 | 2.776E-05 | -56.6 | 0.0 | 80769 | (BEAM) | |

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**Cross-sections static properties**

| SNo | Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|---|
| | MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 52 | = | Montante 5 A2 | | | | | | | |
| 101 | 1 | 2.4750E-02 | 9.596E-03 | 1.873E-03 | 0.0 | 0.0 | 210000 | 208.9 | |
| | | 4.917E-05 | 7.478E-03 | 8.173E-05 | 113.9 | 210.9 | 80769 | (BEAM) | |
| | = | Vigueta 1 | | | | | | | |
| 102 | 1 | 3.0550E-02 | 1.457E-02 | 2.613E-03 | 0.0 | 0.0 | 210000 | 257.8 | |
| | | 6.127E-05 | 8.031E-03 | 1.224E-04 | 105.6 | 167.4 | 80769 | (BEAM) | |
| | = | Vigueta 2 | | | | | | | |
| 103 | 1 | 3.3450E-02 | 1.706E-02 | 3.038E-03 | 0.0 | 0.0 | 210000 | 282.3 | |
| | | 6.352E-05 | 8.229E-03 | 1.427E-04 | 70.9 | 102.0 | 80769 | (BEAM) | |
| | = | Vigueta 3 | | | | | | | |
| 104 | 1 | 3.6350E-02 | 1.946E-02 | 3.392E-03 | 0.0 | 0.0 | 210000 | 306.7 | |
| | | 7.227E-05 | 8.481E-03 | 1.630E-04 | 99.9 | 144.7 | 80769 | (BEAM) | |
| | = | Vigueta 4 | | | | | | | |
| 111 | 1 | 2.2550E-02 | 8.207E-03 | 1.759E-03 | -9.1 | 3.2 | 210000 | 190.3 | 1.760E-03 |
| | | 2.556E-05 | 7.632E-03 | 5.789E-05 | 93.0 | 150.2 | 80769 | (BEAM) | 5.641E-05 |
| | | | | -5.029E-05 | | | | | 1.69 |
| | = | Vigueta Extrema 1 | | | | | | | |
| 112 | 1 | 2.8350E-02 | 1.317E-02 | 2.492E-03 | -7.3 | 1.7 | 210000 | 239.2 | 2.493E-03 |
| | | 3.200E-05 | 8.161E-03 | 9.893E-05 | 88.3 | 120.5 | 80769 | (BEAM) | 9.783E-05 |
| | | | | -5.126E-05 | | | | | 1.23 |
| | = | Vigueta Extrema 2 | | | | | | | |
| 113 | 1 | 3.1250E-02 | 1.564E-02 | 2.878E-03 | -6.6 | 3.2 | 210000 | 263.7 | 2.880E-03 |
| | | 3.426E-05 | 8.360E-03 | 1.194E-04 | 52.7 | 49.6 | 80769 | (BEAM) | 1.181E-04 |
| | | | | -5.859E-05 | | | | | 1.22 |
| | = | Vigueta Extrema 3 | | | | | | | |
| 114 | 1 | 3.4150E-02 | 1.796E-02 | 3.266E-03 | -6.0 | 0.4 | 210000 | 288.2 | 3.267E-03 |
| | | 3.914E-05 | 8.594E-03 | 1.398E-04 | 85.2 | 107.5 | 80769 | (BEAM) | 1.390E-04 |
| | | | | -5.190E-05 | | | | | 0.95 |
| | = | Vigueta Extrema 4 | | | | | | | |
| 121 | 1 | 1.2520E-02 | 3.860E-03 | 1.819E-04 | 0.0 | 0.0 | 210000 | 105.7 | |
| | | 8.516E-05 | 5.565E-03 | 6.068E-05 | 0.0 | 0.0 | 80769 | (BEAM) | |
| | = | Larguero | | | | | | | |
| 131 | 1 | 1.9600E-03 | 8.167E-04 | 1.601E-06 | 0.0 | 0.0 | 210000 | 16.5 | |
| | | 2.433E-06 | 8.167E-04 | 1.601E-06 | 0.0 | 0.0 | 80769 | (BEAM) | |
| | = | 2L70x70x7 | | | | | | | |
| 132 | 1 | 2.4800E-03 | 1.067E-03 | 1.433E-06 | 0.0 | 0.0 | 210000 | 20.9 | 2.731E-06 |
| | | 1.297E-07 | 7.148E-04 | 2.731E-06 | 18.1 | 0.0 | 80769 | (BEAM) | 1.433E-06 |
| | = | 2L80x80x8 | | | | | | | |

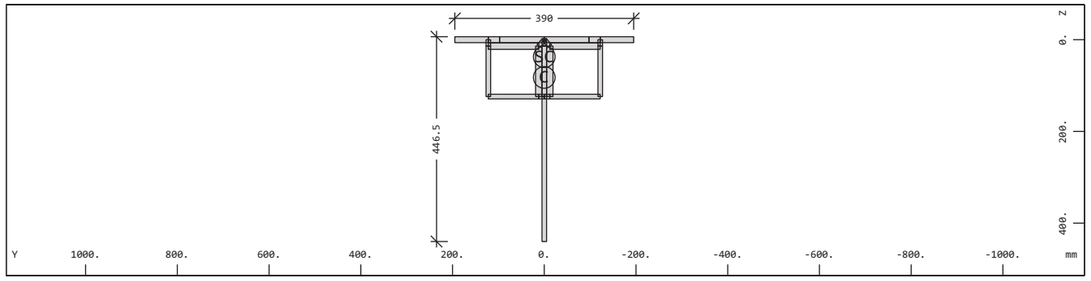
| | | | |
|---|---|---|---|
| SNo | section number | yc[mm],zc[mm] | ordinate of elastic centroid |
| Mat | material number | ysc[mm],zsc[mm] | ordinate of shear centre |
| A[m2] | sectional area | E[N/mm2] | Young's modulus |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | g[kg/m] | mass per length |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | | |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

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**Cross section No. 1 - Cordon 1**




**Static properties of cross section**

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 2.0030E-02 | 1.060E-02 | 2.132E-04 | 0.0 | 0.0 | 210000 | 169.0 | |
| | 5.974E-05 | 6.056E-03 | 1.265E-04 | 82.3 | 37.1 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

**Additional static properties of cross section**

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -195.0 | -88.8 | 219.3 | 2.745E-02 | | 1.844E+03 | 1.508E+02 |
| | 195.0 | 357.7 | 275.7 | | | 1.047E+04 | 2.960E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

**Section values for warping**

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0017 | 0.0017 | 8.750E-09 | 0.000 | -1.977E-22 | -9.211E-23 | 0.0 | 233.7 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

**Design forces and moments**

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 4707.1 | 1469.39 | 1389.34 | 74.95 | 20.84 | 8.23 | 343.20 | 273.64 | 0.0 | 43.7 | -, b, c |
| P[1,2] | -1050.8 | | | | | | 363.46 | 0.00 | 0.0 | 82.3 | COMB[3] |
| E[4,2] | 4707.1 | 899.86 | 458.38 | 73.57 | 12.96 | 1.19 | 140.07 | 152.42 | 0.0 | 82.3 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

**Additional design data**

| Mat | periphery-O/-I | | deff | t-min | t-max | thet-p | thet-y | thet-z | thet-yz | yg | zg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [m2/m] | [m2/m] | [mm] | [mm] | [mm] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [mm] | [mm] |
| | 3.420 | | 11.7 | 10.0 | 14.0 | 2.867 | 1.799 | 1.067 | 0.000 | 0.0 | 82.3 |

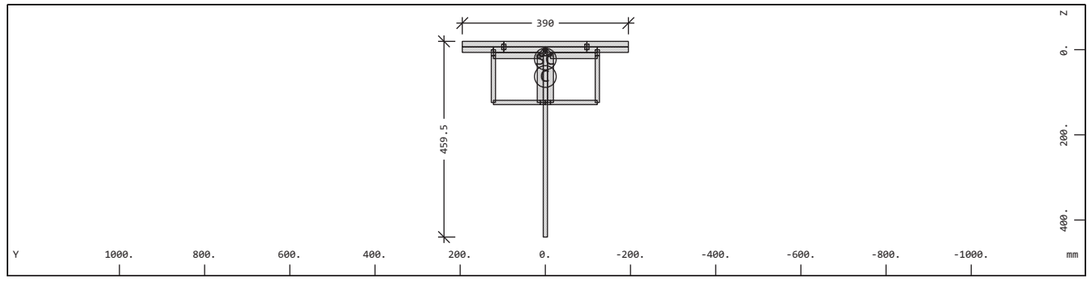
| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |

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| | | | |
|---|---|---|---|
| deff | effective depth | yg,zg | ordinate of the mass centre |

**Cross section No. 2 - Cordon 2**




**Static properties of cross section**

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 2.5100E-02 | 1.478E-02 | 2.499E-04 | 0.0 | 0.0 | 210000 | 211.8 | |
| | 6.826E-05 | 6.597E-03 | 1.907E-04 | 63.0 | 21.8 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

**Additional static properties of cross section**

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -195.0 | -82.5 | 231.5 | 2.897E-02 | | 1.726E+03 | 1.029E+02 |
| | 195.0 | 377.0 | 267.7 | | | 1.074E+04 | 2.768E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

**Section values for warping**

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0026 | 0.0026 | 8.959E-09 | 0.000 | 4.021E-22 | 1.751E-22 | 0.0 | 235.8 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

**Design forces and moments**

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 5898.5 | 2157.27 | 1424.61 | 78.61 | 16.52 | 6.55 | 389.51 | 389.81 | 0.0 | 16.6 | -, b, c |
| P[1,2] | -1717.6 | | | | | | 438.88 | 0.00 | 0.0 | 63.0 | COMB[3] |
| E[4,2] | 5898.5 | 1318.58 | 490.12 | 78.61 | 12.63 | 0.81 | 155.82 | 229.86 | 0.0 | 63.0 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

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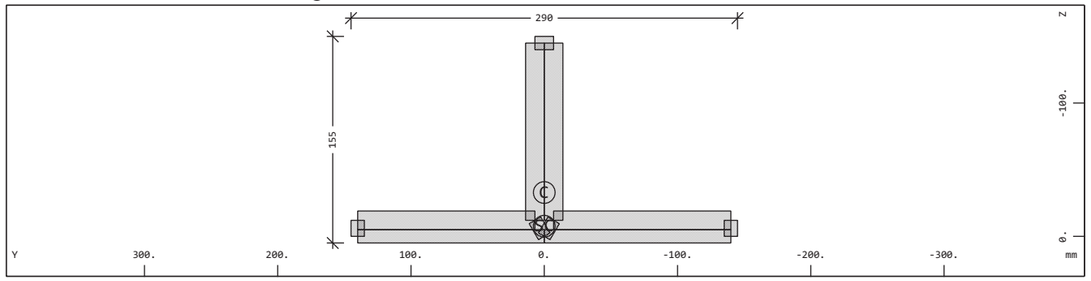
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**Additional design data**

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4.200 | | 12.0 | 10.0 | 14.0 | 3.719 | 2.109 | 1.610 | 0.000 | 0.0 | 63.0 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

**Cross section No. 6 - Diagonal 6**




**Static properties of cross section**

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 1.0248E-02 | 5.842E-03 | 1.789E-05 | 0.0 | 0.0 | 210000 | 86.5 | 4.408E-05 |
| | 2.184E-06 | 2.745E-03 | 4.408E-05 | -32.9 | -7.6 | 80769 | (BEAM) | 1.789E-05 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

**Additional static properties of cross section**

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -140.0 | -112.1 | 177.8 | 5.929E-03 | | 1.244E+04 | 2.789E+02 |
| | 140.0 | 37.9 | 101.7 | | | 2.355E+04 | 3.513E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

**Section values for warping**

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0008 | 0.0008 | 2.094E-09 | 0.000 | -2.221E-15 | 1.551E-15 | 0.0 | -41.8 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

**Design forces and moments**

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 2408.3 | 923.15 | 570.39 | 16.18 | 5.31 | 0.20 | 68.99 | 116.51 | 0.0 | -13.6 | -, b, b |
| P[1,2] | 932.9 | | | | | | 82.71 | 0.00 | 0.0 | -32.9 | COMB[3] |
| E[4,2] | 2408.3 | 486.52 | 386.23 | 10.91 | 5.76 | 0.59 | 37.50 | 74.00 | 0.0 | -32.9 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |

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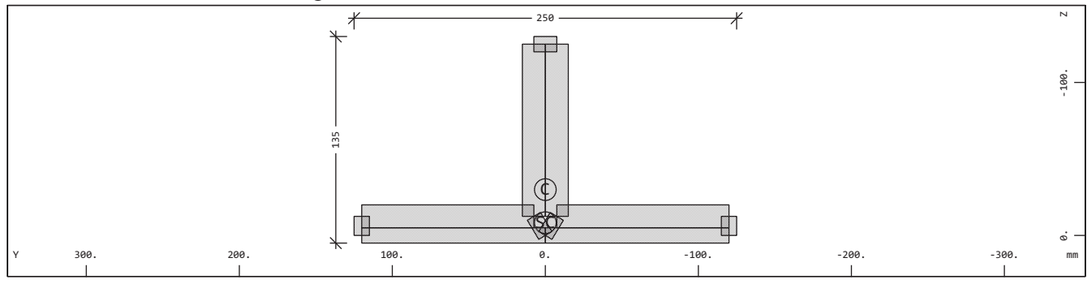
| | | | |
|---|---|---|---|
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.624 | | 12.6 | 10.0 | 14.0 | 0.523 | 0.151 | 0.372 | 0.000 | 0.0 | -32.9 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 7 - Diagonal 7




### Static properties of cross section

| Mat / MRf | A[m2] / It[m4] | Ay[m2] / Az[m2] / Ayz[m2] | Iy[m4] / Iz[m4] / Iyz[m4] | yc[mm] / zc[mm] | ysc[mm] / zsc[mm] | E[N/mm2] / G[N/mm2] | g[kg/m] | I-1[m4] / I-2[m4] / α[°] |
|---|---|---|---|---|---|---|---|---|
| 1 | 9.1500E-03 | 5.258E-03 | 1.182E-05 | 0.0 | 0.0 | 210000 | 77.2 | 2.899E-05 |
| | 2.156E-06 | 2.535E-03 | 2.899E-05 | -30.0 | -8.3 | 80769 | (BEAM) | 1.182E-05 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] / ymax[mm] | zmin[mm] / zmax[mm] | hymin[mm] / hzmin[mm] | AK[m2] / AB[m2] | MRs | 1/WT[1/m3] / 1/WT2[1/m3] | 1/WVy[1/m2] / 1/WVz[1/m2] |
|---|---|---|---|---|---|---|---|
| 1.2E-05 | -120.0 | -95.0 | 150.8 | 5.255E-03 | | 1.330E+04 | 3.239E+02 |
| | 120.0 | 35.0 | 87.3 | | | 2.736E+04 | 3.820E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0007 | 0.0007 | 1.408E-09 | 0.000 | -1.151E-15 | 6.947E-16 | 0.0 | -33.9 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 2150.2 | 824.24 | 525.75 | 14.56 | 4.74 | 0.13 | 54.42 | 90.35 | 0.0 | -14.4 | -, b, b |
| P[1,2] | 810.3 | | | | | | 63.67 | 0.00 | 0.0 | -30.0 | COMB[3] |
| E[4,2] | 2150.2 | 418.85 | 355.19 | 10.20 | 4.96 | 0.45 | 29.23 | 56.76 | 0.0 | -30.0 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

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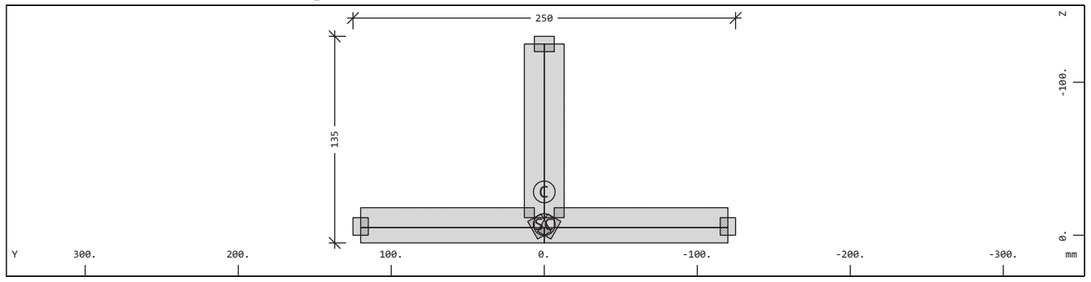
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.380 | | 13.3 | 10.0 | 15.0 | 0.344 | 0.100 | 0.245 | 0.000 | 0.0 | -30.0 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 8 - Diagonal 8




### Static properties of cross section

| Mat / MRf | A[m2] / It[m4] | Ay[m2] / Az[m2] / Ayz[m2] | Iy[m4] / Iz[m4] / Iyz[m4] | yc[mm] / zc[mm] | ysc[mm] / zsc[mm] | E[N/mm2] / G[N/mm2] | g[kg/m] | I-1[m4] / I-2[m4] / α[°] |
|---|---|---|---|---|---|---|---|---|
| 1 | 8.3020E-03 | 4.813E-03 | 1.063E-05 | 0.0 | 0.0 | 210000 | 70.1 | 2.662E-05 |
| | 1.580E-06 | 2.231E-03 | 2.662E-05 | -28.3 | -7.0 | 80769 | (BEAM) | 1.063E-05 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] / ymax[mm] | zmin[mm] / zmax[mm] | hymin[mm] / hzmin[mm] | AK[m2] / AB[m2] | MRs | 1/WT[1/m3] / 1/WT2[1/m3] | 1/WVy[1/m2] / 1/WVz[1/m2] |
|---|---|---|---|---|---|---|---|
| 1.2E-05 | -120.0 | -96.7 | 152.2 | 4.929E-03 | | 1.603E+04 | 3.146E+02 |
| | 120.0 | 33.3 | 87.6 | | | 2.764E+04 | 4.393E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0007 | 0.0007 | 1.108E-09 | 0.000 | -9.958E-16 | 6.809E-16 | 0.0 | -35.6 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 1951.0 | 761.29 | 462.80 | 13.13 | 4.66 | 0.16 | 48.02 | 82.21 | 0.0 | -12.6 | -, b, b |
| P[1,2] | 769.9 | | | | | | 57.08 | 0.00 | 0.0 | -28.3 | COMB[3] |
| E[4,2] | 1951.0 | 431.27 | 308.86 | 8.46 | 4.91 | 0.39 | 25.85 | 52.13 | 0.0 | -28.3 | |

[1] P = plastic design values (ultimate bearing capacity)

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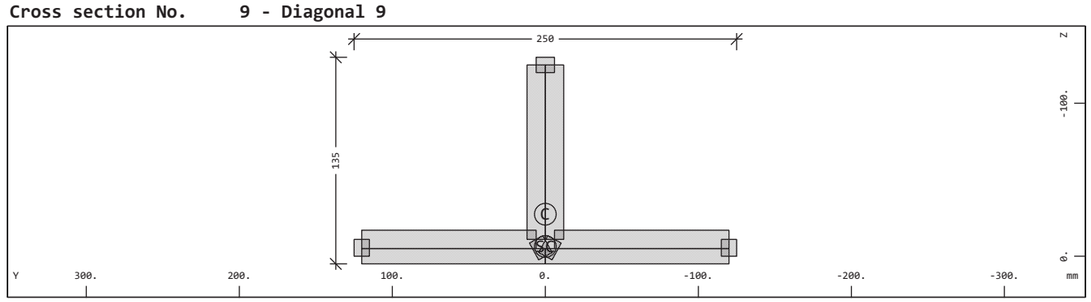
| | | | |
|---|---|---|---|
| ² Material safety γ-M0 for structural steel = 1.00 | | | |
| ³ Maximum moment (defining point D in interaction diagramm) | | | |
| ⁴ E = elastic design values (stress limit reached) | | | |
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I | | deff | t-min | t-max | thet-p | thet-y | thet-z | thet-yz | yg | zg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [m2/m] | [m2/m] | [mm] | [mm] | [mm] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [mm] | [mm] |
| | 1.388 | | 12.0 | 10.0 | 13.0 | 0.314 | 0.090 | 0.225 | 0.000 | 0.0 | -28.3 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 9 - Diagonal 9




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 7.8720E-03 | 4.590E-03 | 1.001E-05 | 0.0 | 0.0 | 210000 | 66.4 | 2.544E-05 |
| | 1.335E-06 | 2.078E-03 | 2.544E-05 | -27.5 | -6.3 | 80769 | (BEAM) | 1.001E-05 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -120.0 | -97.5 | 152.9 | 4.799E-03 | | 1.767E+04 | 3.081E+02 |
| | 120.0 | 32.5 | 87.7 | | | 2.771E+04 | 4.752E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0006 | 0.0006 | 9.671E-10 | 0.000 | -9.218E-16 | 6.720E-16 | 0.0 | -36.3 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P¹² | 1849.9 | 729.40 | 430.91 | 12.40 | 4.57 | 0.17 | 44.76 | 78.20 | 0.0 | -11.7 | -, b, b |
| P¹² | 749.6 | | | | | | 53.66 | 0.00 | 0.0 | -27.5 | COMB³ |

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### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| E⁴² | 1849.9 | 440.42 | 285.50 | 7.68 | 4.90 | 0.36 | 24.12 | 49.82 | 0.0 | -27.5 | |

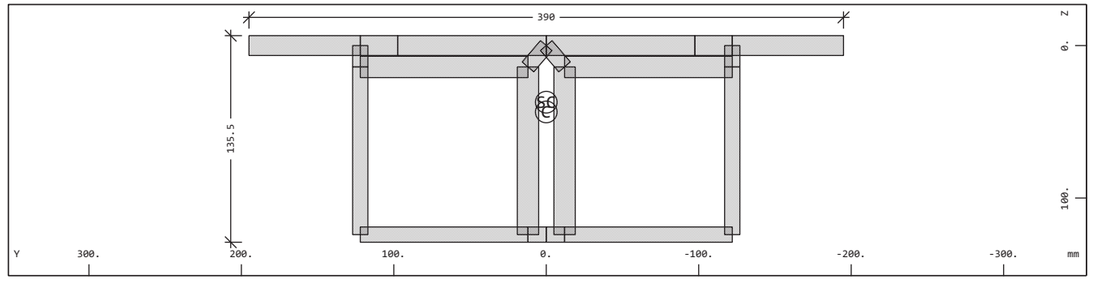
| | | | |
|---|---|---|---|
| ¹ P = plastic design values (ultimate bearing capacity) | | | |
| ² Material safety γ-M0 for structural steel = 1.00 | | | |
| ³ Maximum moment (defining point D in interaction diagramm) | | | |
| ⁴ E = elastic design values (stress limit reached) | | | |
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I | | deff | t-min | t-max | thet-p | thet-y | thet-z | thet-yz | yg | zg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [m2/m] | [m2/m] | [mm] | [mm] | [mm] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [mm] | [mm] |
| | 1.392 | | 11.3 | 10.0 | 12.0 | 0.299 | 0.084 | 0.215 | 0.000 | 0.0 | -27.5 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 11 - Cordon 1




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 1.5630E-02 | 1.060E-02 | 3.529E-05 | 0.0 | 0.0 | 210000 | 131.9 | 1.265E-04 |
| | 5.960E-05 | 5.195E-03 | 1.265E-04 | 43.5 | 37.1 | 80769 | (BEAM) | 3.529E-05 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -195.0 | -50.0 | 219.3 | 2.739E-02 | | 1.849E+03 | 1.508E+02 |
| | 195.0 | 85.5 | 106.1 | | | 1.047E+04 | 2.149E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0017 | 0.0017 | 8.750E-09 | 0.000 | 2.961E-23 | 1.798E-23 | 0.0 | 3.3 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

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### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 3673.1 | 1469.39 | 792.36 | 74.76 | 34.90 | 8.23 | 143.05 | 271.06 | 0.0 | 18.5 | -, b, b |
| P[1,2] | -823.5 | | | | | | 156.27 | 0.00 | 0.0 | 43.5 | COMB[3] |
| E[4,2] | 3673.1 | 899.86 | 631.35 | 73.39 | 12.96 | 1.19 | 103.04 | 152.42 | 0.0 | 43.5 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

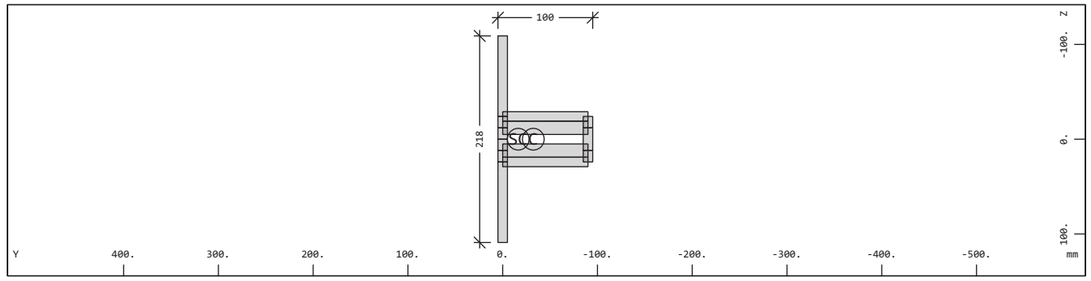
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.540 | | 12.3 | 10.0 | 14.0 | 1.365 | 0.298 | 1.067 | 0.000 | 0.0 | 43.5 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 31 - Montante 3 EX




### Static properties of cross section

| Mat / MRf | A[m2] / It[m4] | Ay[m2] / Az[m2] / Ayz[m2] | Iy[m4] / Iz[m4] / Iyz[m4] | yc[mm] / zc[mm] | ysc[mm] / zsc[mm] | E[N/mm2] / G[N/mm2] | g[kg/m] | I-1[m4] / I-2[m4] / α[°] |
|---|---|---|---|---|---|---|---|---|
| 1 | 6.0200E-03 | 2.441E-03 | 9.941E-06 | -32.3 | -16.4 | 210000 | 50.8 | |
| | 3.458E-06 | 3.612E-03 | 5.386E-06 | 0.0 | 0.0 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] / ymax[mm] | zmin[mm] / zmax[mm] | hymin[mm] / hzmin[mm] | AK[m2] / AB[m2] | MRs | 1/WT[1/m3] / 1/WT2[1/m3] | 1/WVy[1/m2] / 1/WVz[1/m2] |
|---|---|---|---|---|---|---|---|
| 1.2E-05 | -57.7 | -109.0 | 67.4 | 3.830E-03 | | 1.305E+04 | 5.096E+02 |
| | 37.3 | 109.0 | 106.6 | | | 3.270E+04 | 6.107E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0009 | 0.0009 | 1.517E-09 | 0.000 | 1.596E-16 | -3.269E-16 | 4.4 | 0.0 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |

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CMS[m4] warping shear resistance

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 1414.7 | 586.13 | 360.90 | 10.39 | 3.35 | 0.75 | 43.83 | 37.28 | -27.3 | 0.0 | -, b, b |
| P[1,2] | -112.8 | | | | | | 0.00 | 37.56 | -32.3 | 0.0 | COMB[3] |
| E[4,2] | 1414.7 | 266.25 | 222.17 | 10.39 | 4.15 | 0.40 | 21.43 | 21.93 | -32.3 | 0.0 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

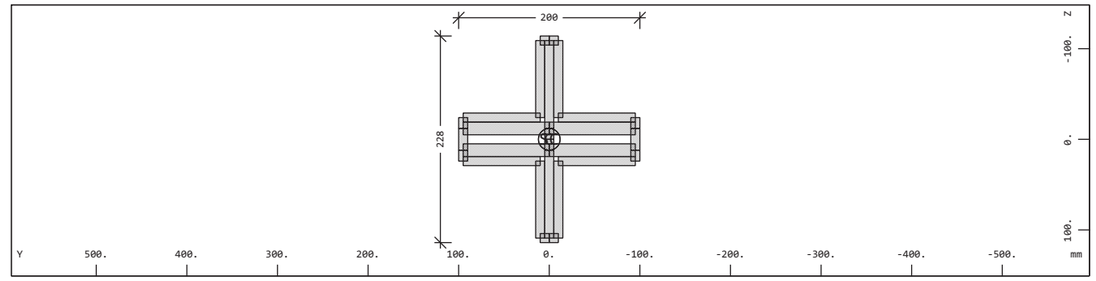
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.060 | | 11.4 | 10.0 | 14.0 | 0.129 | 0.084 | 0.045 | 0.000 | -32.3 | 0.0 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 32 - Montante 3 P




### Static properties of cross section

| Mat / MRf | A[m2] / It[m4] | Ay[m2] / Az[m2] / Ayz[m2] | Iy[m4] / Iz[m4] / Iyz[m4] | yc[mm] / zc[mm] | ysc[mm] / zsc[mm] | E[N/mm2] / G[N/mm2] | g[kg/m] | I-1[m4] / I-2[m4] / α[°] |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.4060E-02 | 5.161E-03 | 2.843E-05 | 0.0 | 0.0 | 210000 | 118.6 | |
| | 1.017E-05 | 3.880E-03 | 2.776E-05 | 0.0 | 0.0 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] / ymax[mm] | zmin[mm] / zmax[mm] | hymin[mm] / hzmin[mm] | AK[m2] / AB[m2] | MRs | 1/WT[1/m3] / 1/WT2[1/m3] | 1/WVy[1/m2] / 1/WVz[1/m2] |
|---|---|---|---|---|---|---|---|
| 1.2E-05 | -95.0 | -109.0 | 119.4 | 9.519E-03 | | 5.253E+03 | 2.045E+02 |
| | 95.0 | 109.0 | 116.3 | | | 1.483E+04 | 3.381E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

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### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0013 | 0.0013 | 5.109E-09 | 0.000 | -2.064E-16 | -1.287E-16 | 0.0 | 0.0 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 3304.1 | 1237.38 | 887.33 | 25.83 | 2.03 | 1.56 | 114.89 | 110.46 | 0.0 | 0.0 | -, b, b |
| E[3,2] | 3304.1 | 663.53 | 401.35 | 25.83 | 9.15 | 0.93 | 61.29 | 68.68 | 0.0 | 0.0 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] E = elastic design values (stress limit reached)

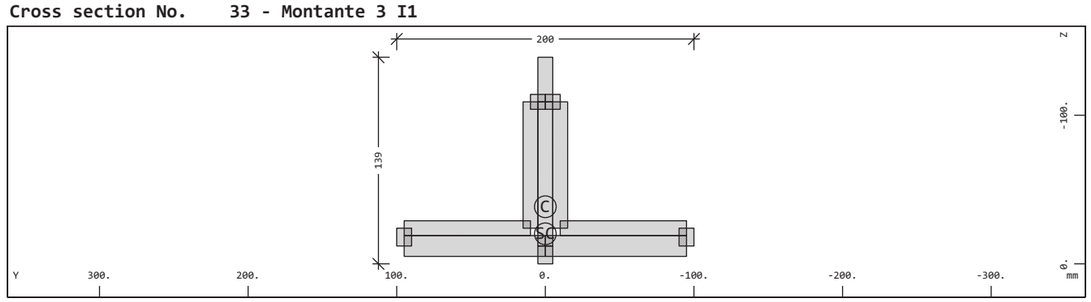
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.508 | | 11.2 | 10.0 | 14.0 | 0.474 | 0.240 | 0.234 | 0.000 | 0.0 | 0.0 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 33 - Montante 3 I1




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### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 7.3300E-03 | 2.580E-03 | 8.027E-06 | 0.0 | 0.0 | 210000 | 61.9 | 1.388E-05 |
| | 1.549E-06 | 1.967E-03 | 1.388E-05 | -38.4 | -20.2 | 80769 | (BEAM) | 8.027E-06 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -95.0 | -100.6 | 119.4 | 5.056E-03 | | 1.635E+04 | 4.090E+02 |
| | 95.0 | 33.4 | 80.0 | | | 4.405E+04 | 5.465E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |



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### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0007 | 0.0007 | 7.375E-10 | 0.000 | -2.328E-16 | 4.869E-17 | 0.0 | -40.8 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 1722.6 | 618.69 | 451.81 | 13.22 | 3.76 | 0.12 | 41.19 | 55.41 | 0.0 | -24.2 | -, b, b |
| P[1,2] | 586.4 | | | | | | 47.18 | 0.00 | 0.0 | -38.4 | COMB[3] |
| E[4,2] | 1722.6 | 331.76 | 248.26 | 8.30 | 3.08 | 0.24 | 12.80 | 34.34 | 0.0 | -38.4 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

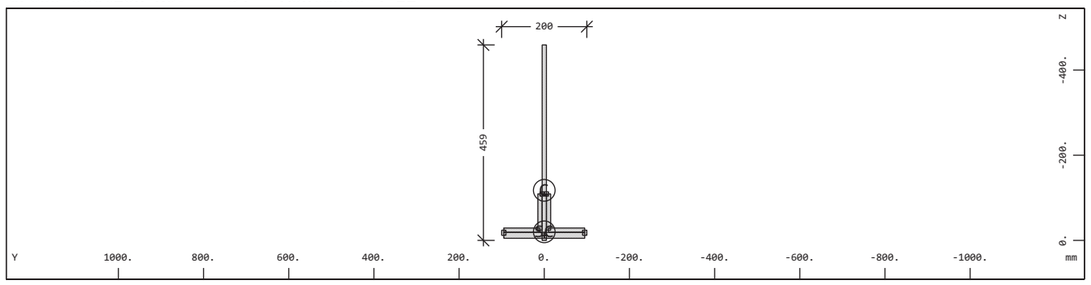
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.314 | | 11.2 | 10.0 | 14.0 | 0.185 | 0.068 | 0.117 | 0.000 | 0.0 | -38.4 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 34 - Montante 4 I2




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### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 1.0530E-02 | 2.580E-03 | 1.866E-04 | 0.0 | 0.0 | 210000 | 88.9 | |
| | 1.655E-06 | 4.623E-03 | 1.388E-05 | -117.6 | -20.2 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -95.0 | -341.4 | 119.4 | 5.404E-03 | | 1.529E+04 | 4.090E+02 |
| | 95.0 | 112.6 | 320.2 | | | 4.405E+04 | 3.123E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |

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| | |
|---|---|
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0007 | 0.0007 | 7.375E-10 | 0.000 | 5.617E-15 | -1.196E-13 | 0.0 | -341.3 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 2474.6 | 618.69 | 885.97 | 14.13 | 1.24 | 0.12 | 242.16 | 55.23 | 0.0 | -50.2 | -, b, c |
| P[1,2] | 870.0 | | | | | | 273.88 | 0.00 | 0.0 | -118. | COMB[3] |
| E[4,2] | 2474.6 | 331.76 | 434.42 | 8.87 | 3.08 | 0.24 | 128.44 | 34.34 | 0.0 | -118. | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

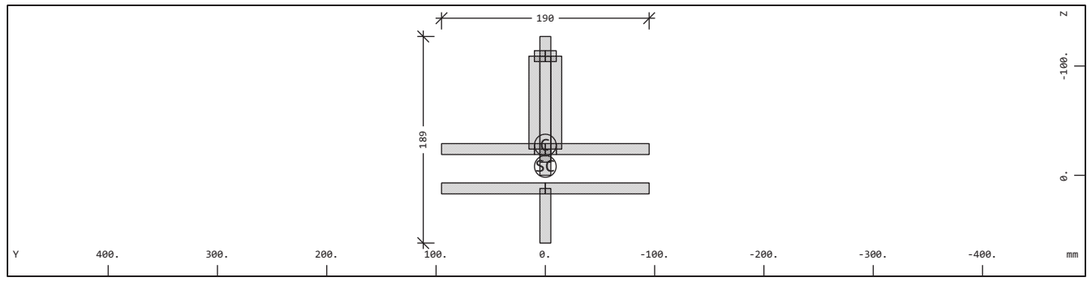
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.954 | | 10.8 | 10.0 | 14.0 | 1.692 | 1.575 | 0.117 | 0.000 | 0.0 | -117.6 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 41 - Montante 4 1




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 6.9500E-03 | 3.572E-03 | 1.207E-05 | 0.0 | 0.0 | 210000 | 58.6 | |
| | 7.821E-07 | 2.836E-03 | 1.160E-05 | -27.7 | -8.1 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -95.0 | -99.3 | 118.0 | 2.415E-03 | | 3.349E+04 | 3.892E+02 |
| | 95.0 | 89.7 | 104.6 | | | 2.017E+04 | 4.728E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |

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| | |
|---|---|
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0019 | 0.0019 | 4.876E-09 | 0.000 | -8.669E-17 | 2.546E-16 | 0.0 | -34.6 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 1633.3 | 542.71 | 487.08 | 6.37 | 3.34 | 0.99 | 53.84 | 47.15 | 0.0 | -24.5 | -, b, b |
| P[1,2] | 297.9 | | | | | | 54.31 | 0.00 | 0.0 | -27.7 | COMB[3] |
| E[4,2] | 1633.3 | 348.63 | 286.95 | 4.05 | 6.73 | 0.60 | 28.57 | 28.68 | 0.0 | -27.7 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

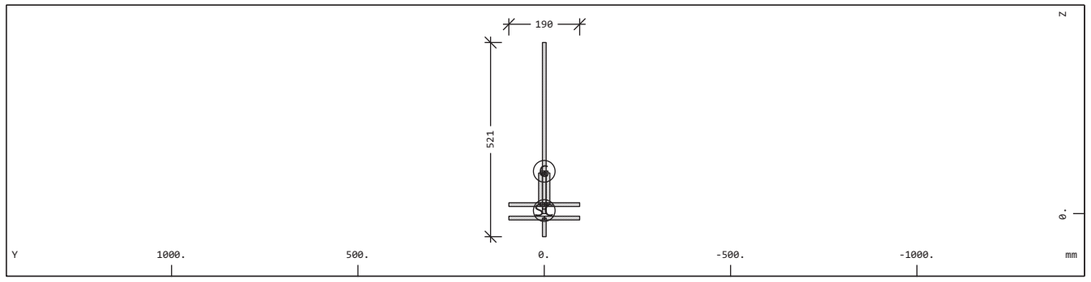
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.390 | | 10.0 | 10.0 | 10.0 | 0.200 | 0.102 | 0.098 | 0.000 | 0.0 | -27.7 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 42 - Montante 4 I




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 1.0270E-02 | 3.572E-03 | 2.007E-04 | 0.0 | 0.0 | 210000 | 86.7 | |
| | 8.928E-07 | 5.712E-03 | 1.160E-05 | -113.5 | -8.1 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -95.0 | -345.5 | 118.0 | 2.757E-03 | | 2.933E+04 | 3.892E+02 |
| | 95.0 | 175.5 | 336.2 | | | 2.017E+04 | 2.974E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |

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| | |
|---|---|
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0019 | 0.0019 | 4.876E-09 | 0.000 | 5.291E-15 | -1.265E-13 | 0.0 | -345.7 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 2413.5 | 542.71 | 937.53 | 7.27 | 1.28 | 0.99 | 256.17 | 47.04 | 0.0 | -54.5 | -, b, c |
| P[1,2] | 789.4 | | | | | | 280.58 | 0.00 | 0.0 | -113. | COMB[3] |
| E[4,2] | 2413.5 | 348.63 | 456.16 | 4.63 | 6.73 | 0.60 | 136.50 | 28.68 | 0.0 | -113. | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

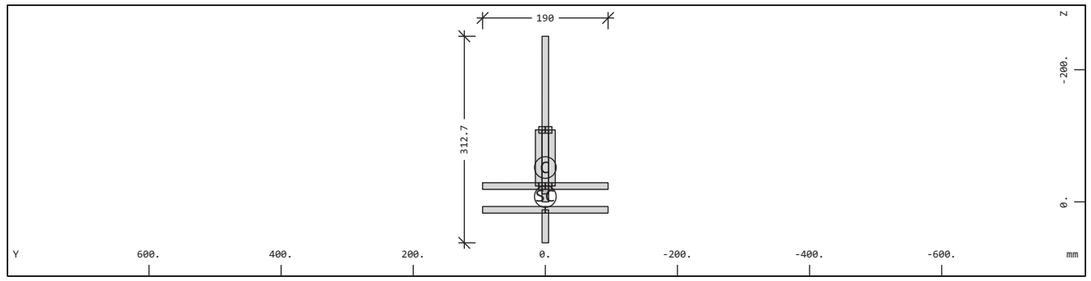
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.054 | | 10.0 | 10.0 | 10.0 | 1.792 | 1.694 | 0.098 | 0.000 | 0.0 | -113.5 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 43 - Montante 4 I




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 8.1870E-03 | 3.572E-03 | 4.092E-05 | 0.0 | 0.0 | 210000 | 69.1 | |
| | 8.234E-07 | 3.916E-03 | 1.160E-05 | -52.0 | -8.1 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

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### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -95.0 | -198.7 | 118.0 | 2.543E-03 | | 3.181E+04 | 3.892E+02 |
| | 95.0 | 114.0 | 178.1 | | | 2.017E+04 | 4.425E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0019 | 0.0019 | 4.876E-09 | 0.000 | 6.420E-16 | -4.311E-15 | 0.0 | -148.8 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 1923.9 | 542.71 | 654.91 | 6.71 | 2.03 | 0.99 | 101.16 | 47.87 | -0.0 | -27.6 | -, b, c |
| P[1,2] | 454.9 | | | | | | 107.99 | 0.00 | 0.0 | -52.0 | COMB[3] |
| E[4,2] | 1923.9 | 348.63 | 306.60 | 4.27 | 6.73 | 0.60 | 48.41 | 28.68 | 0.0 | -52.0 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

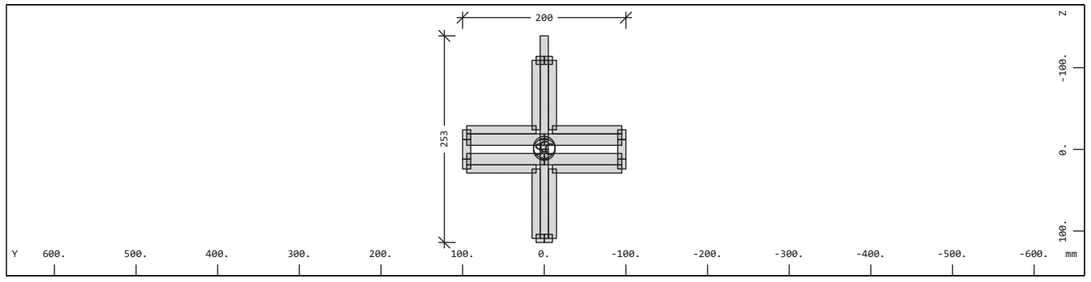
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.637 | | 10.0 | 10.0 | 10.0 | 0.443 | 0.345 | 0.098 | 0.000 | 0.0 | -52.0 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 51 - Montante 5 A1




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 1.4360E-02 | 5.161E-03 | 3.297E-05 | 0.0 | 0.0 | 210000 | 121.2 | |
| | 1.018E-05 | 4.179E-03 | 2.776E-05 | -2.6 | 0.0 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |

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| | |
|---|---|
| G[N/mm2] | Shear modulus |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -95.0 | -136.4 | 119.4 | 9.528E-03 | | 5.248E+03 | 2.045E+02 |
| | 95.0 | 111.6 | 125.5 | | | 1.483E+04 | 3.155E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0013 | 0.0013 | 5.109E-09 | 0.000 | -2.069E-16 | -1.208E-16 | 0.0 | -12.8 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 3374.6 | 1237.38 | 928.03 | 25.86 | 2.03 | 1.56 | 123.26 | 110.07 | 0.0 | -5.8 | -, b, b |
| P[1,2] | -70.5 | | | | | | 123.45 | 0.00 | 0.0 | -2.6 | COMB[3] |
| E[4,2] | 3374.6 | 663.53 | 430.03 | 25.86 | 9.15 | 0.93 | 56.80 | 68.68 | 0.0 | -2.6 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

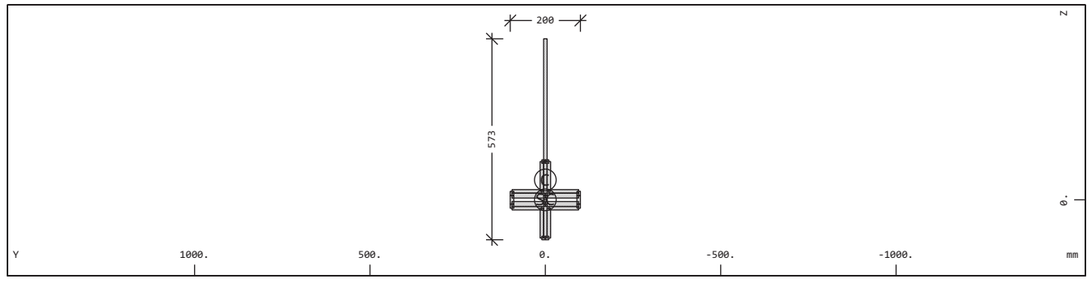
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I | | deff | t-min | t-max | thet-p | thet-y | thet-z | thet-yz | yg | zg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [m2/m] | [m2/m] | [mm] | [mm] | [mm] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [mm] | [mm] |
| | 2.568 | | 11.2 | 10.0 | 14.0 | 0.512 | 0.278 | 0.234 | 0.000 | 0.0 | -2.6 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 52 - Montante 5 A2




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 1.7560E-02 | 5.161E-03 | 2.902E-04 | 0.0 | 0.0 | 210000 | 148.2 | |
| | 1.029E-05 | 5.982E-03 | 2.776E-05 | -56.6 | 0.0 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |

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| | |
|---|---|
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes |
| MRf | reinforcement material number |
| It[m4] | torsional moment of inertia |
| G[N/mm2] | Shear modulus |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -95.0 | -402.4 | 119.4 | 9.628E-03 | | 5.193E+03 | 2.045E+02 |
| | 95.0 | 165.6 | 346.7 | | | 1.483E+04 | 2.743E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0013 | 0.0013 | 5.109E-09 | 0.000 | 3.308E-15 | -1.303E-13 | 0.0 | -308.2 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 4126.6 | 1237.38 | 1362.20 | 39.19 | 2.03 | 1.56 | 340.59 | 112.52 | 0.0 | -14.1 | -, b, c |
| P[1,2] | 1742.8 | | | | | | 393.42 | 0.00 | 0.0 | -56.6 | COMB[3] |
| E[4,2] | 4126.6 | 663.53 | 494.70 | 26.13 | 9.15 | 0.93 | 169.47 | 68.68 | 0.0 | -56.6 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

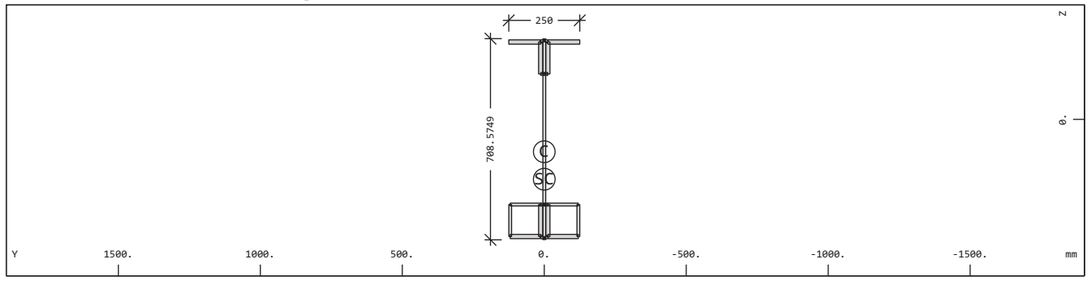
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I | | deff | t-min | t-max | thet-p | thet-y | thet-z | thet-yz | yg | zg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [m2/m] | [m2/m] | [mm] | [mm] | [mm] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [mm] | [mm] |
| | 3.208 | | 10.9 | 10.0 | 14.0 | 2.683 | 2.449 | 0.234 | 0.000 | 0.0 | -56.6 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 101 - Vigueta 1




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 2.4750E-02 | 9.596E-03 | 1.873E-03 | 0.0 | 0.0 | 210000 | 208.9 | |
| | 4.917E-05 | 7.478E-03 | 8.173E-05 | 113.9 | 210.9 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |

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| | | | |
|---|---|---|---|
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -125.0 | -393.9 | 173.4 | 2.715E-02 | | 1.922E+03 | 2.215E+02 |
| | 125.0 | 306.1 | 586.3 | | | 8.562E+02 | 1.706E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0601 | 0.0601 | 6.086E-06 | 0.001 | 8.459E-23 | -7.038E-21 | 0.0 | -282.8 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 5816.3 | 1322.85 | 2211.54 | 75.02 | 327.18 | 54.36 | 1434.60 | 225.60 | 0.0 | 282.4 | -, b, c |
| P[1,2] | 792.3 | | | | | | 1501.38 | 0.00 | 0.0 | 113.9 | COMB[3] |
| E[4,2] | 5816.3 | 612.61 | 795.51 | 70.60 | 158.46 | 23.80 | 1117.34 | 153.66 | 0.0 | 113.9 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I | | deff | t-min | t-max | thet-p | thet-y | thet-z | thet-yz | yg | zg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [m2/m] | [m2/m] | [mm] | [mm] | [mm] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [mm] | [mm] |
| | 4.060 | | 12.2 | 10.0 | 15.0 | 16.495 | 15.806 | 0.690 | 0.000 | 0.0 | 113.9 |

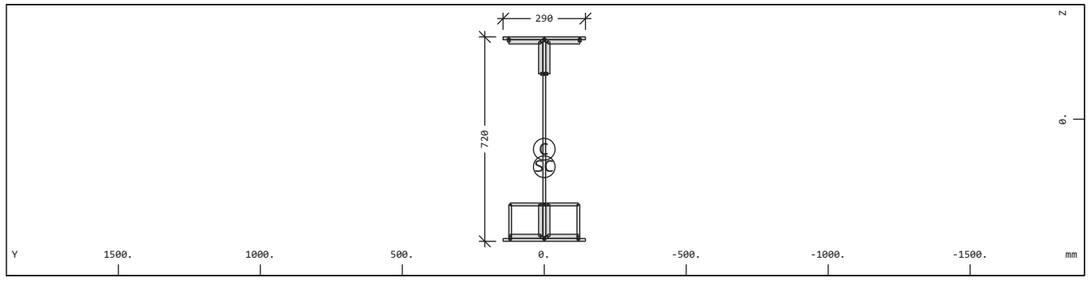
| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

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**Cross section No. 102 - Vigueta 2**




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 3.0550E-02 | 1.457E-02 | 2.613E-03 | 0.0 | 0.0 | 210000 | 257.8 | |
| | 6.127E-05 | 8.031E-03 | 1.224E-04 | 105.6 | 167.4 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -145.0 | -395.6 | 179.6 | 2.828E-02 | | 1.770E+03 | 1.395E+02 |
| | 145.0 | 324.4 | 616.5 | | | 4.501E+02 | 1.622E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0637 | 0.0637 | 1.175E-05 | 0.002 | 6.936E-22 | -6.361E-21 | 0.0 | -199.6 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 7179.3 | 2109.78 | 2292.95 | 76.77 | 635.54 | 93.47 | 1918.47 | 324.42 | 0.0 | 282.5 | -, b, c |
| P[1,2] | 831.5 | | | | | | 1992.02 | 0.00 | 0.0 | 105.6 | COMB[3] |
| E[4,2] | 7179.3 | 972.48 | 836.47 | 76.66 | 301.43 | 43.37 | 1572.13 | 198.34 | 0.0 | 105.6 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I | | deff | t-min | t-max | thet-p | thet-y | thet-z | thet-yz | yg | zg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [m2/m] | [m2/m] | [mm] | [mm] | [mm] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [kgm2/m] | [mm] | [mm] |
| | 5.220 | | 11.7 | 10.0 | 15.0 | 23.083 | 22.050 | 1.033 | 0.000 | 0.0 | 105.6 |

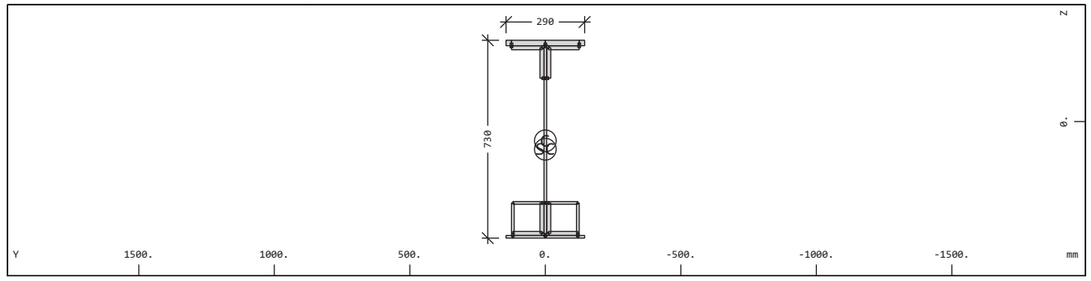
| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |

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| | | | |
|---|---|---|---|
| deff | effective depth | yg,zg | ordinate of the mass centre |

**Cross section No. 103 - Vigueta 3**




**Static properties of cross section**

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 3.3450E-02 | 1.706E-02 | 3.038E-03 | 0.0 | 0.0 | 210000 | 282.3 | |
| | 6.352E-05 | 8.229E-03 | 1.427E-04 | 70.9 | 102.0 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

**Additional static properties of cross section**

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -145.0 | -370.9 | 181.4 | 2.932E-02 | | 1.707E+03 | 1.196E+02 |
| | 145.0 | 359.1 | 628.1 | | | 3.098E+02 | 1.592E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

**Section values for warping**

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0551 | 0.0551 | 1.542E-05 | 0.002 | 2.030E-21 | 2.233E-20 | 0.0 | -85.4 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

**Design forces and moments**

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 7860.8 | 2503.25 | 2313.30 | 79.60 | 777.09 | 119.14 | 2262.62 | 373.83 | 0.0 | 137.6 | -, b, c |
| P[1,2] | 313.2 | | | | | | 2273.06 | 0.00 | 0.0 | 70.9 | COMB[3] |
| E[4,2] | 7860.8 | 1133.98 | 852.24 | 79.48 | 437.97 | 65.78 | 1978.34 | 231.28 | 0.0 | 70.9 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

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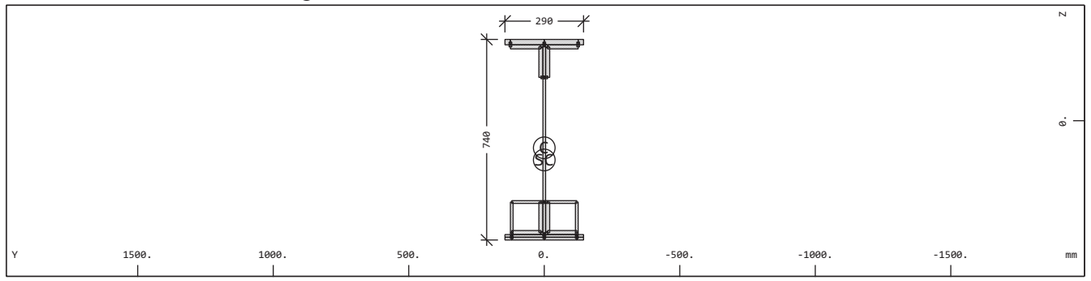
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**Additional design data**

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5.220 | | 12.8 | 10.0 | 20.0 | 26.840 | 25.636 | 1.204 | 0.000 | 0.0 | 70.9 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

**Cross section No. 104 - Vigueta 4**




**Static properties of cross section**

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 3.6350E-02 | 1.946E-02 | 3.392E-03 | 0.0 | 0.0 | 210000 | 306.7 | |
| | 7.227E-05 | 8.481E-03 | 1.630E-04 | 99.9 | 144.7 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

**Additional static properties of cross section**

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -145.0 | -399.9 | 182.8 | 3.046E-02 | | 1.641E+03 | 1.021E+02 |
| | 145.0 | 340.1 | 639.1 | | | 3.014E+02 | 1.565E+02 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

**Section values for warping**

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0613 | 0.0613 | 1.744E-05 | 0.002 | 3.096E-21 | 2.301E-21 | 0.0 | -155.6 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

**Design forces and moments**

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 8542.3 | 2896.71 | 2354.00 | 82.67 | 924.22 | 131.64 | 2415.96 | 423.24 | 0.0 | 282.6 | -, b, c |
| P[1,2] | 858.2 | | | | | | 2494.31 | 0.00 | 0.0 | 99.9 | COMB[3] |
| E[4,2] | 8542.3 | 1329.04 | 867.11 | 82.67 | 450.17 | 66.89 | 2044.21 | 264.22 | 0.0 | 99.9 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |

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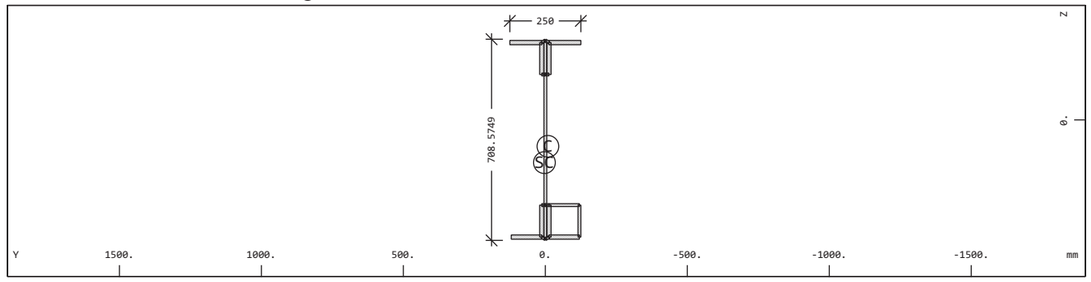
| | | | |
|---|---|---|---|
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5.800 | | 12.5 | 10.0 | 20.0 | 29.998 | 28.622 | 1.376 | 0.000 | 0.0 | 99.9 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 111 - Vigueta Extrema 1




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 2.2550E-02 | 8.207E-03 | 1.759E-03 | -9.1 | 3.2 | 210000 | 190.3 | 1.760E-03 |
| | 2.556E-05 | 7.632E-03 | 5.789E-05 | 93.0 | 150.2 | 80769 | (BEAM) | 5.641E-05 |
| | | | -5.029E-05 | | | | | 1.69 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -115.9 | -373.0 | 144.7 | 1.606E-02 | | 3.504E+03 | 2.458E+02 |
| | 134.1 | 327.0 | 576.9 | | | 8.617E+02 | 1.685E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0526 | 0.0525 | 5.443E-06 | 0.001 | -3.707E-07 | 6.282E-07 | 21.5 | -162.3 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 5299.3 | 1177.00 | 2058.90 | 45.21 | 349.02 | 49.33 | 1382.25 | 176.73 | -1.6 | 172.4 | -, b, c |
| P[1,2] | 373.8 | | | | | | 1397.11 | 0.00 | 0.0 | 93.0 | COMB[3] |
| P[1,2] | -1566.3 | | | | | | 0.00 | 184.25 | -9.1 | 0.0 | COMB[3] |
| E[4,2] | 5299.3 | 552.03 | 805.20 | 38.72 | 157.46 | 24.33 | 864.64 | 95.94 | -9.1 | 93.0 | |

[1] P = plastic design values (ultimate bearing capacity)

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[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

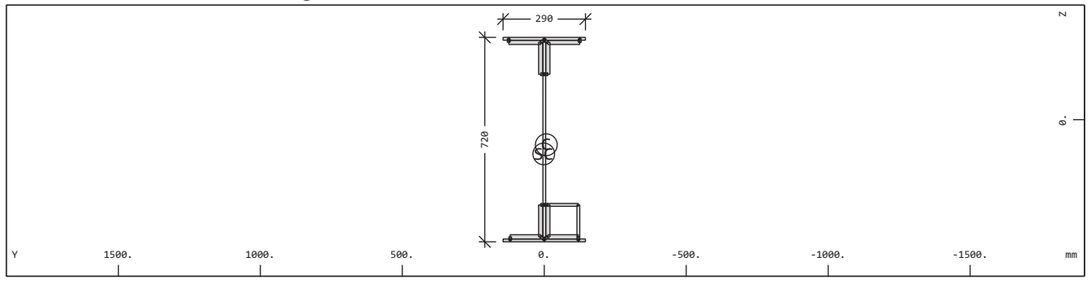
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3.620 | | 12.5 | 10.0 | 15.0 | 15.329 | 14.840 | 0.489 | -0.424 | -9.1 | 93.0 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 112 - Vigueta Extrema 2




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 2.8350E-02 | 1.317E-02 | 2.492E-03 | -7.3 | 1.7 | 210000 | 239.2 | 2.493E-03 |
| | 3.200E-05 | 8.161E-03 | 9.893E-05 | 88.3 | 120.5 | 80769 | (BEAM) | 9.783E-05 |
| | | | -5.126E-05 | | | | | 1.23 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -137.7 | -378.3 | 164.1 | 1.757E-02 | | 3.158E+03 | 1.475E+02 |
| | 152.3 | 341.7 | 615.4 | | | 4.514E+02 | 1.604E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0567 | 0.0570 | 1.073E-05 | 0.001 | -3.961E-07 | 1.299E-06 | 30.6 | -104.4 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

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### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 6662.3 | 1963.93 | 2140.31 | 49.35 | 648.77 | 86.71 | 1866.11 | 275.56 | -1.5 | 172.4 | -, b, c |
| P[1,2] | 395.9 | | | | | | 1882.79 | 0.00 | 0.0 | 88.3 | COMB[3] |
| P[1,2] | -1436.9 | | | | | | 0.00 | 280.57 | -7.3 | 0.0 | COMB[3] |
| E[4,2] | 6662.3 | 920.09 | 845.61 | 42.97 | 300.56 | 44.22 | 1303.06 | 144.48 | -7.3 | 88.3 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

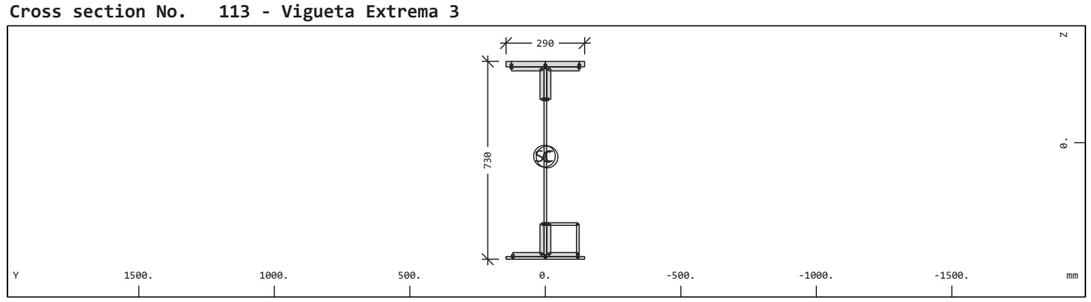
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4.780 | | 11.9 | 10.0 | 15.0 | 21.864 | 21.029 | 0.835 | -0.433 | -7.3 | 88.3 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 113 - Vigueta Extrema 3




### Static properties of cross section

| Mat / MRf | A[m2] / It[m4] | Ay[m2] / Az[m2] / Ayz[m2] | Iy[m4] / Iz[m4] / Iyz[m4] | yc[mm] / zc[mm] | ysc[mm] / zsc[mm] | E[N/mm2] / G[N/mm2] | g[kg/m] | I-1[m4] / I-2[m4] / α[°] |
|---|---|---|---|---|---|---|---|---|
| 1 | 3.1250E-02 | 1.564E-02 | 2.878E-03 | -6.6 | 3.2 | 210000 | 263.7 | 2.880E-03 |
| | 3.426E-05 | 8.360E-03 | 1.194E-04 | 52.7 | 49.6 | 80769 | (BEAM) | 1.181E-04 |
| | | | -5.859E-05 | | | | | 1.22 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] / ymax[mm] | zmin[mm] / zmax[mm] | hymin[mm] / hzmin[mm] | AK[m2] / AB[m2] | MRs | 1/WT[1/m3] / 1/WT2[1/m3] | 1/WVy[1/m2] / 1/WVz[1/m2] |
|---|---|---|---|---|---|---|---|
| 1.2E-05 | -138.4 | -352.7 | 168.9 | 1.881E-02 | | 2.950E+03 | 1.221E+02 |
| | 151.6 | 377.3 | 626.8 | | | 3.725E+02 | 1.577E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

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### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0474 | 0.0574 | 1.358E-05 | 0.002 | -5.146E-07 | 1.487E-06 | -3.2 | 20.8 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 7343.8 | 2357.39 | 2160.66 | 52.82 | 798.01 | 106.42 | 2135.31 | 324.98 | -1.5 | 27.5 | -, b, c |
| P[1,2] | -1390.1 | | | | | | 0.00 | 329.14 | -6.6 | 0.0 | COMB[3] |
| E[4,2] | 7343.8 | 1111.23 | 860.11 | 45.99 | 364.21 | 55.64 | 1499.10 | 174.50 | -6.6 | 52.7 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

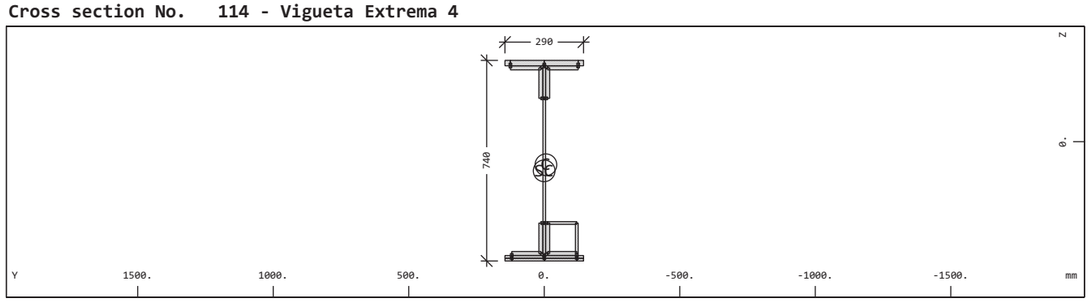
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4.780 | | 13.1 | 10.0 | 20.0 | 25.297 | 24.289 | 1.008 | -0.494 | -6.6 | 52.7 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 114 - Vigueta Extrema 4




### Static properties of cross section

| Mat / MRf | A[m2] / It[m4] | Ay[m2] / Az[m2] / Ayz[m2] | Iy[m4] / Iz[m4] / Iyz[m4] | yc[mm] / zc[mm] | ysc[mm] / zsc[mm] | E[N/mm2] / G[N/mm2] | g[kg/m] | I-1[m4] / I-2[m4] / α[°] |
|---|---|---|---|---|---|---|---|---|
| 1 | 3.4150E-02 | 1.796E-02 | 3.266E-03 | -6.0 | 0.4 | 210000 | 288.2 | 3.267E-03 |
| | 3.914E-05 | 8.594E-03 | 1.398E-04 | 85.2 | 107.5 | 80769 | (BEAM) | 1.390E-04 |
| | | | -5.190E-05 | | | | | 0.95 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] / ymax[mm] | zmin[mm] / zmax[mm] | hymin[mm] / hzmin[mm] | AK[m2] / AB[m2] | MRs | 1/WT[1/m3] / 1/WT2[1/m3] | 1/WVy[1/m2] / 1/WVz[1/m2] |
|---|---|---|---|---|---|---|---|
| 1.2E-05 | -139.0 | -385.2 | 172.9 | 2.006E-02 | | 2.748E+03 | 1.072E+02 |
| | 151.0 | 354.8 | 640.8 | | | 3.046E+02 | 1.549E+02 |

| | |
|---|---|
| α-T[1/K] | Elongation coefficient |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |

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| | |
|---|---|
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0556 | 0.0561 | 1.621E-05 | 0.002 | -3.905E-07 | 1.963E-06 | 33.2 | -78.9 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 8025.3 | 2750.86 | 2201.36 | 56.25 | 938.65 | 123.78 | 2363.61 | 374.39 | -1.5 | 172.6 | -, b, c |
| P[1,2] | 410.5 | | | | | | 2381.53 | 0.00 | 0.0 | 85.2 | COMB[3] |
| P[1,2] | -1351.4 | | | | | | 0.00 | 377.87 | -6.0 | 0.0 | COMB[3] |
| E[4,2] | 8025.3 | 1266.19 | 875.66 | 49.36 | 445.38 | 67.85 | 1788.02 | 208.60 | -6.0 | 85.2 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

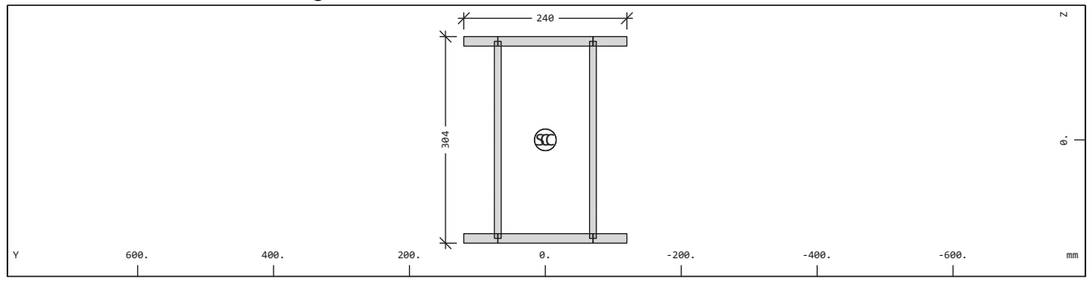
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5.360 | | 12.7 | 10.0 | 20.0 | 28.742 | 27.562 | 1.180 | -0.438 | -6.0 | 85.2 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 121 - Larguero




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 1.2520E-02 | 3.860E-03 | 1.819E-04 | 0.0 | 0.0 | 210000 | 105.7 | |
| | 8.516E-05 | 5.565E-03 | 6.068E-05 | 0.0 | 0.0 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -120.0 | -152.0 | 150.0 | 4.090E-02 | | 1.340E+03 | 2.382E+02 |
| | 120.0 | 152.0 | 260.9 | | | 1.982E+03 | 1.917E+02 |

α-T[1/K] Elongation coefficient

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| | |
|---|---|
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| -0.0122 | 0.0122 | 2.971E-07 | 0.000 | 1.478E-22 | 4.699E-22 | 0.0 | 0.0 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 2942.2 | 911.75 | 786.93 | 114.58 | 77.12 | 20.66 | 327.80 | 190.16 | 0.0 | 0.0 | -, b, c |
| E[3,2] | 2942.2 | 569.71 | 707.85 | 101.27 | 68.44 | 5.73 | 294.86 | 118.82 | 0.0 | 0.0 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] E = elastic design values (stress limit reached)

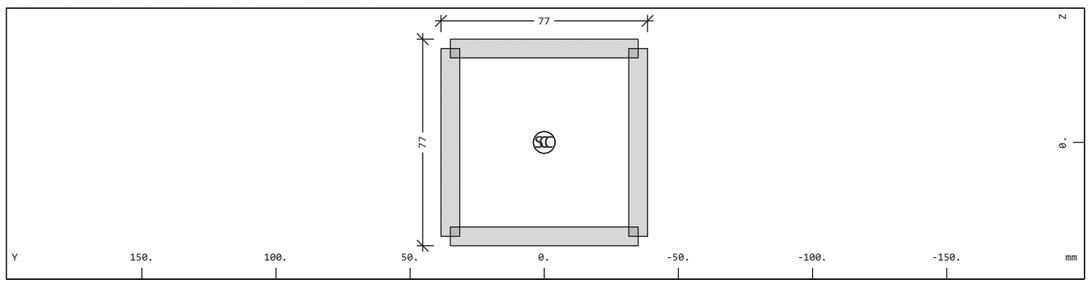
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.120 | | 11.8 | 10.0 | 14.0 | 2.047 | 1.535 | 0.512 | | 0.0 | 0.0 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 131 - 2L70x70x7




### Static properties of cross section

| Mat | A[m2] | Ay[m2] | Iy[m4] | yc[mm] | ysc[mm] | E[N/mm2] | g[kg/m] | I-1[m4] |
|---|---|---|---|---|---|---|---|---|
| MRf | It[m4] | Az[m2] | Iz[m4] | zc[mm] | zsc[mm] | G[N/mm2] | | I-2[m4] |
| | | Ayz[m2] | Iyz[m4] | | | | | α[°] |
| 1 | 1.9600E-03 | 8.167E-04 | 1.601E-06 | 0.0 | 0.0 | 210000 | 16.5 | |
| | 2.433E-06 | 8.167E-04 | 1.601E-06 | 0.0 | 0.0 | 80769 | (BEAM) | |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] | zmin[mm] | hymin[mm] | AK[m2] | MRs | 1/WT[1/m3] | 1/WVy[1/m2] |
|---|---|---|---|---|---|---|---|
| | ymax[mm] | zmax[mm] | hzmin[mm] | AB[m2] | | 1/WT2[1/m3] | 1/WVz[1/m2] |
| 1.2E-05 | -38.5 | -38.5 | 62.2 | 4.965E-03 | | 1.726E+04 | 1.148E+03 |
| | 38.5 | 38.5 | 62.2 | | | | 1.148E+03 |

α-T[1/K] Elongation coefficient

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| | |
|---|---|
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid |
| hymin[mm],hzmin[mm] | minimum value for internal lever |
| AK[m2] | torsional equivalent area (Bredt) |
| MRs | transverse reinforcements material number |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance |
| AB[m2] | gross concrete area |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 460.6 | 132.96 | 132.96 | 9.82 | | | 12.09 | 12.09 | 0.0 | 0.0 | -, b, b |
| E[3,2] | 460.6 | 118.19 | 118.19 | 7.86 | | | 10.75 | 10.75 | 0.0 | 0.0 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] E = elastic design values (stress limit reached)

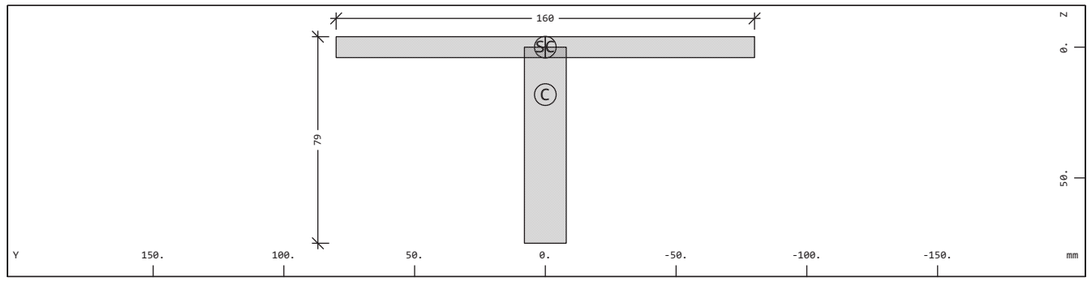
| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.560 | | 7.0 | 7.0 | 7.0 | 0.027 | 0.014 | 0.014 | | 0.0 | 0.0 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

### Cross section No. 132 - 2L80x80x8




### Static properties of cross section

| Mat / MRf | A[m2] / It[m4] | Ay[m2] / Az[m2] / Ayz[m2] | Iy[m4] / Iz[m4] / Iyz[m4] | yc[mm] / zc[mm] | ysc[mm] / zsc[mm] | E[N/mm2] / G[N/mm2] | g[kg/m] | I-1[m4] / I-2[m4] / α[°] |
|---|---|---|---|---|---|---|---|---|
| 1 | 2.4800E-03 | 1.067E-03 | 1.433E-06 | 0.0 | 0.0 | 210000 | 20.9 | 2.731E-06 |
| | 1.297E-07 | 7.148E-04 | 2.731E-06 | 18.1 | 0.0 | 80769 | (BEAM) | 1.433E-06 |

| | | | |
|---|---|---|---|
| Mat | material number | yc[mm],zc[mm] | ordinate of elastic centroid |
| A[m2] | sectional area | ysc[mm],zsc[mm] | ordinate of shear centre |
| Ay[m2],Az[m2],Ayz[m2] | transverse shear deformation area | E[N/mm2] | Young's modulus |
| Iy[m4],Iz[m4],Iyz[m4] | bending moment of inertia | g[kg/m] | mass per length |
| I-1[m4],I-2[m4],α[°] | principal moments of inertia and angle of the principal axes | | |
| MRf | reinforcement material number | | |
| It[m4] | torsional moment of inertia | | |
| G[N/mm2] | Shear modulus | | |

### Additional static properties of cross section

| α-T[1/K] | ymin[mm] / ymax[mm] | zmin[mm] / zmax[mm] | hymin[mm] / hzmin[mm] | AK[m2] / AB[m2] | MRs | 1/WT[1/m3] / 1/WT2[1/m3] | 1/WVy[1/m2] / 1/WVz[1/m2] |
|---|---|---|---|---|---|---|---|
| 1.2E-05 | -80.0 | -22.1 | 106.7 | 1.268E-03 | | 1.234E+05 | 1.172E+03 |
| | 80.0 | 56.9 | 55.4 | | | | 1.128E+03 |

| | | | |
|---|---|---|---|
| α-T[1/K] | Elongation coefficient | | |
| ymin[mm],zmin[mm],ymax[mm],zmax[mm] | extreme coordinates relative to centroid | | |
| hymin[mm],hzmin[mm] | minimum value for internal lever | | |
| AK[m2] | torsional equivalent area (Bredt) | | |
| MRs | transverse reinforcements material number | | |
| 1/WT[1/m3],1/WT2[1/m3] | torsional resistance | | |
| 1/WVy[1/m2],1/WVz[1/m2] | shear force resistance | | |
| AB[m2] | gross concrete area | | |

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### Section values for warping

| Wmin[m2] | Wmax[m2] | CM[m6] | CMS[m4] | ASwyy[m6] | ASwzz[m6] | ry[mm] | rz[mm] |
|---|---|---|---|---|---|---|---|
| 0.0000 | 0.0000 | 1.004E-25 | 0.000 | 0.000E+00 | 0.000E+00 | 0.0 | 25.2 |

| | | | |
|---|---|---|---|
| Wmin[m2],Wmax[m2] | unit warping | ASwyy[m6],ASwzz[m6] | warping sectional value |
| CM[m6] | warping resistance | ry[mm],rz[mm] | sectional distance |
| CMS[m4] | warping shear resistance | | |

### Design forces and moments

| | N[kN] | Vy[kN] | Vz[kN] | Mt[kNm] | Mt2[kNm] | Mb[kNm2] | My[kNm] | Mz[kNm] | y[mm] | z[mm] | BUCK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P[1,2] | 582.8 | 173.67 | 162.81 | 2.00 | | | 10.70 | 13.16 | 0.0 | 3.4 | -, b, b |
| P[1,2] | -155.3 | | | | | | 12.15 | 0.00 | 0.0 | 18.1 | COMB[3] |
| E[4,2] | 582.8 | 115.78 | 120.33 | 1.10 | | | 5.93 | 8.02 | 0.0 | 18.1 | |

[1] P = plastic design values (ultimate bearing capacity)
[2] Material safety γ-M0 for structural steel = 1.00
[3] Maximum moment (defining point D in interaction diagramm)
[4] E = elastic design values (stress limit reached)

| | | | |
|---|---|---|---|
| N[kN] | normal force | Mb[kNm2] | warping moment |
| Vy[kN],Vz[kN] | shear force | My[kNm],Mz[kNm] | bending moment |
| Mt[kNm] | primary torsional moment | y[mm],z[mm] | ordinate of plastic centre |
| Mt2[kNm] | secondary torsional moment | BUCK | buckling curve (LTB, y-y, z-z) |

### Additional design data

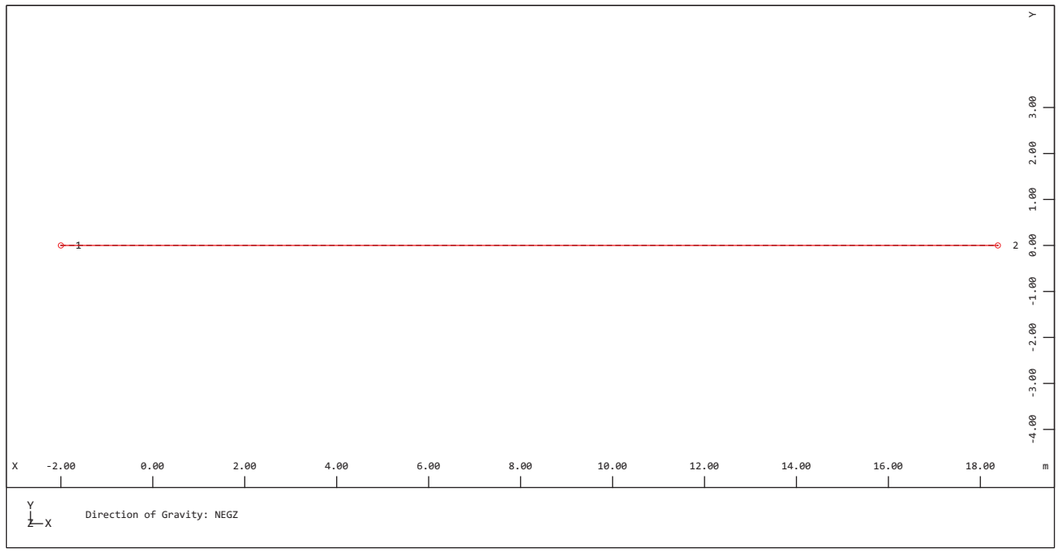
| Mat | periphery-O/-I [m2/m] | [m2/m] | deff [mm] | t-min [mm] | t-max [mm] | thet-p [kgm2/m] | thet-y [kgm2/m] | thet-z [kgm2/m] | thet-yz [kgm2/m] | yg [mm] | zg [mm] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.470 | | 10.6 | 8.0 | 16.0 | 0.035 | 0.012 | 0.023 | | 0.0 | 18.1 |

| | | | |
|---|---|---|---|
| Mat | material number | t-min,t-max | thickness |
| periphery-O/-I | peripheral area per length | thet-p,thet-y,thet-z,thet-yz | rotational mass |
| deff | effective depth | yg,zg | ordinate of the mass centre |

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**Geometric axis EJE**




**Plan view**

**Tangential intersection points**

| | Ident | S[-] | X[m] | Y[m] | R[m] | La[m] | Le[m] | Tau[°] |
|---|---|---|---|---|---|---|---|---|
| IP | 1 | 0.000 | -2.000 | 0.000 | | | | |
| IP | 2 | 20.380 | 18.380 | 0.000 | | | | |

S[-] station value
X[m],Y[m] coordinates of the tangential intersection point
R[m] radius in mid of transition
La[m] length of the first transition element
Le[m] length of the second transition element
Tau[°] deflection angle

**Segments**

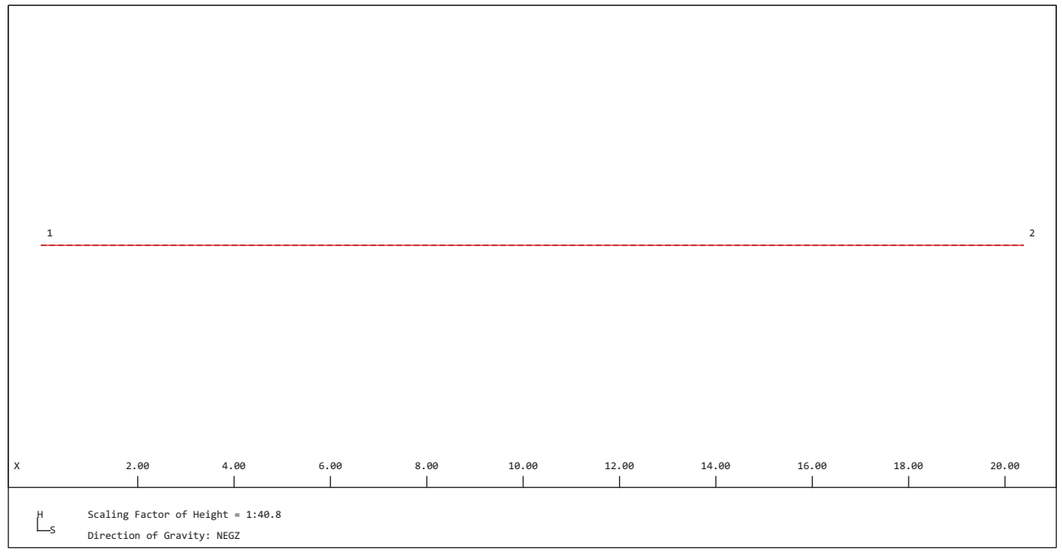
| | | S[-] | X[m] | Y[m] | L[m] | Ra[m] | Re[m] | A[m] |
|---|---|---|---|---|---|---|---|---|
| IP | straight | 0.000 | -2.000 | 0.000 | 20.380 | | | |
| IP | | 20.380 | 18.380 | 0.000 | | | | |

S[-] station value at start point
X[m],Y[m] coordinates of start point
L[m] length of the segment
Ra[m],Re[m] radius at start / end point
A[m] clothoidal parameter R*L=A²

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**Elevation**

**Tangential intersection points**

| | Ident | S[-] | H[m] | R[m] |
|---|---|---|---|---|
| IP | 1 | 0.000 | 0.460 | |
| IP | 2 | 20.380 | 0.460 | |

S[-] station value
H[m] height of the gradient polygon
R[m] radius of curvature

**Segments**

| | S[-] | H[m] | L[m] | R[m] | i[o/oo] |
|---|---|---|---|---|---|
| IP | 0.000 | 0.460 | 20.380 | | |
| IP | 20.380 | 0.460 | | | |

S[-] station value at start point
H[m] height at start point
L[m] length of the segment
R[m] radius of curvature
i[o/oo] inclination

**Structural Elements**

**Structural Points**

| Number | X[m] | Y[m] | Z[m] | Support Conditions | Designation |
|---|---|---|---|---|---|
| 601 | -0.920 | -4.400 | -0.300 | FMB | |
| 602 | 0.000 | 4.400 | -0.300 | FMB | |
| 603 | 16.380 | -4.400 | -0.300 | FMB | |
| 604 | 17.300 | 4.400 | -0.300 | FMB | |

**Structural Lines**

| Number | SPt-a | SPt-e | Ref | Type | SNo | Grp | Hinges-a | Hinges-e | Designation |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 3 | | SECT | 33: 34 | 7 | | | |
| | 3 | 2 | | SECT | 33: 34 | 7 | | | |
| 3 | 2 | 4 | | SECT | 34 | 7 | | | |
| 4 | 6 | 8 | | SECT | 51: 52 | 7 | | | |
| | 8 | 7 | | SECT | 51: 52 | 7 | | | |
| 6 | 7 | 9 | | SECT | 52 | 7 | | | |
| 7 | 1 | 1002 | | SECT | 6 | 8 | | | |
| | 1002 | 1001 | | SECT | 6 | 8 | | | |
| | 1001 | 14 | | SECT | 6 | 8 | | | |
| 8 | 4 | 1041 | | SECT | 6 | 8 | | | |
| | 1041 | 1001 | | SECT | 6 | 8 | | | |
| | 1001 | 11 | | SECT | 6 | 8 | | | |
| 9 | 6 | 1004 | | SECT | 6 | 8 | | | |

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**Structural Lines**

| Number | SPt-a | SPt-e | Ref | Type | SNo | Grp | Hinges-a | Hinges-e | Designation |
|---|---|---|---|---|---|---|---|---|---|
| | 1004 | 1003 | | SECT | 6 | 8 | | | |
| | 1003 | 19 | | SECT | 6 | 8 | | | |
| 10 | 9 | 1042 | | SECT | 6 | 8 | | | |
| | 1042 | 1003 | | SECT | 6 | 8 | | | |
| | 1003 | 16 | | SECT | 6 | 8 | | | |
| 11 | 11 | 13 | | SECT | 41: 43 | 9 | | | |
| 12 | 13 | 12 | | SECT | 43: 42 | 7 | | | |
| 13 | 12 | 14 | | SECT | 42 | 7 | | | |
| 14 | 16 | 18 | | SECT | 41: 43 | 9 | | | |
| 15 | 18 | 17 | | SECT | 43: 42 | 7 | | | |
| 16 | 17 | 19 | | SECT | 42 | 7 | | | |
| 17 | 11 | 1005 | | SECT | 7 | 8 | | | |
| | 1005 | 24 | | SECT | 7 | 8 | | | |
| 18 | 14 | 1005 | | SECT | 7 | 8 | | | |
| | 1005 | 21 | | SECT | 7 | 8 | | | |
| 19 | 16 | 1006 | | SECT | 7 | 8 | | | |
| | 1006 | 29 | | SECT | 7 | 8 | | | |
| 20 | 19 | 1006 | | SECT | 7 | 8 | | | |
| | 1006 | 26 | | SECT | 7 | 8 | | | |
| 21 | 21 | 23 | | SECT | 41: 43 | 9 | | | |
| 22 | 23 | 22 | | SECT | 43: 42 | 7 | | | |
| 23 | 22 | 24 | | SECT | 42 | 7 | | | |
| 24 | 26 | 28 | | SECT | 41: 43 | 9 | | | |
| 25 | 28 | 27 | | SECT | 43: 42 | 7 | | | |
| 26 | 27 | 29 | | SECT | 42 | 7 | | | |
| 27 | 21 | 1007 | | SECT | 7 | 8 | | | |
| | 1007 | 34 | | SECT | 7 | 8 | | | |
| 28 | 24 | 1007 | | SECT | 7 | 8 | | | |
| | 1007 | 31 | | SECT | 7 | 8 | | | |
| 29 | 26 | 1008 | | SECT | 7 | 8 | | | |
| | 1008 | 39 | | SECT | 7 | 8 | | | |
| 30 | 29 | 1008 | | SECT | 7 | 8 | | | |
| | 1008 | 36 | | SECT | 7 | 8 | | | |
| 31 | 31 | 33 | | SECT | 41: 43 | 9 | | | |
| 32 | 33 | 32 | | SECT | 43: 42 | 7 | | | |
| 33 | 32 | 34 | | SECT | 42 | 7 | | | |
| 34 | 36 | 38 | | SECT | 41: 43 | 9 | | | |
| 35 | 38 | 37 | | SECT | 43: 42 | 7 | | | |
| 36 | 37 | 39 | | SECT | 42 | 7 | | | |
| 37 | 31 | 1009 | | SECT | 8 | 8 | | | |
| | 1009 | 44 | | SECT | 8 | 8 | | | |
| 38 | 34 | 1009 | | SECT | 8 | 8 | | | |
| | 1009 | 41 | | SECT | 8 | 8 | | | |
| 39 | 36 | 1010 | | SECT | 8 | 8 | | | |
| | 1010 | 49 | | SECT | 8 | 8 | | | |
| 40 | 39 | 1010 | | SECT | 8 | 8 | | | |
| | 1010 | 46 | | SECT | 8 | 8 | | | |
| 41 | 41 | 43 | | SECT | 41: 43 | 9 | | | |
| 42 | 43 | 42 | | SECT | 43: 42 | 7 | | | |
| 43 | 42 | 44 | | SECT | 42 | 7 | | | |
| 44 | 46 | 48 | | SECT | 41: 43 | 9 | | | |
| 45 | 48 | 47 | | SECT | 43: 42 | 7 | | | |
| 46 | 47 | 49 | | SECT | 42 | 7 | | | |
| 47 | 41 | 1011 | | SECT | 9 | 8 | | | |
| | 1011 | 54 | | SECT | 9 | 8 | | | |
| 48 | 44 | 1011 | | SECT | 9 | 8 | | | |
| | 1011 | 51 | | SECT | 9 | 8 | | | |
| 49 | 46 | 1012 | | SECT | 9 | 8 | | | |
| | 1012 | 59 | | SECT | 9 | 8 | | | |

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**Structural Lines**

| Number | SPt-a | SPt-e | Ref | Type | SNo | Grp | Hinges-a | Hinges-e | Designation |
|---|---|---|---|---|---|---|---|---|---|
| 50 | 49 | 1012 | | SECT | 9 | 8 | | | |
| | 1012 | 56 | | SECT | 9 | 8 | | | |
| 51 | 51 | 53 | | SECT | 41: 43 | 9 | | | |
| 52 | 53 | 52 | | SECT | 43: 42 | 7 | | | |
| 53 | 52 | 54 | | SECT | 42 | 7 | | | |
| 54 | 56 | 58 | | SECT | 41: 43 | 9 | | | |
| 55 | 58 | 57 | | SECT | 43: 42 | 7 | | | |
| 56 | 57 | 59 | | SECT | 42 | 7 | | | |
| 57 | 51 | 1013 | | SECT | 8 | 8 | | | |
| | 1013 | 64 | | SECT | 8 | 8 | | | |
| 58 | 54 | 1013 | | SECT | 8 | 8 | | | |
| | 1013 | 61 | | SECT | 8 | 8 | | | |
| 59 | 56 | 1014 | | SECT | 8 | 8 | | | |
| | 1014 | 69 | | SECT | 8 | 8 | | | |
| 60 | 59 | 1014 | | SECT | 8 | 8 | | | |
| | 1014 | 66 | | SECT | 8 | 8 | | | |
| 61 | 61 | 63 | | SECT | 41: 43 | 9 | | | |
| 62 | 63 | 62 | | SECT | 43: 42 | 7 | | | |
| 63 | 62 | 64 | | SECT | 42 | 7 | | | |
| 64 | 66 | 68 | | SECT | 41: 43 | 9 | | | |
| 65 | 68 | 67 | | SECT | 43: 42 | 7 | | | |
| 66 | 67 | 69 | | SECT | 42 | 7 | | | |
| 67 | 61 | 1015 | | SECT | 7 | 8 | | | |
| | 1015 | 74 | | SECT | 7 | 8 | | | |
| 68 | 64 | 1015 | | SECT | 7 | 8 | | | |
| | 1015 | 71 | | SECT | 7 | 8 | | | |
| 69 | 66 | 1016 | | SECT | 7 | 8 | | | |
| | 1016 | 79 | | SECT | 7 | 8 | | | |
| 70 | 69 | 1016 | | SECT | 7 | 8 | | | |
| | 1016 | 76 | | SECT | 7 | 8 | | | |
| 71 | 71 | 73 | | SECT | 41: 43 | 9 | | | |
| 72 | 73 | 72 | | SECT | 43: 42 | 7 | | | |
| 73 | 72 | 74 | | SECT | 42 | 7 | | | |
| 74 | 76 | 78 | | SECT | 41: 43 | 9 | | | |
| 75 | 78 | 77 | | SECT | 43: 42 | 7 | | | |
| 76 | 77 | 79 | | SECT | 42 | 7 | | | |
| 77 | 71 | 1017 | | SECT | 7 | 8 | | | |
| | 1017 | 84 | | SECT | 7 | 8 | | | |
| 78 | 74 | 1017 | | SECT | 7 | 8 | | | |
| | 1017 | 81 | | SECT | 7 | 8 | | | |
| 79 | 76 | 1018 | | SECT | 7 | 8 | | | |
| | 1018 | 89 | | SECT | 7 | 8 | | | |
| 80 | 79 | 1018 | | SECT | 7 | 8 | | | |
| | 1018 | 86 | | SECT | 7 | 8 | | | |
| 81 | 81 | 83 | | SECT | 41: 43 | 9 | | | |
| 82 | 83 | 82 | | SECT | 43: 42 | 7 | | | |
| 83 | 82 | 84 | | SECT | 42 | 7 | | | |
| 84 | 86 | 88 | | SECT | 41: 43 | 9 | | | |
| 85 | 88 | 87 | | SECT | 43: 42 | 7 | | | |
| 86 | 87 | 89 | | SECT | 42 | 7 | | | |
| 87 | 81 | 1019 | | SECT | 6 | 8 | | | |
| | 1019 | 1037 | | SECT | 6 | 8 | | | |
| | 1037 | 94 | | SECT | 6 | 8 | | | |
| 88 | 84 | 1019 | | SECT | 6 | 8 | | | |
| | 1019 | 1038 | | SECT | 6 | 8 | | | |
| | 1038 | 91 | | SECT | 6 | 8 | | | |
| 89 | 86 | 1020 | | SECT | 6 | 8 | | | |
| | 1020 | 1039 | | SECT | 6 | 8 | | | |
| | 1039 | 99 | | SECT | 6 | 8 | | | |

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**Structural Lines**

| Number | SPt-a | SPt-e | Ref | Type | SNo | Grp | Hinges-a | Hinges-e | Designation |
|---|---|---|---|---|---|---|---|---|---|
| 90 | 89 | 1020 | | SECT | 6 | 8 | | | |
| | 1020 | 1040 | | SECT | 6 | 8 | | | |
| | 1040 | 96 | | SECT | 6 | 8 | | | |
| 91 | 91 | 93 | | SECT | 51: 52 | 7 | | | |
| | 93 | 92 | | SECT | 51: 52 | 7 | | | |
| 93 | 92 | 94 | | SECT | 52 | 7 | | | |
| 94 | 96 | 98 | | SECT | 33: 34 | 7 | | | |
| | 98 | 97 | | SECT | 33: 34 | 7 | | | |
| 96 | 97 | 99 | | SECT | 34 | 7 | | | |
| 101 | 101 | 102 | | SECT | 11 | 3 | | | |
| | 102 | 1 | | SECT | 11 | 3 | | | |
| 102 | 1 | 121 | | SECT | 1 | 1 | | | |
| | 121 | 11 | | SECT | 1 | 1 | | | |
| | 11 | 103 | | SECT | 1 | 1 | | | |
| 103 | 103 | 21 | | SECT | 2 | 2 | | | |
| | 21 | 31 | | SECT | 2 | 2 | | | |
| | 31 | 41 | | SECT | 2 | 2 | | | |
| | 41 | 51 | | SECT | 2 | 2 | | | |
| | 51 | 61 | | SECT | 2 | 2 | | | |
| | 61 | 71 | | SECT | 2 | 2 | | | |
| | 71 | 104 | | SECT | 2 | 2 | | | |
| 104 | 104 | 81 | | SECT | 1 | 1 | | | |
| | 81 | 123 | | SECT | 1 | 1 | | | |
| | 123 | 91 | | SECT | 1 | 1 | | | |
| 105 | 91 | 105 | | SECT | 11 | 3 | | | |
| 106 | 106 | 6 | | SECT | 11 | 3 | | | |
| 107 | 6 | 131 | | SECT | 1 | 1 | | | |
| | 131 | 16 | | SECT | 1 | 1 | | | |
| | 16 | 107 | | SECT | 1 | 1 | | | |
| 108 | 107 | 26 | | SECT | 2 | 2 | | | |
| | 26 | 36 | | SECT | 2 | 2 | | | |
| | 36 | 46 | | SECT | 2 | 2 | | | |
| | 46 | 56 | | SECT | 2 | 2 | | | |
| | 56 | 66 | | SECT | 2 | 2 | | | |
| | 66 | 76 | | SECT | 2 | 2 | | | |
| | 76 | 108 | | SECT | 2 | 2 | | | |
| 109 | 108 | 86 | | SECT | 1 | 1 | | | |
| | 86 | 133 | | SECT | 1 | 1 | | | |
| | 133 | 96 | | SECT | 1 | 1 | | | |
| 110 | 96 | 109 | | SECT | 11 | 3 | | | |
| | 109 | 110 | | SECT | 11 | 3 | | | |
| 111 | 111 | 112 | | SECT | 11 | 6 | | | |
| | 112 | 4 | | SECT | 11 | 6 | | | |
| 112 | 4 | 122 | | SECT | 1 | 4 | | | |
| | 122 | 14 | | SECT | 1 | 4 | | | |
| | 14 | 401 | | SECT | 1 | 4 | | | |
| | 401 | 113 | | SECT | 1 | 4 | | | |
| 113 | 113 | 24 | | SECT | 2 | 5 | | | |
| | 24 | 34 | | SECT | 2 | 5 | | | |
| | 34 | 44 | | SECT | 2 | 5 | | | |
| | 44 | 54 | | SECT | 2 | 5 | | | |
| | 54 | 64 | | SECT | 2 | 5 | | | |
| | 64 | 74 | | SECT | 2 | 5 | | | |
| | 74 | 114 | | SECT | 2 | 5 | | | |
| 114 | 114 | 411 | | SECT | 1 | 4 | | | |
| | 411 | 84 | | SECT | 1 | 4 | | | |
| | 84 | 124 | | SECT | 1 | 4 | | | |
| | 124 | 94 | | SECT | 1 | 4 | | | |
| 115 | 94 | 115 | | SECT | 11 | 6 | | | |

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**Structural Lines**

| Number | SPt-a | SPt-e | Ref | Type | SNo | Grp | Hinges-a | Hinges-e | Designation |
|---|---|---|---|---|---|---|---|---|---|
| 116 | 116 | 9 | | SECT | 11 | 6 | | | |
| 117 | 9 | 132 | | SECT | 1 | 4 | | | |
| | 132 | 19 | | SECT | 1 | 4 | | | |
| | 19 | 402 | | SECT | 1 | 4 | | | |
| | 402 | 117 | | SECT | 1 | 4 | | | |
| 118 | 117 | 29 | | SECT | 2 | 5 | | | |
| | 29 | 39 | | SECT | 2 | 5 | | | |
| | 39 | 49 | | SECT | 2 | 5 | | | |
| | 49 | 59 | | SECT | 2 | 5 | | | |
| | 59 | 69 | | SECT | 2 | 5 | | | |
| | 69 | 79 | | SECT | 2 | 5 | | | |
| | 79 | 118 | | SECT | 2 | 5 | | | |
| 119 | 118 | 412 | | SECT | 1 | 4 | | | |
| | 412 | 89 | | SECT | 1 | 4 | | | |
| | 89 | 134 | | SECT | 1 | 4 | | | |
| | 134 | 99 | | SECT | 1 | 4 | | | |
| 120 | 99 | 119 | | SECT | 11 | 6 | | | |
| | 119 | 120 | | SECT | 11 | 6 | | | |
| 121 | 101 | 111 | | SECT | 31 | 0 | | | |
| 122 | 102 | 112 | | SECT | 32 | 0 | | | |
| 123 | 105 | 115 | | SECT | 31 | 0 | | | |
| 124 | 106 | 116 | | SECT | 31 | 0 | | | |
| 125 | 109 | 119 | | SECT | 32 | 0 | | | |
| 126 | 110 | 120 | | SECT | 31 | 0 | | | |
| 201 | 10 | 206 | | SECT | 111 | 21 | | | |
| 202 | 206 | 205 | | SECT | 112 | 22 | | | |
| 203 | 205 | 204 | | SECT | 113 | 23 | | | |
| 204 | 204 | 304 | | SECT | 114 | 24 | | | |
| | 304 | 303 | | SECT | 114 | 24 | | | |
| | 303 | 302 | | SECT | 114 | 24 | | | |
| | 302 | 301 | | SECT | 114 | 24 | | | |
| | 301 | 203 | | SECT | 114 | 24 | | | |
| 205 | 203 | 202 | | SECT | 113 | 23 | | | |
| 206 | 202 | 201 | | SECT | 112 | 22 | | | |
| 207 | 201 | 5 | | SECT | 111 | 21 | | | |
| 211 | 15 | 211 | | SECT | 101 | 11 | | | |
| 212 | 211 | 212 | | SECT | 102 | 12 | | | |
| 213 | 212 | 213 | | SECT | 103 | 13 | | | |
| 214 | 213 | 311 | | SECT | 104 | 14 | | | |
| | 311 | 312 | | SECT | 104 | 14 | | | |
| | 312 | 313 | | SECT | 104 | 14 | | | |
| | 313 | 314 | | SECT | 104 | 14 | | | |
| | 314 | 214 | | SECT | 104 | 14 | | | |
| 215 | 214 | 215 | | SECT | 103 | 13 | | | |
| 216 | 215 | 216 | | SECT | 102 | 12 | | | |
| 217 | 216 | 20 | | SECT | 101 | 11 | | | |
| 221 | 25 | 221 | | SECT | 101 | 11 | | | |
| 222 | 221 | 222 | | SECT | 102 | 12 | | | |
| 223 | 222 | 223 | | SECT | 103 | 13 | | | |
| 224 | 223 | 321 | | SECT | 104 | 14 | | | |
| | 321 | 322 | | SECT | 104 | 14 | | | |
| | 322 | 323 | | SECT | 104 | 14 | | | |
| | 323 | 324 | | SECT | 104 | 14 | | | |
| | 324 | 224 | | SECT | 104 | 14 | | | |
| 225 | 224 | 225 | | SECT | 103 | 13 | | | |
| 226 | 225 | 226 | | SECT | 102 | 12 | | | |
| 227 | 226 | 30 | | SECT | 101 | 11 | | | |
| 231 | 35 | 231 | | SECT | 101 | 11 | | | |
| 232 | 231 | 232 | | SECT | 102 | 12 | | | |

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**Structural Lines**

| Number | SPt-a | SPt-e | Ref | Type | SNo | Grp | Hinges-a | Hinges-e | Designation |
|---|---|---|---|---|---|---|---|---|---|
| 233 | 232 | 233 | | SECT | 103 | 13 | | | |
| 234 | 233 | 331 | | SECT | 104 | 14 | | | |
| | 331 | 332 | | SECT | 104 | 14 | | | |
| | 332 | 333 | | SECT | 104 | 14 | | | |
| | 333 | 334 | | SECT | 104 | 14 | | | |
| | 334 | 234 | | SECT | 104 | 14 | | | |
| 235 | 234 | 235 | | SECT | 103 | 13 | | | |
| 236 | 235 | 236 | | SECT | 102 | 12 | | | |
| 237 | 236 | 40 | | SECT | 101 | 11 | | | |
| 241 | 45 | 241 | | SECT | 101 | 11 | | | |
| 242 | 241 | 242 | | SECT | 102 | 12 | | | |
| 243 | 242 | 243 | | SECT | 103 | 13 | | | |
| 244 | 243 | 341 | | SECT | 104 | 14 | | | |
| | 341 | 342 | | SECT | 104 | 14 | | | |
| | 342 | 343 | | SECT | 104 | 14 | | | |
| | 343 | 344 | | SECT | 104 | 14 | | | |
| | 344 | 244 | | SECT | 104 | 14 | | | |
| 245 | 244 | 245 | | SECT | 103 | 13 | | | |
| 246 | 245 | 246 | | SECT | 102 | 12 | | | |
| 247 | 246 | 50 | | SECT | 101 | 11 | | | |
| 251 | 55 | 251 | | SECT | 101 | 11 | | | |
| 252 | 251 | 252 | | SECT | 102 | 12 | | | |
| 253 | 252 | 253 | | SECT | 103 | 13 | | | |
| 254 | 253 | 351 | | SECT | 104 | 14 | | | |
| | 351 | 352 | | SECT | 104 | 14 | | | |
| | 352 | 353 | | SECT | 104 | 14 | | | |
| | 353 | 354 | | SECT | 104 | 14 | | | |
| | 354 | 254 | | SECT | 104 | 14 | | | |
| 255 | 254 | 255 | | SECT | 103 | 13 | | | |
| 256 | 255 | 256 | | SECT | 102 | 12 | | | |
| 257 | 256 | 60 | | SECT | 101 | 11 | | | |
| 261 | 65 | 261 | | SECT | 101 | 11 | | | |
| 262 | 261 | 262 | | SECT | 102 | 12 | | | |
| 263 | 262 | 263 | | SECT | 103 | 13 | | | |
| 264 | 263 | 361 | | SECT | 104 | 14 | | | |
| | 361 | 362 | | SECT | 104 | 14 | | | |
| | 362 | 363 | | SECT | 104 | 14 | | | |
| | 363 | 364 | | SECT | 104 | 14 | | | |
| | 364 | 264 | | SECT | 104 | 14 | | | |
| 265 | 264 | 265 | | SECT | 103 | 13 | | | |
| 266 | 265 | 266 | | SECT | 102 | 12 | | | |
| 267 | 266 | 70 | | SECT | 101 | 11 | | | |
| 271 | 75 | 271 | | SECT | 101 | 11 | | | |
| 272 | 271 | 272 | | SECT | 102 | 12 | | | |
| 273 | 272 | 273 | | SECT | 103 | 13 | | | |
| 274 | 273 | 371 | | SECT | 104 | 14 | | | |
| | 371 | 372 | | SECT | 104 | 14 | | | |
| | 372 | 373 | | SECT | 104 | 14 | | | |
| | 373 | 374 | | SECT | 104 | 14 | | | |
| | 374 | 274 | | SECT | 104 | 14 | | | |
| 275 | 274 | 275 | | SECT | 103 | 13 | | | |
| 276 | 275 | 276 | | SECT | 102 | 12 | | | |
| 277 | 276 | 80 | | SECT | 101 | 11 | | | |
| 281 | 85 | 281 | | SECT | 101 | 11 | | | |
| 282 | 281 | 282 | | SECT | 102 | 12 | | | |
| 283 | 282 | 283 | | SECT | 103 | 13 | | | |
| 284 | 283 | 381 | | SECT | 104 | 14 | | | |
| | 381 | 382 | | SECT | 104 | 14 | | | |
| | 382 | 383 | | SECT | 104 | 14 | | | |

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**Structural Lines**

| Number | SPt-a | SPt-e | Ref | Type | SNo | Grp | Hinges-a | Hinges-e | Designation |
|---|---|---|---|---|---|---|---|---|---|
| | 383 | 384 | | SECT | 104 | 14 | | | |
| | 384 | 284 | | SECT | 104 | 14 | | | |
| 285 | 284 | 285 | | SECT | 103 | 13 | | | |
| 286 | 285 | 286 | | SECT | 102 | 12 | | | |
| 287 | 286 | 90 | | SECT | 101 | 11 | | | |
| 291 | 95 | 291 | | SECT | 111 | 21 | | | |
| 292 | 291 | 292 | | SECT | 112 | 22 | | | |
| 293 | 292 | 293 | | SECT | 113 | 23 | | | |
| 294 | 293 | 391 | | SECT | 114 | 24 | | | |
| | 391 | 392 | | SECT | 114 | 24 | | | |
| | 392 | 393 | | SECT | 114 | 24 | | | |
| | 393 | 394 | | SECT | 114 | 24 | | | |
| | 394 | 294 | | SECT | 114 | 24 | | | |
| 295 | 294 | 295 | | SECT | 113 | 23 | | | |
| 296 | 295 | 296 | | SECT | 112 | 22 | | | |
| 297 | 296 | 100 | | SECT | 111 | 21 | | | |
| 301 | 301 | 311 | | SECT | 121 | 31 | | | |
| 302 | 302 | 312 | | SECT | 121 | 31 | | | |
| 303 | 303 | 313 | | SECT | 121 | 31 | | | |
| 304 | 304 | 314 | | SECT | 121 | 31 | | | |
| 311 | 311 | 321 | | SECT | 121 | 31 | | | |
| 312 | 312 | 322 | | SECT | 121 | 31 | | | |
| 313 | 313 | 323 | | SECT | 121 | 31 | | | |
| 314 | 314 | 324 | | SECT | 121 | 31 | | | |
| 321 | 321 | 331 | | SECT | 121 | 31 | | | |
| 322 | 322 | 332 | | SECT | 121 | 31 | | | |
| 323 | 323 | 333 | | SECT | 121 | 31 | | | |
| 324 | 324 | 334 | | SECT | 121 | 31 | | | |
| 331 | 331 | 341 | | SECT | 121 | 31 | | | |
| 332 | 332 | 342 | | SECT | 121 | 31 | | | |
| 333 | 333 | 343 | | SECT | 121 | 31 | | | |
| 334 | 334 | 344 | | SECT | 121 | 31 | | | |
| 341 | 341 | 351 | | SECT | 121 | 31 | | | |
| 342 | 342 | 352 | | SECT | 121 | 31 | | | |
| 343 | 343 | 353 | | SECT | 121 | 31 | | | |
| 344 | 344 | 354 | | SECT | 121 | 31 | | | |
| 351 | 351 | 361 | | SECT | 121 | 31 | | | |
| 352 | 352 | 362 | | SECT | 121 | 31 | | | |
| 353 | 353 | 363 | | SECT | 121 | 31 | | | |
| 354 | 354 | 364 | | SECT | 121 | 31 | | | |
| 361 | 361 | 371 | | SECT | 121 | 31 | | | |
| 362 | 362 | 372 | | SECT | 121 | 31 | | | |
| 363 | 363 | 373 | | SECT | 121 | 31 | | | |
| 364 | 364 | 374 | | SECT | 121 | 31 | | | |
| 371 | 371 | 381 | | SECT | 121 | 31 | | | |
| 372 | 372 | 382 | | SECT | 121 | 31 | | | |
| 373 | 373 | 383 | | SECT | 121 | 31 | | | |
| 374 | 374 | 384 | | SECT | 121 | 31 | | | |
| 381 | 381 | 391 | | SECT | 121 | 31 | | | |
| 382 | 382 | 392 | | SECT | 121 | 31 | | | |
| 383 | 383 | 393 | | SECT | 121 | 31 | | | |
| 384 | 384 | 394 | | SECT | 121 | 31 | | | |
| 401 | 302 | 1021 | | SECT | 131 | 41 | | | |
| | 1021 | 313 | | SECT | 131 | 41 | | | |
| 402 | 303 | 1021 | | SECT | 131 | 41 | | | |
| | 1021 | 312 | | SECT | 131 | 41 | | | |
| 411 | 312 | 1022 | | SECT | 131 | 41 | | | |
| | 1022 | 323 | | SECT | 131 | 41 | | | |
| 412 | 313 | 1022 | | SECT | 131 | 41 | | | |

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Pont Carretera Vic

**Structural Lines**

| Number | SPt-a | SPt-e | Ref | Type | SNo | Grp | Hinges-a | Hinges-e | Designation |
|---|---|---|---|---|---|---|---|---|---|
| | 1022 | 322 | | SECT | 131 | 41 | | | |
| 413 | 312 | 1023 | | SECT | 131 | 42 | | | |
| | 1023 | 321 | | SECT | 131 | 42 | | | |
| 414 | 311 | 1023 | | SECT | 131 | 42 | | | |
| | 1023 | 322 | | SECT | 131 | 42 | | | |
| 415 | 313 | 1024 | | SECT | 131 | 42 | | | |
| | 1024 | 324 | | SECT | 131 | 42 | | | |
| 416 | 314 | 1024 | | SECT | 131 | 42 | | | |
| | 1024 | 323 | | SECT | 131 | 42 | | | |
| 417 | 403 | 311 | | SECT | 131 | 42 | | | |
| 418 | 403 | 321 | | SECT | 131 | 42 | | | |
| 419 | 404 | 314 | | SECT | 131 | 42 | | | |
| 420 | 404 | 324 | | SECT | 131 | 42 | | | |
| 421 | 322 | 1025 | | SECT | 131 | 41 | | | |
| | 1025 | 333 | | SECT | 131 | 41 | | | |
| 422 | 323 | 1025 | | SECT | 131 | 41 | | | |
| | 1025 | 332 | | SECT | 131 | 41 | | | |
| 431 | 332 | 1026 | | SECT | 131 | 41 | | | |
| | 1026 | 343 | | SECT | 131 | 41 | | | |
| 432 | 333 | 1026 | | SECT | 131 | 41 | | | |
| | 1026 | 342 | | SECT | 131 | 41 | | | |
| 441 | 342 | 1027 | | SECT | 131 | 41 | | | |
| | 1027 | 353 | | SECT | 131 | 41 | | | |
| 442 | 343 | 1027 | | SECT | 131 | 41 | | | |
| | 1027 | 352 | | SECT | 131 | 41 | | | |
| 451 | 352 | 1028 | | SECT | 131 | 41 | | | |
| | 1028 | 363 | | SECT | 131 | 41 | | | |
| 452 | 353 | 1028 | | SECT | 131 | 41 | | | |
| | 1028 | 362 | | SECT | 131 | 41 | | | |
| 461 | 362 | 1029 | | SECT | 131 | 41 | | | |
| | 1029 | 373 | | SECT | 131 | 41 | | | |
| 462 | 363 | 1029 | | SECT | 131 | 41 | | | |
| | 1029 | 372 | | SECT | 131 | 41 | | | |
| 471 | 372 | 1030 | | SECT | 131 | 41 | | | |
| | 1030 | 383 | | SECT | 131 | 41 | | | |
| 472 | 373 | 1030 | | SECT | 131 | 41 | | | |
| | 1030 | 382 | | SECT | 131 | 41 | | | |
| 473 | 372 | 1031 | | SECT | 131 | 42 | | | |
| | 1031 | 381 | | SECT | 131 | 42 | | | |
| 474 | 371 | 1031 | | SECT | 131 | 42 | | | |
| | 1031 | 382 | | SECT | 131 | 42 | | | |
| 475 | 373 | 1032 | | SECT | 131 | 42 | | | |
| | 1032 | 384 | | SECT | 131 | 42 | | | |
| 476 | 374 | 1032 | | SECT | 131 | 42 | | | |
| | 1032 | 383 | | SECT | 131 | 42 | | | |
| 477 | 413 | 371 | | SECT | 131 | 42 | | | |
| 478 | 413 | 381 | | SECT | 131 | 42 | | | |
| 479 | 414 | 374 | | SECT | 131 | 42 | | | |
| 480 | 414 | 384 | | SECT | 131 | 42 | | | |
| 481 | 382 | 1033 | | SECT | 131 | 41 | | | |
| | 1033 | 393 | | SECT | 131 | 41 | | | |
| 482 | 383 | 1033 | | SECT | 131 | 41 | | | |
| | 1033 | 392 | | SECT | 131 | 41 | | | |
| 501 | 4 | 501 | | SECT | 132 | 43 | | | |
| 502 | 501 | 1034 | | SECT | 132 | 43 | | | |
| | 1034 | 504 | | SECT | 132 | 43 | | | |
| 503 | 504 | 39 | | SECT | 132 | 43 | | | |
| 504 | 9 | 502 | | SECT | 132 | 43 | | | |
| 505 | 502 | 1034 | | SECT | 132 | 43 | | | |

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**Structural Lines**

| Number | SPt-a | SPt-e | Ref | Type | SNo | Grp | Hinges-a | Hinges-e | Designation |
|---|---|---|---|---|---|---|---|---|---|
| | 1034 | 503 | | SECT | 132 | 43 | | | |
| 506 | 503 | 34 | | SECT | 132 | 43 | | | |
| 511 | 34 | 511 | | SECT | 132 | 43 | | | |
| 512 | 511 | 1035 | | SECT | 132 | 43 | | | |
| | 1035 | 514 | | SECT | 132 | 43 | | | |
| 513 | 514 | 69 | | SECT | 132 | 43 | | | |
| 514 | 39 | 512 | | SECT | 132 | 43 | | | |
| 515 | 512 | 1035 | | SECT | 132 | 43 | | | |
| | 1035 | 513 | | SECT | 132 | 43 | | | |
| 516 | 513 | 64 | | SECT | 132 | 43 | | | |
| 521 | 64 | 521 | | SECT | 132 | 43 | | | |
| 522 | 521 | 1036 | | SECT | 132 | 43 | | | |
| | 1036 | 524 | | SECT | 132 | 43 | | | |
| 523 | 524 | 99 | | SECT | 132 | 43 | | | |
| 524 | 69 | 522 | | SECT | 132 | 43 | | | |
| 525 | 522 | 1036 | | SECT | 132 | 43 | | | |
| | 1036 | 523 | | SECT | 132 | 43 | | | |
| 526 | 523 | 94 | | SECT | 132 | 43 | | | |

SPt-a,SPt-e structural point start / end — SNo section number
Ref reference line, reference axis — Grp primary group number
Type element type

**Structural Areas**

| Number | Grp | Mat | MRf | t[mm] | Kind | locX | dX[-] | dY[-] | dZ[-] | dRot[°] | Designation |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 1 | | 10.0 | | SURF | | | | | |
| 2 | 3 | 1 | | 10.0 | | SURF | | | | | |
| 3 | 3 | 1 | | 10.0 | | SURF | | | | | |
| 4 | 3 | 1 | | 10.0 | | SURF | | | | | |

Grp primary group number — locX direction of the local x axis
Mat material number — dX[-],dY[-],dZ[-] explicit components of the direction
MRf reinforcement material number — dRot[°] additional rotation about beam axis
t[mm] thickness

**Groups**

| Grp | Number | Type | min-no | max-no | Designation |
|---|---|---|---|---|---|
| 0 | 36 | BEAM | 1 | 36 | |
| 1 | 20 | BEAM | 100001 | 100020 | C. Sup |
| 2 | 24 | BEAM | 200001 | 200024 | C. Sup Reforzado |
| 3 | 16 | BEAM | 300001 | 300016 | C. Sup Ext |
| | 152 | QUAD | 300001 | 300152 | |
| | 168 | base | 300000 | 399999 | |
| 4 | 24 | BEAM | 400001 | 400024 | C. Inf |
| 5 | 24 | BEAM | 500001 | 500024 | C. Inf Reforzado |
| 6 | 16 | BEAM | 600001 | 600016 | C. Inf Ext |
| 7 | 56 | BEAM | 700001 | 700056 | |
| 8 | 88 | BEAM | 800001 | 800088 | |
| 9 | 16 | BEAM | 900001 | 900016 | |
| 11 | 16 | BEAM | 1100001 | 1100016 | Vigas transversales |
| 12 | 16 | BEAM | 1200001 | 1200016 | Vigas transversales |
| 13 | 16 | BEAM | 1300001 | 1300016 | Vigas transversales |
| 14 | 56 | BEAM | 1400001 | 1400056 | Vigas transversales |
| 21 | 4 | BEAM | 2100001 | 2100004 | Vigas diafragma |
| 22 | 4 | BEAM | 2200001 | 2200004 | Vigas diafragma |
| 23 | 4 | BEAM | 2300001 | 2300004 | Vigas diafragma |
| 24 | 14 | BEAM | 2400001 | 2400014 | Vigas diafragma |
| 31 | 72 | BEAM | 3100001 | 3100072 | Largueros |
| 41 | 72 | BEAM | 4100001 | 4100072 | Arr. Contraviento |
| 42 | 32 | BEAM | 4200001 | 4200032 | Arr. Frenado |
| 43 | 60 | BEAM | 4300001 | 4300060 | Arr. Antiguo |
| 51 | 4 | SPRI | 5100001 | 5100004 | |
| 52 | 4 | SPRI | 5200001 | 5200004 | |

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**Groups**

| Grp | Number | Type | min-no | max-no | Designation |
|---|---|---|---|---|---|
| 53 | 4 | SPRI | 5300001 | 5300004 | |

Grp primary group number — Type element type
Number number of elements within group — min-no,max-no minimum/maximum element number

**Summary of beam elements**

**Groups**

| Grp | TotLength [m] | Max.Length [m] | TotVolume [m3] | TotWeight [t] | Surface [m2] |
|---|---|---|---|---|---|
| 0 | 12.012 | 0.411 | 0.105 | 0.882 | 18.531 |
| 1 | 11.960 | 1.170 | 0.240 | 2.022 | 40.903 |
| 2 | 20.800 | 0.910 | 0.522 | 4.406 | 87.360 |
| 3 | 3.040 | 0.272 | 0.048 | 0.401 | 7.722 |
| 4 | 11.960 | 0.910 | 0.240 | 2.022 | 40.903 |
| 5 | 20.800 | 0.910 | 0.522 | 4.406 | 87.360 |
| 6 | 3.040 | 0.257 | 0.048 | 0.401 | 7.722 |
| 7 | 32.968 | 0.820 | 0.347 | 2.929 | 67.588 |
| 8 | 97.402 | 1.353 | 0.883 | 7.450 | 140.000 |
| 9 | 7.072 | 0.442 | 0.054 | 0.452 | 10.705 |
| 11 | 8.000 | 0.500 | 0.198 | 1.671 | 32.480 |
| 12 | 8.800 | 0.550 | 0.269 | 2.269 | 45.936 |
| 13 | 4.800 | 0.300 | 0.161 | 1.355 | 25.056 |
| 14 | 48.000 | 1.060 | 1.745 | 14.724 | 278.400 |
| 21 | 2.000 | 0.500 | 0.045 | 0.381 | 7.240 |
| 22 | 2.200 | 0.550 | 0.062 | 0.526 | 10.516 |
| 23 | 1.200 | 0.300 | 0.038 | 0.316 | 5.736 |
| 24 | 12.000 | 1.060 | 0.410 | 3.458 | 64.320 |
| 31 | 65.520 | 0.910 | 0.820 | 6.922 | 138.902 |
| 41 | 61.934 | 0.860 | 0.121 | 1.024 | 34.683 |
| 42 | 33.643 | 1.053 | 0.066 | 0.556 | 18.840 |
| 43 | 62.137 | 1.151 | 0.154 | 1.300 | 29.205 |
| Sum | 531.288 | | 7.095 | 59.872 | 1200.107 |

Grp primary group number

**Summary of quadrilateral elements**

**Groups**

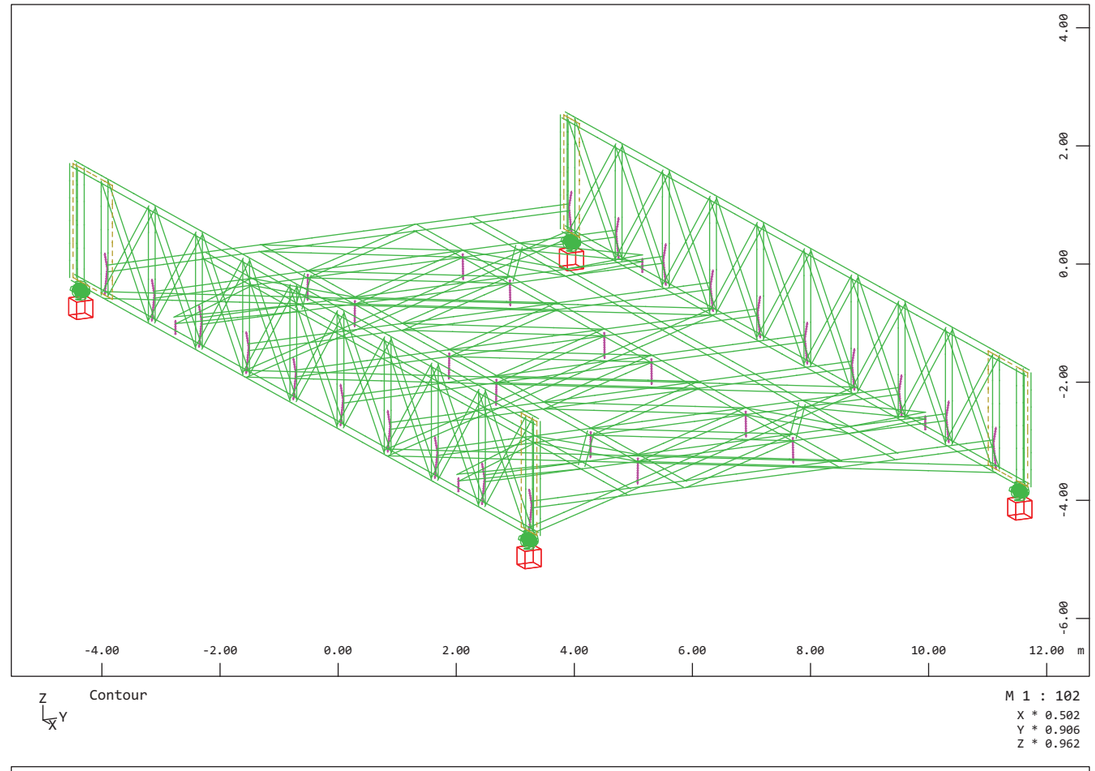
| Grp | TotArea [m2] | TotVolume [m3] | TotWeight [t] | Material |
|---|---|---|---|---|
| 3 | 8.488 | 0.085 | 0.716 | 1 |
| Sum | 8.488 | 0.085 | 0.716 | |

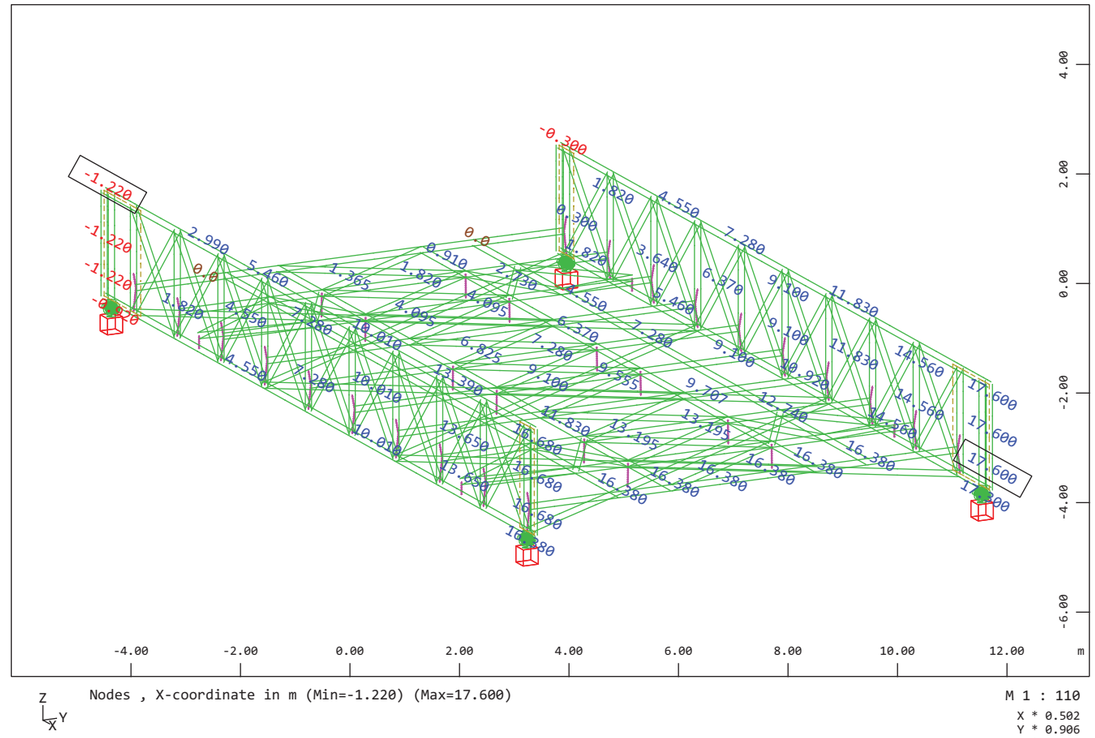
Grp primary group number

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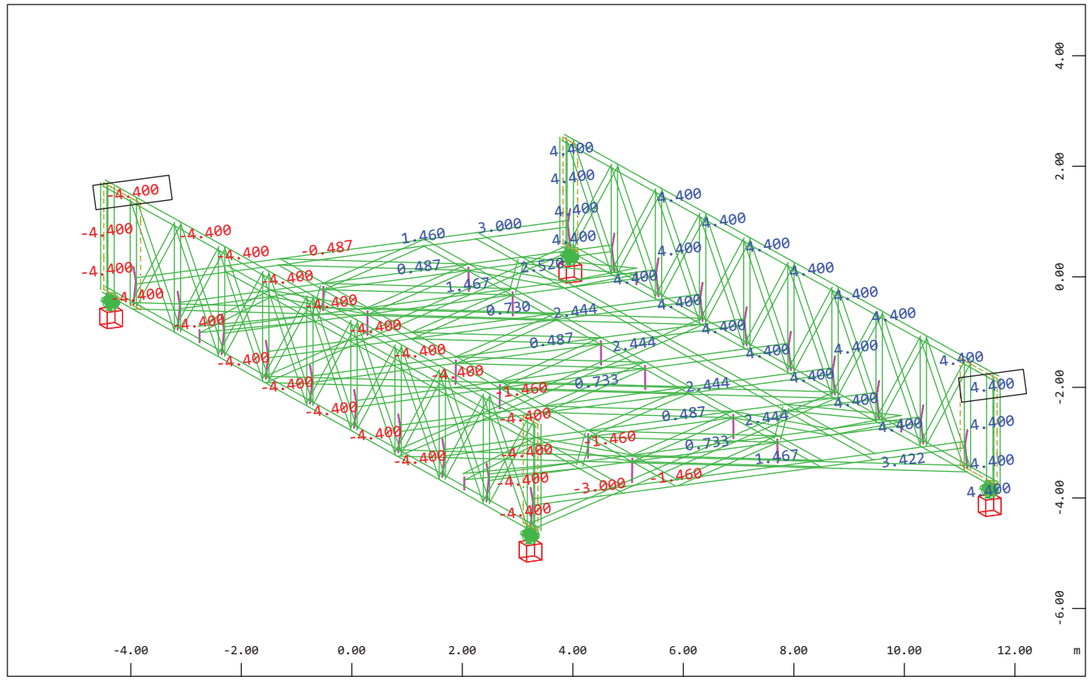
Pont Carretera Vic
Modelo

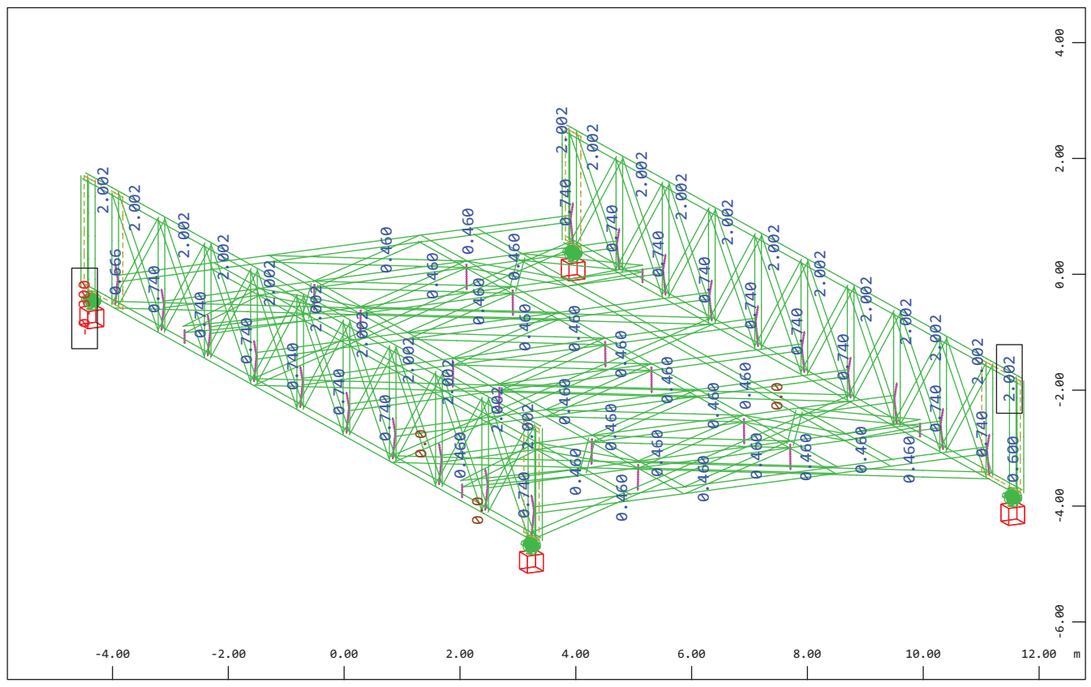



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Pont Carretera Vic
Modelo

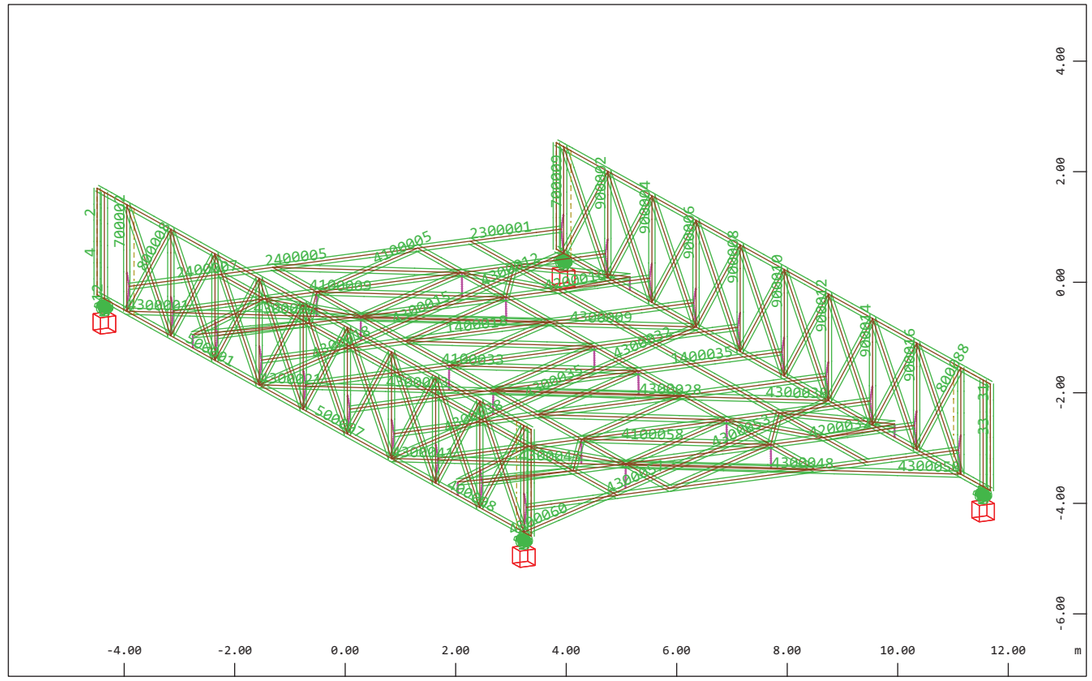


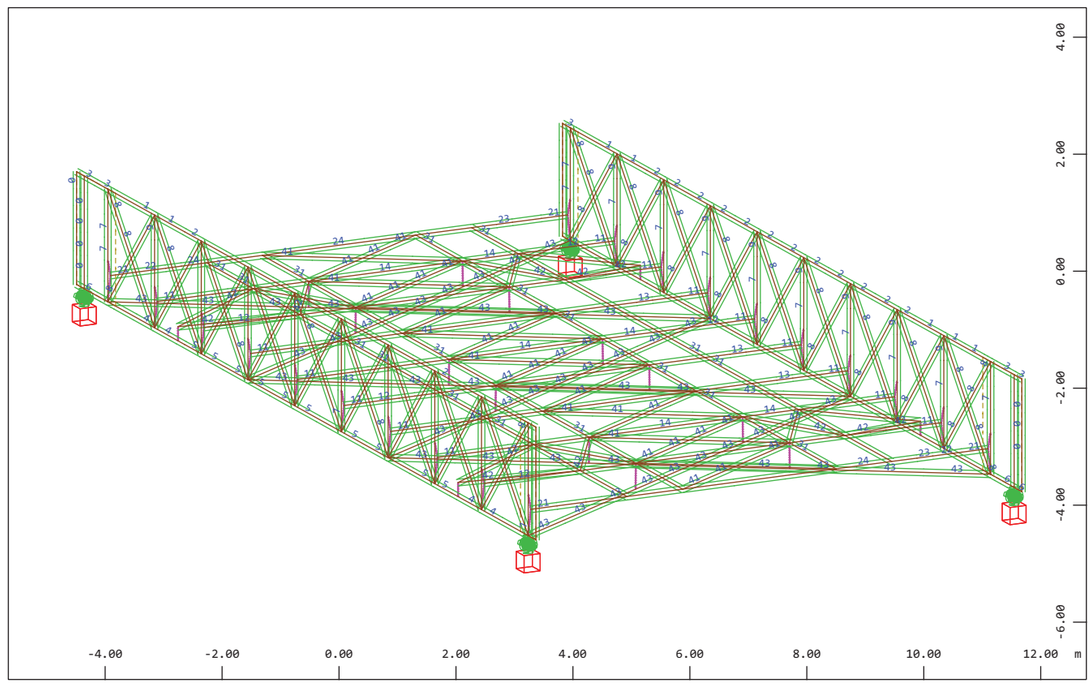




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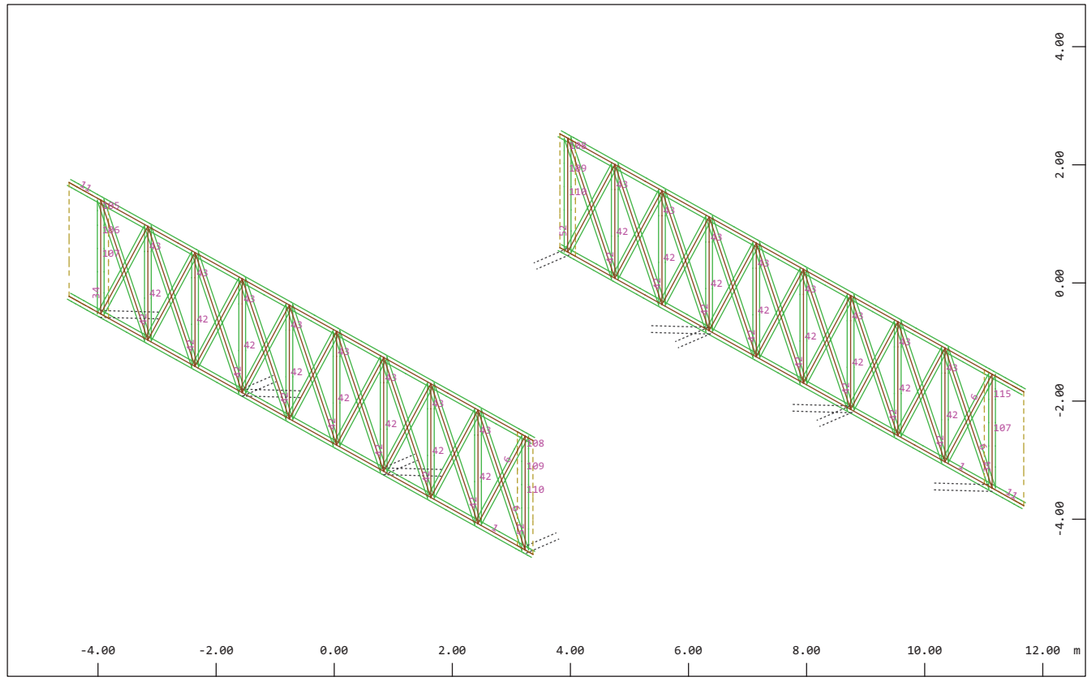
Pont Carretera Vic
Modelo



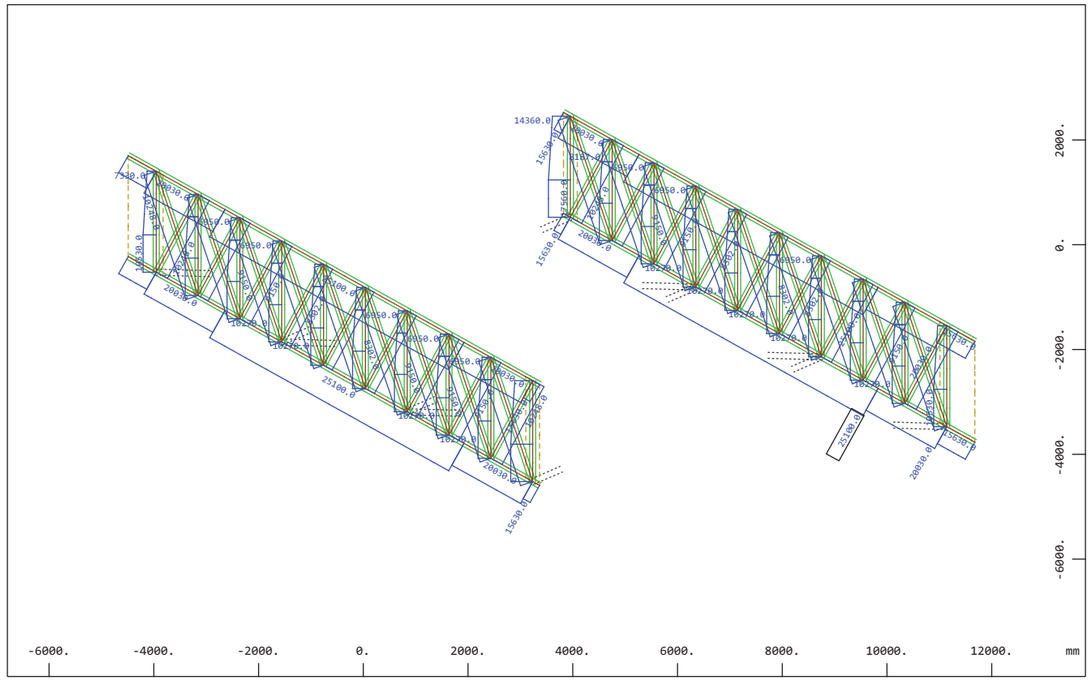

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Pont Carretera Vic
Modelo




Sector of system Group 1...9
Beam Elements , Numbers of cross section (Max=115)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962



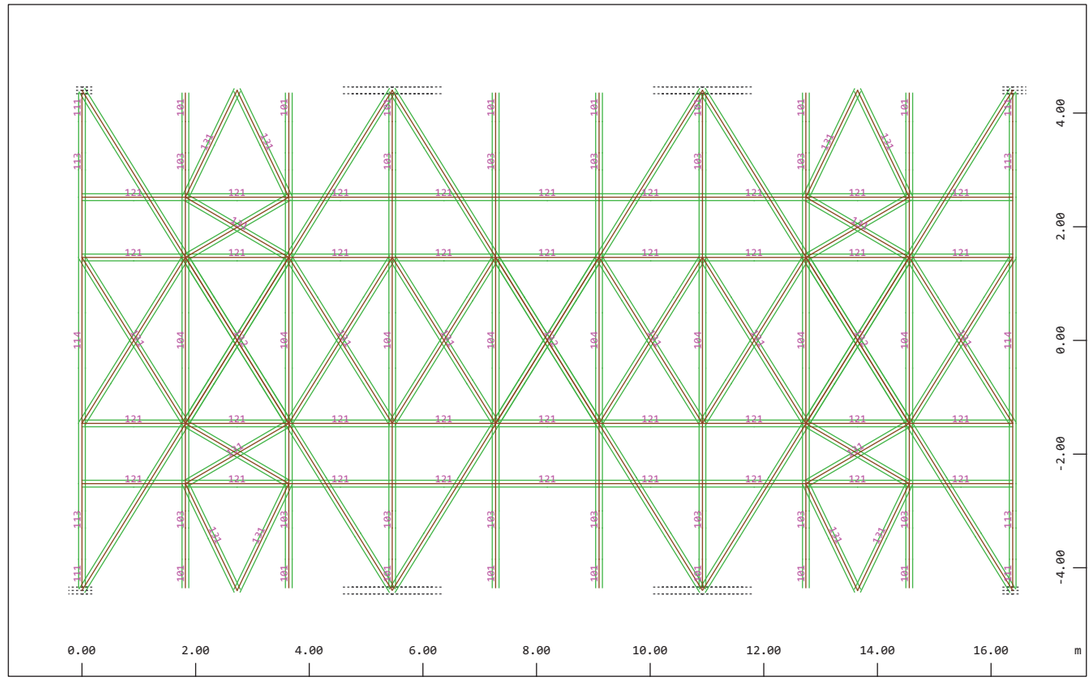

Sector of system Group 1...9
Beam Elements , Gross section Sectional Area, 1 cm 3D = 42813 mm2 (Max=25100.0)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

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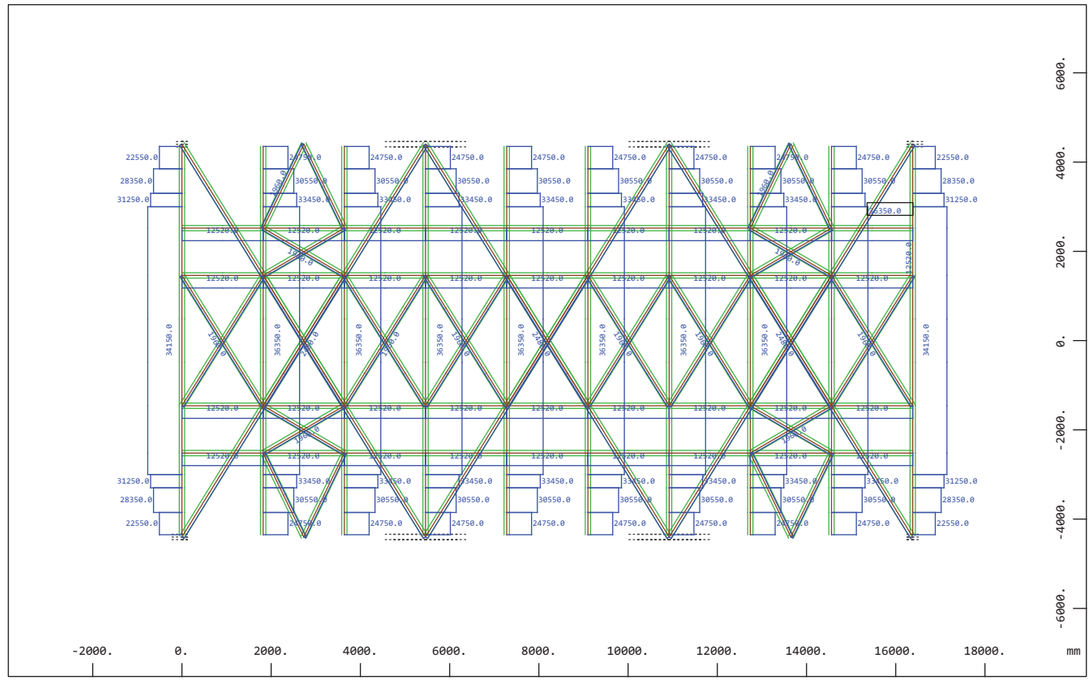


Pont Carretera Vic
Modelo




Sector of system Beam Elements Group 11...14 21...24 31 41...43
Beam Elements , Numbers of cross section (Max=132)

M 1 : 106




Sector of system Beam Elements Group 11...14 21...24 31 41...43
Beam Elements , Gross section Sectional Area, 1 cm 3D = 47188 mm2 (Max=36350.0)

M 1 : 135

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Pont Carretera Vic
Peso Propio Original

**Elementgroups**

| No. | Fac-S | Fac-B | Fac-L | LC-P |
|---|---|---|---|---|
| 0 | 1.000 | 1.000 | 1.000 | 0 |
| 1 | 1.000 | 1.000 | 1.000 | 0 |
| 2 | 1.000 | 1.000 | 1.000 | 0 |
| 3 | 1.000 | 1.000 | 1.000 | 0 |
| 4 | 1.000 | 1.000 | 1.000 | 0 |
| 5 | 1.000 | 1.000 | 1.000 | 0 |
| 6 | 1.000 | 1.000 | 1.000 | 0 |
| 7 | 1.000 | 1.000 | 1.000 | 0 |
| 8 | 1.000 | 1.000 | 1.000 | 0 |
| 9 | 1.000 | 1.000 | 1.000 | 0 |
| 11 | 1.000 | 1.000 | 1.000 | 0 |
| 12 | 1.000 | 1.000 | 1.000 | 0 |
| 13 | 1.000 | 1.000 | 1.000 | 0 |
| 14 | 1.000 | 1.000 | 1.000 | 0 |
| 21 | 1.000 | 1.000 | 1.000 | 0 |
| 22 | 1.000 | 1.000 | 1.000 | 0 |
| 23 | 1.000 | 1.000 | 1.000 | 0 |
| 24 | 1.000 | 1.000 | 1.000 | 0 |
| 31 | 1.000 | 1.000 | 1.000 | 0 |
| 41 | 1.000 | 1.000 | 1.000 | 0 |
| 42 | 1.000 | 1.000 | 1.000 | 0 |
| 43 | 1.000 | 1.000 | 1.000 | 0 |
| 51 | 1.000 | 1.000 | 1.000 | 0 |
| 52 | 1.000 | 1.000 | 1.000 | 0 |
| 53 | 1.000 | 1.000 | 1.000 | 0 |

No. group number
Fac-S factor stiffness
Fac-B factor stiffness quad bedding
Fac-L factor loads from primary stress state
LC-P primary loadcase

**Load Case 1 (G_1 ) Peso Propio**

| | | |
|---|---|---|
| Factor forces and moments | | 1.000 |
| Factor dead weight | DL-ZZ | -1.000 |
| unfavourable partial safety factor | | 1.350 |
| favourable partial safety factor | | 1.000 |
| Combination coefficient | $\psi_0$ | 1.000 (rare) |
| Combination coefficient | $\psi_1$inf | 1.000 (infrequent) |
| Combination coefficient | $\psi_1$ | 1.000 (frequent) |
| Combination coefficient | $\psi_2$ | 1.000 (permanent) |

**Sum of Loadings**

| Loadcase | Σ(Loads) | | | Designation |
|---|---|---|---|---|
| | X[kN] | Y[kN] | Z[kN] | |
| 1 | 0.0 | 0.0 | -605.9 | Peso Propio |

**Sum of Reactions and Loadings**

| Loadcase | Σ(Reactions) | | | Designation |
|---|---|---|---|---|
| | X[kN] | Y[kN] | Z[kN] | |
| | Σ(Loads) | | | |
| 1 | 0.0 | 0.0 | 605.9 | Peso Propio |
| | 0.0 | 0.0 | -605.9 | |

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Pont Carretera Vic
Cargas permanentes

**Actions**

| type | part | sup | Designation | γ-u | γ-f | γ-a | $\psi_0$ | $\psi_1$ | $\psi_2$ | $\psi_1$inf |
|---|---|---|---|---|---|---|---|---|---|---|
| C_1 | G | perm | Fluencia t_0 | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C_2 | G | cond | Fluencia t_inf | 1.35 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G | G | perm | dead load | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G_1 | G | perm | Peso propio | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G_2 | G | perm | | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G_3 | G | perm | Firme | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PP | G | perm | Peso propio | 1.35 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C | P | perm | creep + shrinkage | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| CL_1 | Q | exex | V+SC | 1.50 | 0.00 | 1.00 | 1.00 | 0.33 | 0.00 | 0.33 |
| GR_1 | Q | exex | grp1 | 1.35 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| GR_2 | Q | exex | grp2 | 1.35 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| GR_6 | Q | exex | grp1f | 1.35 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| L1_T | Q | excl | gr1a LM1 TS | 1.35 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 |
| L1_U | Q | excl | gr1a LM1 UDL | 1.35 | 0.00 | 0.00 | 0.40 | 0.40 | 0.00 | 0.40 |
| LL_1 | Q | excl | LL-Serie 254 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_2 | Q | excl | LL-Serie 257 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_3 | Q | excl | LL-Tolva 62000 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_4 | Q | excl | LL-2x254 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_5 | Q | excl | LL-2x257 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_6 | Q | excl | LL-2xtolvas | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_7 | Q | excl | LL-254+tolvas | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_8 | Q | excl | LL-257+tolvas | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | Reliability factor Kfi | 1.000 | | | | | | |
| | | | Reduction factor xsi | 0.850 | | | | | | |

type action γ-u,γ-f,γ-a partial safety factors for unfavourable/favourable/accidental
part partition of the action $\psi_0,\psi_1,\psi_2,\psi_1$inf combination coefficients
sup superposition type

**Load Case 12 Material via**

Factor forces and moments 1.000

**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[mm] | za[mm] | ye[mm] | ze[mm] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3100001 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100002 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100003 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100004 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100005 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100006 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100007 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100008 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100009 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100010 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100011 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100012 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100013 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100014 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100015 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100016 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100017 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100018 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100019 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100020 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100021 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100022 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100023 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100024 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100025 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100026 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |

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**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[mm] | za[mm] | ye[mm] | ze[mm] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3100027 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100028 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100029 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100030 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100031 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100032 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100033 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100034 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100035 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100036 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100037 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100038 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100039 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100040 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100041 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100042 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100043 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100044 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100045 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100046 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100047 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100048 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100049 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100050 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100051 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100052 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100053 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100054 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100055 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100056 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100057 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100058 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100059 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100060 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100061 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100062 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100063 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100064 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100065 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100066 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100067 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100068 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100069 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100070 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100071 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |
| 3100072 | PG | 0.000 | 0.910 | 2.60 | | [kN/m] | | | | | |

**Load Case 13 P. Servicio**

Factor forces and moments 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Line | qgrp -mult- | | | 0.000 | 3.960 | 0.460 | PG | 0.52 [kN/m] |
| | | | | 0.000 | 3.080 | 0.460 | | 0.52 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 0.000 | -3.960 | 0.460 | PG | 0.52 [kN/m] |
| | | | | 0.000 | -3.080 | 0.460 | | 0.52 [kN/m] |

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 1.820 | 3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 1.820 | 3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 1.820 | -3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 1.820 | -3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 3.640 | 3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 3.640 | 3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 3.640 | -3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 3.640 | -3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 5.460 | 3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 5.460 | 3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 5.460 | -3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 5.460 | -3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 7.280 | 3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 7.280 | 3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 7.280 | -3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 7.280 | -3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 9.100 | 3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 9.100 | 3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 9.100 | -3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 9.100 | -3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 10.920 | 3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 10.920 | 3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 10.920 | -3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 10.920 | -3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 12.740 | 3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 12.740 | 3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 12.740 | -3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 12.740 | -3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 14.560 | 3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 14.560 | 3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 14.560 | -3.960 | 0.460 | PG | 1.03 [kN/m] |
| | | | | 14.560 | -3.080 | 0.460 | | 1.03 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 16.380 | 3.960 | 0.460 | PG | 0.52 [kN/m] |
| | | | | 16.380 | 3.080 | 0.460 | | 0.52 [kN/m] |
| | | | | | | activated | | 100.00 percent |
| Line | qgrp -mult- | | | 16.380 | -3.960 | 0.460 | PG | 0.52 [kN/m] |
| | | | | 16.380 | -3.080 | 0.460 | | 0.52 [kN/m] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 14 Canalizaciones**

Factor forces and moments 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | sln 1072 | | | 0.000 | 0.000 | 0.460 | PG | 1.4 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | sln 1128 | | | 1.820 | 0.000 | 0.460 | PG | 2.7 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | sln 1130 | | | 3.640 | 0.000 | 0.460 | PG | 2.7 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | sln 1132 | | | 5.460 | 0.000 | 0.460 | PG | 2.7 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | sln 1134 | | | 7.280 | 0.000 | 0.460 | PG | 2.7 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | sln 1136 | | | 9.100 | 0.000 | 0.460 | PG | 2.7 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | sln 1138 | | | 10.920 | 0.000 | 0.460 | PG | 2.7 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | sln 1140 | | | 12.740 | 0.000 | 0.460 | PG | 2.7 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | sln 1142 | | | 14.560 | 0.000 | 0.460 | PG | 2.7 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | sln 1144 | | | 16.380 | 0.000 | 0.460 | PG | 1.4 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 15 P tramex**

Factor forces and moments 1.000

**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[mm] | za[mm] | ye[mm] | ze[mm] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1100001 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100002 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100003 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100004 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100005 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100006 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100007 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100008 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100009 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100010 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100011 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100012 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100013 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100014 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100015 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1100016 | PG | 0.000 | 0.500 | 0.50 | | [kN/m] | | | | | |
| 1200001 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200002 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200003 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200004 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200005 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200006 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200007 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200008 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200009 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200010 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200011 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200012 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |

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**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[mm] | za[mm] | ye[mm] | ze[mm] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1200013 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200014 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200015 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1200016 | PG | 0.000 | 0.550 | 0.50 | | [kN/m] | | | | | |
| 1300001 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300002 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300003 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300004 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300005 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300006 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300007 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300008 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300009 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300010 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300011 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300012 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300013 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300014 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300015 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1300016 | PG | 0.000 | 0.300 | 0.50 | | [kN/m] | | | | | |
| 1400001 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400002 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400003 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400004 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400005 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400006 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400007 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400008 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400009 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400010 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400011 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400012 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400013 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400014 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400015 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400016 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400017 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400018 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400019 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400020 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400021 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400022 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400023 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400024 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400025 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400026 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400027 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400028 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400029 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400030 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400031 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400032 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400033 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400034 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400035 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400036 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400037 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400038 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |

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Pont Carretera Vic
Cargas permanentes

**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[mm] | za[mm] | ye[mm] | ze[mm] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1400039 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400040 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400041 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400042 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400043 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400044 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400045 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400046 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400047 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400048 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400049 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400050 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 1400051 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400052 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400053 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400054 | PG | 0.000 | 0.973 | 0.50 | | [kN/m] | | | | | |
| 1400055 | PG | 0.000 | 1.060 | 0.50 | | [kN/m] | | | | | |
| 1400056 | PG | 0.000 | 0.480 | 0.50 | | [kN/m] | | | | | |
| 2100001 | PG | 0.000 | 0.500 | 0.25 | | [kN/m] | | | | | |
| 2100002 | PG | 0.000 | 0.500 | 0.25 | | [kN/m] | | | | | |
| 2100003 | PG | 0.000 | 0.500 | 0.25 | | [kN/m] | | | | | |
| 2100004 | PG | 0.000 | 0.500 | 0.25 | | [kN/m] | | | | | |
| 2200001 | PG | 0.000 | 0.550 | 0.25 | | [kN/m] | | | | | |
| 2200002 | PG | 0.000 | 0.550 | 0.25 | | [kN/m] | | | | | |
| 2200003 | PG | 0.000 | 0.550 | 0.25 | | [kN/m] | | | | | |
| 2200004 | PG | 0.000 | 0.550 | 0.25 | | [kN/m] | | | | | |
| 2300001 | PG | 0.000 | 0.300 | 0.25 | | [kN/m] | | | | | |
| 2300002 | PG | 0.000 | 0.300 | 0.25 | | [kN/m] | | | | | |
| 2300003 | PG | 0.000 | 0.300 | 0.25 | | [kN/m] | | | | | |
| 2300004 | PG | 0.000 | 0.300 | 0.25 | | [kN/m] | | | | | |
| 2400001 | PG | 0.000 | 0.480 | 0.25 | | [kN/m] | | | | | |
| 2400002 | PG | 0.000 | 1.060 | 0.25 | | [kN/m] | | | | | |
| 2400003 | PG | 0.000 | 0.973 | 0.25 | | [kN/m] | | | | | |
| 2400004 | PG | 0.000 | 0.973 | 0.25 | | [kN/m] | | | | | |
| 2400005 | PG | 0.000 | 0.973 | 0.25 | | [kN/m] | | | | | |
| 2400006 | PG | 0.000 | 1.060 | 0.25 | | [kN/m] | | | | | |
| 2400007 | PG | 0.000 | 0.480 | 0.25 | | [kN/m] | | | | | |
| 2400008 | PG | 0.000 | 0.480 | 0.25 | | [kN/m] | | | | | |
| 2400009 | PG | 0.000 | 1.060 | 0.25 | | [kN/m] | | | | | |
| 2400010 | PG | 0.000 | 0.973 | 0.25 | | [kN/m] | | | | | |
| 2400011 | PG | 0.000 | 0.973 | 0.25 | | [kN/m] | | | | | |
| 2400012 | PG | 0.000 | 0.973 | 0.25 | | [kN/m] | | | | | |
| 2400013 | PG | 0.000 | 1.060 | 0.25 | | [kN/m] | | | | | |
| 2400014 | PG | 0.000 | 0.480 | 0.25 | | [kN/m] | | | | | |

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**Elementgroups**

| No. | Fac-S | Fac-B | Fac-L | LC-P |
|---|---|---|---|---|
| 0 | 1.000 | 1.000 | 1.000 | 0 |
| 1 | 1.000 | 1.000 | 1.000 | 0 |
| 2 | 1.000 | 1.000 | 1.000 | 0 |
| 3 | 1.000 | 1.000 | 1.000 | 0 |
| 4 | 1.000 | 1.000 | 1.000 | 0 |
| 5 | 1.000 | 1.000 | 1.000 | 0 |
| 6 | 1.000 | 1.000 | 1.000 | 0 |
| 7 | 1.000 | 1.000 | 1.000 | 0 |
| 8 | 1.000 | 1.000 | 1.000 | 0 |
| 9 | 1.000 | 1.000 | 1.000 | 0 |
| 11 | 1.000 | 1.000 | 1.000 | 0 |
| 12 | 1.000 | 1.000 | 1.000 | 0 |
| 13 | 1.000 | 1.000 | 1.000 | 0 |
| 14 | 1.000 | 1.000 | 1.000 | 0 |
| 21 | 1.000 | 1.000 | 1.000 | 0 |
| 22 | 1.000 | 1.000 | 1.000 | 0 |
| 23 | 1.000 | 1.000 | 1.000 | 0 |
| 24 | 1.000 | 1.000 | 1.000 | 0 |
| 31 | 1.000 | 1.000 | 1.000 | 0 |
| 41 | 1.000 | 1.000 | 1.000 | 0 |
| 42 | 1.000 | 1.000 | 1.000 | 0 |
| 43 | 1.000 | 1.000 | 1.000 | 0 |
| 51 | 1.000 | 1.000 | 1.000 | 0 |
| 52 | 1.000 | 1.000 | 1.000 | 0 |
| 53 | 1.000 | 1.000 | 1.000 | 0 |

No. group number
Fac-S factor stiffness
Fac-B factor stiffness quad bedding
Fac-L factor loads from primary stress state
LC-P primary loadcase

**Load Case 12 Material via**
Factor forces and moments 1.000

**Load Case 13 P. Servicio**
Factor forces and moments 1.000

**Load Case 14 Canalizaciones**
Factor forces and moments 1.000

**Load Case 15 P tramex**
Factor forces and moments 1.000

**Sum of Loadings**

| Loadcase | Σ(Loads) | | | Designation |
|---|---|---|---|---|
| | X[kN] | Y[kN] | Z[kN] | |
| 12 | 0.0 | 0.0 | -170.4 | Material via |
| 13 | 0.0 | 0.0 | -16.4 | P. Servicio |
| 14 | 0.0 | 0.0 | -24.3 | Canalizaciones |
| 15 | 0.0 | 0.0 | -39.1 | P tramex |

**Sum of Reactions and Loadings**

| Loadcase | Σ(Reactions) | | | Designation |
|---|---|---|---|---|
| | X[kN] | Y[kN] | Z[kN] | |
| | Σ(Loads) | | | |
| 12 | 0.0 | 0.0 | 170.4 | Material via |
| | 0.0 | 0.0 | -170.4 | |
| 13 | 0.0 | 0.0 | 16.4 | P. Servicio |
| | 0.0 | 0.0 | -16.4 | |

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**Sum of Reactions and Loadings**

| Loadcase | Σ(Reactions) | | | Designation |
|---|---|---|---|---|
| | X[kN] | Y[kN] | Z[kN] | |
| | Σ(Loads) | | | |
| 14 | 0.0 | 0.0 | 24.3 | Canalizaciones |
| | 0.0 | 0.0 | -24.3 | |
| 15 | 0.0 | 0.0 | 39.1 | P tramex |
| | 0.0 | 0.0 | -39.2 | |

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**Elementgroups**

| No. | Fac-S | Fac-B | Fac-L | LC-P |
|---|---|---|---|---|
| 0 | 1.000 | 1.000 | 1.000 | 0 |
| 1 | 1.000 | 1.000 | 1.000 | 0 |
| 2 | 1.000 | 1.000 | 1.000 | 0 |
| 3 | 1.000 | 1.000 | 1.000 | 0 |
| 4 | 1.000 | 1.000 | 1.000 | 0 |
| 5 | 1.000 | 1.000 | 1.000 | 0 |
| 6 | 1.000 | 1.000 | 1.000 | 0 |
| 7 | 1.000 | 1.000 | 1.000 | 0 |
| 8 | 1.000 | 1.000 | 1.000 | 0 |
| 9 | 1.000 | 1.000 | 1.000 | 0 |
| 11 | 1.000 | 1.000 | 1.000 | 0 |
| 12 | 1.000 | 1.000 | 1.000 | 0 |
| 13 | 1.000 | 1.000 | 1.000 | 0 |
| 14 | 1.000 | 1.000 | 1.000 | 0 |
| 21 | 1.000 | 1.000 | 1.000 | 0 |
| 22 | 1.000 | 1.000 | 1.000 | 0 |
| 23 | 1.000 | 1.000 | 1.000 | 0 |
| 24 | 1.000 | 1.000 | 1.000 | 0 |
| 31 | 1.000 | 1.000 | 1.000 | 0 |
| 41 | 1.000 | 1.000 | 1.000 | 0 |
| 42 | 1.000 | 1.000 | 1.000 | 0 |
| 43 | 1.000 | 1.000 | 1.000 | 0 |
| 51 | 1.000 | 1.000 | 1.000 | 0 |
| 52 | 1.000 | 1.000 | 1.000 | 0 |
| 53 | 1.000 | 1.000 | 1.000 | 0 |

No. group number
Fac-S factor stiffness
Fac-B factor stiffness quad bedding
Fac-L factor loads from primary stress state
LC-P primary loadcase

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**Load Case 11 (G_2 ) Permanentes**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 1.000
Combination coefficient $\psi_0$ 1.000 (rare)
Combination coefficient $\psi_1$inf 1.000 (infrequent)
Combination coefficient $\psi_1$ 1.000 (frequent)
Combination coefficient $\psi_2$ 1.000 (permanent)

**Sum of Loadings**

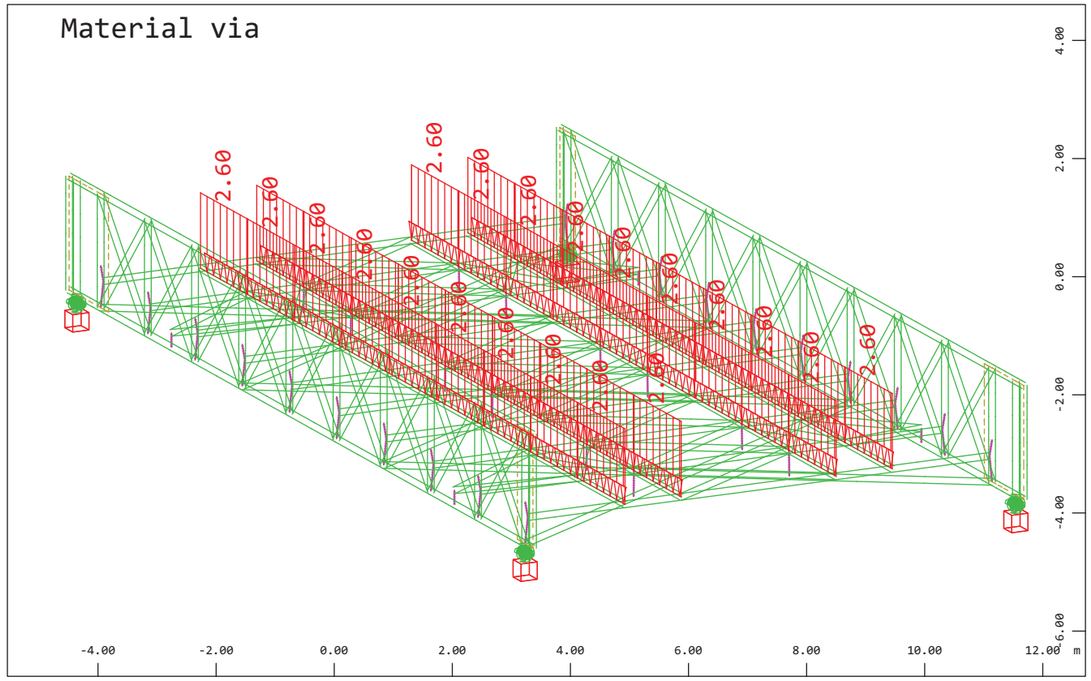
| Loadcase | Σ(Loads) | | | Designation |
|---|---|---|---|---|
| | X[kN] | Y[kN] | Z[kN] | |
| 11 | 0.0 | 0.0 | -250.2 | Permanentes |

**Sum of Reactions and Loadings**

| Loadcase | Σ(Reactions) | | | Designation |
|---|---|---|---|---|
| | X[kN] | Y[kN] | Z[kN] | |
| | Σ(Loads) | | | |
| 11 | 0.0 | 0.0 | 250.2 | Permanentes |
| | 0.0 | 0.0 | -250.2 | |

Pont Carretera Vic
Cargas

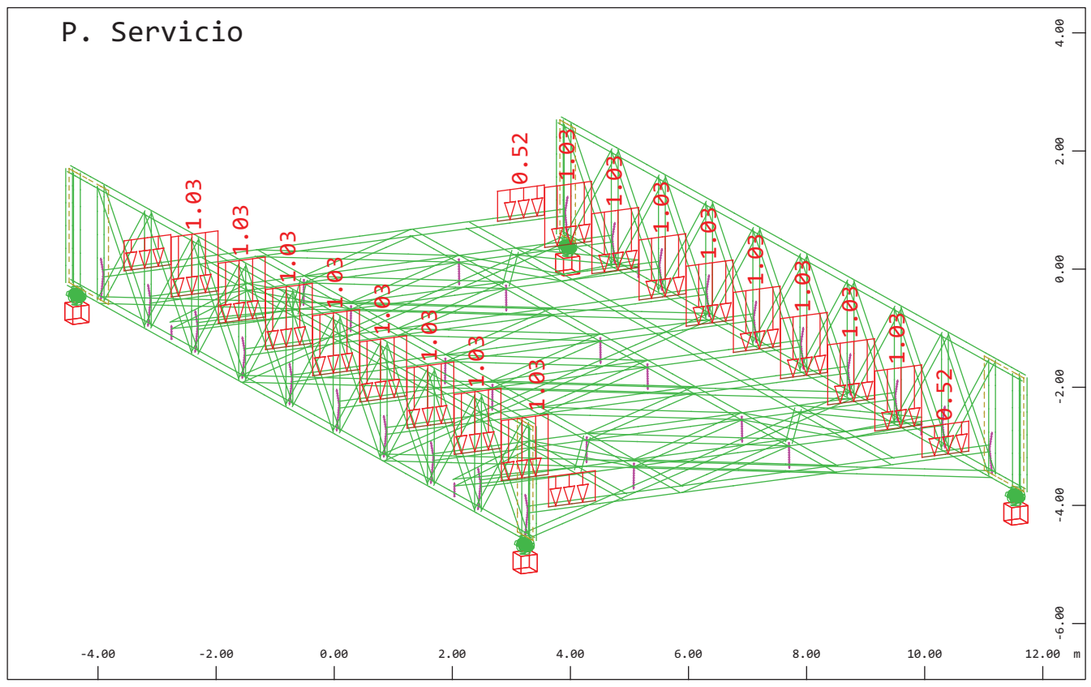
## Material via




All loads, Loadcase 12 Material via , (1 cm 3D = unit) Beam line load (force) in global Z (Unit=2.00 kN/m ) (Min=-2.60) (Max=-2.60)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

## P. Servicio




All loads, Loadcase 13 P. Servicio , (1 cm 3D = unit) Free line load (force) in global Z (Unit=1.00 kN/m ) (Min=-1.03) (Max=-0.52)

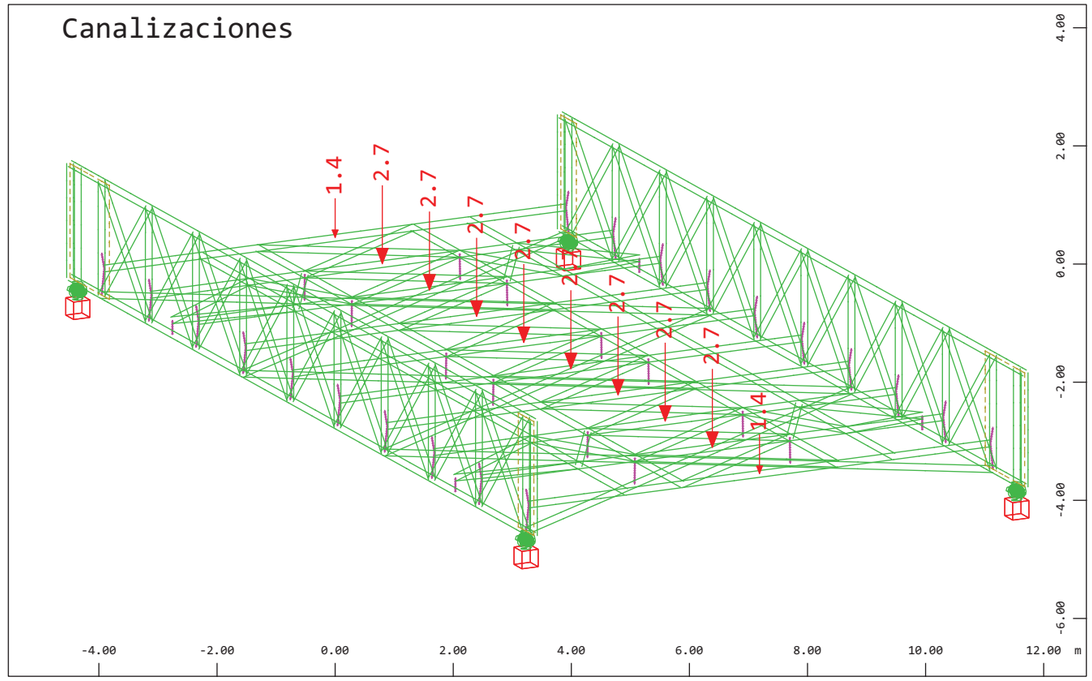
M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Cargas

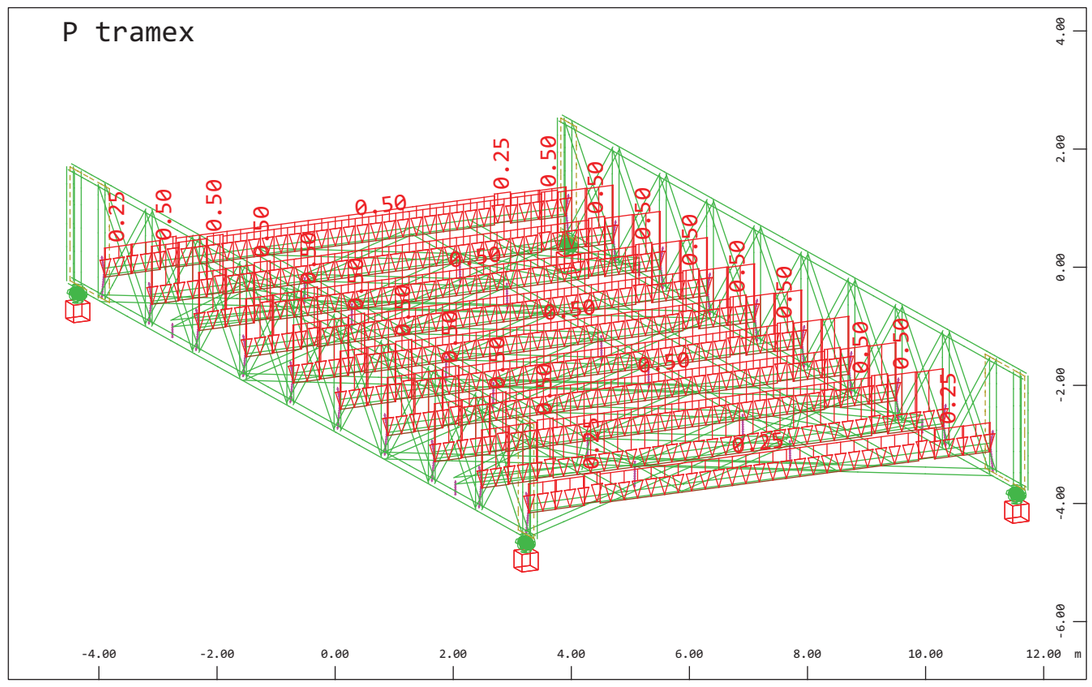
## Canalizaciones




All loads, Loadcase 14 Canalizaciones , (1 cm 3D = unit) Free single load (force) in global Z (Unit=2.0 kN ) (Min=-2.7) (Max=-1.4)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

## P tramex




All loads, Loadcase 15 P tramex , (1 cm 3D = unit) Beam line load (force) in global Z (Unit=0.50 kN/m ) (Min=-0.50) (Max=-0.25)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Trenes

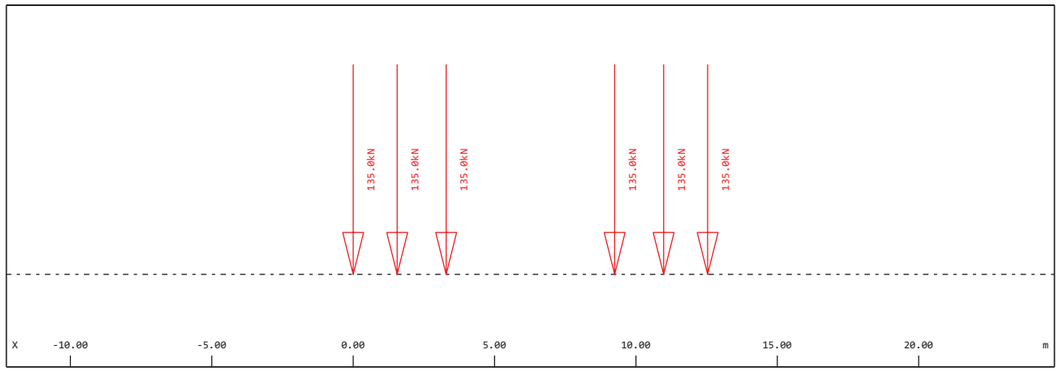
**Actions**

| type | part | sup | Designation | γ-u | γ-f | γ-a | ψ₀ | ψ₁ | ψ₂ | ψ₁inf |
|---|---|---|---|---|---|---|---|---|---|---|
| C_1 | G | perm | Fluencia t_0 | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C_2 | G | cond | Fluencia t_inf | 1.35 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G | G | perm | dead load | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G_1 | G | perm | Peso propio | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G_2 | G | perm | | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G_3 | G | perm | Firme | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PP | G | perm | Peso propio | 1.35 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C | P | perm | creep + shrinkage | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| CL_1 | Q | exex | V+SC | 1.50 | 0.00 | 1.00 | 1.00 | 0.33 | 0.00 | 0.33 |
| GR_1 | Q | exex | grp1 | 1.35 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| GR_2 | Q | exex | grp2 | 1.35 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| GR_6 | Q | exex | grp1f | 1.35 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| L1_T | Q | excl | gr1a LM1 TS | 1.35 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 |
| L1_U | Q | excl | gr1a LM1 UDL | 1.35 | 0.00 | 0.00 | 0.40 | 0.40 | 0.00 | 0.40 |
| LL_1 | Q | excl | LL-Serie 254 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_2 | Q | excl | LL-Serie 257 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_3 | Q | excl | LL-Tolva 62000 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_4 | Q | excl | LL-2x254 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_5 | Q | excl | LL-2x257 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_6 | Q | excl | LL-2xtolvas | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_7 | Q | excl | LL-254+tolvas | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_8 | Q | excl | LL-257+tolvas | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | Reliability factor Kfi | 1.000 | | | | | | |
| | | | Reduction factor xsi | 0.850 | | | | | | |

type action — γ-u,γ-f,γ-a partial safety factors for unfavourable/favourable/accidental
part partition of the action — ψ₀,ψ₁,ψ₂,ψ₁inf combination coefficients
sup superposition type

**Load Train 81 LL-Serie 254**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |




**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 0.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 0.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 1.556 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 1.556 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 3.289 | | -0.535 | 0.000 | 0.000 | | |

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Pont Carretera Vic
Trenes

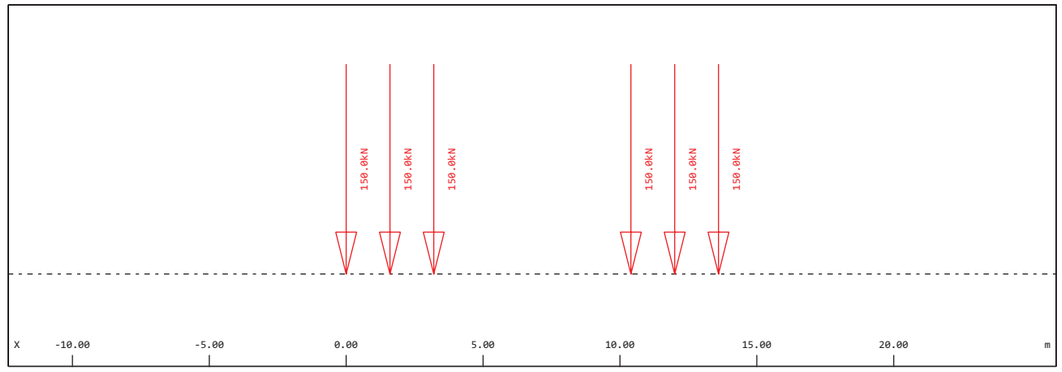
**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 3.289 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 9.247 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 9.247 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 10.980 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 10.980 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 12.536 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 12.536 | | 0.535 | 0.000 | 0.000 | | |

Pv vertical load value — hw[m] height of lateral acting force
Pl longitudinal load value (breaking) — hs[m] height of centrifugal mass center
Pw transverse load value — b[m] spacing of wheels
Pf effective load for centrifugal loading — cont@ connected to node number of vehicle model
ffav factor for favourable load positions — P load Type (P) = axle/pointload, (B) = distributed load
X[m] location along load train — bw[m] width of wheel contact area
L[m] length of loading — lw[m] length of wheel contact area
y[m] excentricity of loading

**Load Train 82 LL-Serie 257**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |




**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 3.200 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 3.200 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 10.400 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 10.400 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 12.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 12.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 13.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 13.600 | | 0.535 | 0.000 | 0.000 | | |

Pv vertical load value — hw[m] height of lateral acting force
Pl longitudinal load value (breaking) — hs[m] height of centrifugal mass center
Pw transverse load value — b[m] spacing of wheels
Pf effective load for centrifugal loading — cont@ connected to node number of vehicle model
ffav factor for favourable load positions — P load Type (P) = axle/pointload, (B) = distributed load
X[m] location along load train — bw[m] width of wheel contact area
L[m] length of loading — lw[m] length of wheel contact area

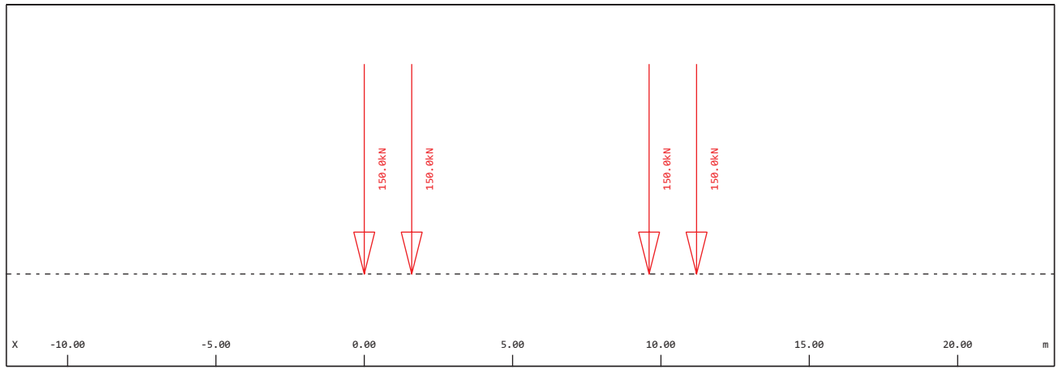
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Pont Carretera Vic
Trenes

y[m] excentricity of loading

**Load Train 83 Tolva 62000**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |




**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 9.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 9.600 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 11.200 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 11.200 | | 0.535 | 0.000 | 0.000 | | |

Pv vertical load value
Pl longitudinal load value (breaking)
Pw transverse load value
Pf effective load for centrifugal loading
ffav factor for favourable load positions
X[m] location along load train
L[m] length of loading
y[m] excentricity of loading
hw[m] height of lateral acting force
hs[m] height of centrifugal mass center
b[m] spacing of wheels
cont@ connected to node number of vehicle model
P load Type (P) = axle/pointload, (B) = distributed load
bw[m] width of wheel contact area
lw[m] length of wheel contact area

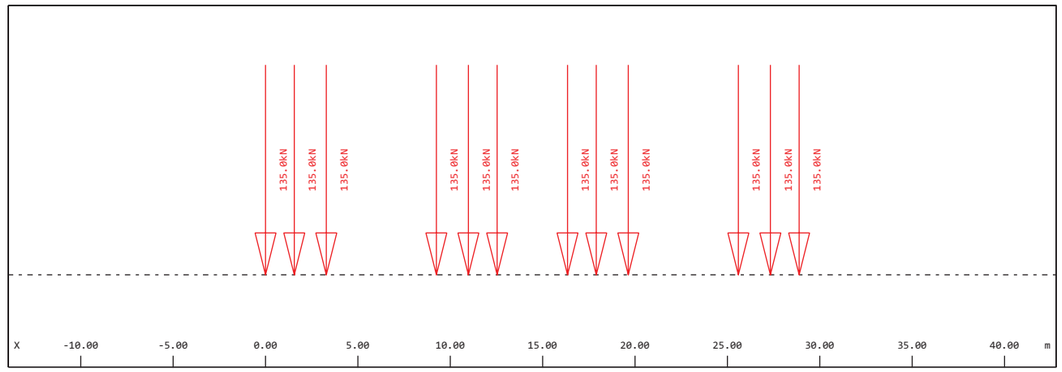
**Load Train 84 LL-2xSerie 254**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |

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Pont Carretera Vic
Trenes




**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 0.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 0.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 1.556 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 1.556 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 3.289 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 3.289 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 9.247 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 9.247 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 10.980 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 10.980 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 12.536 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 12.536 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 16.346 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 16.346 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 17.902 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 17.902 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 19.635 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 19.635 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 25.593 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 25.593 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 27.326 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 27.326 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 28.882 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 28.882 | | 0.535 | 0.000 | 0.000 | | |

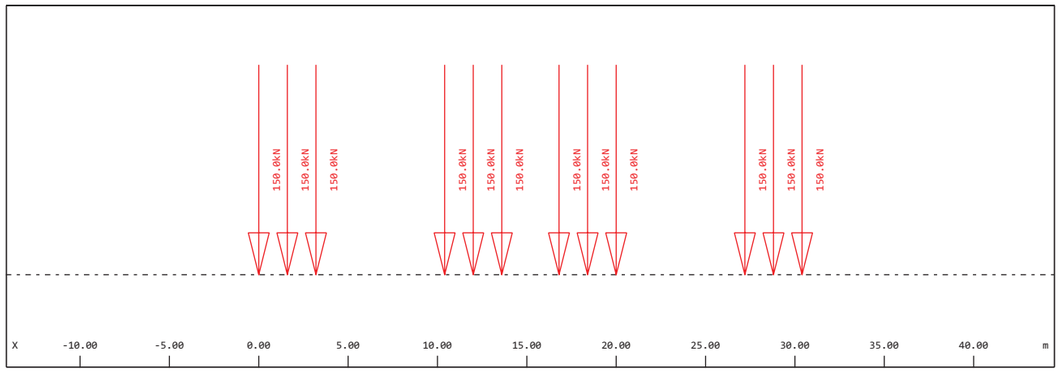
Pv vertical load value
Pl longitudinal load value (breaking)
Pw transverse load value
Pf effective load for centrifugal loading
ffav factor for favourable load positions
X[m] location along load train
L[m] length of loading
y[m] excentricity of loading
hw[m] height of lateral acting force
hs[m] height of centrifugal mass center
b[m] spacing of wheels
cont@ connected to node number of vehicle model
P load Type (P) = axle/pointload, (B) = distributed load
bw[m] width of wheel contact area
lw[m] length of wheel contact area

**Load Train 85 LL-2xSerie 257**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |

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Trenes




**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 3.200 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 3.200 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 10.400 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 10.400 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 12.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 12.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 13.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 13.600 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 16.800 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 16.800 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 18.400 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 18.400 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 20.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 20.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 27.200 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 27.200 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 28.800 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 28.800 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 30.400 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 30.400 | | 0.535 | 0.000 | 0.000 | | |

Pv vertical load value
Pl longitudinal load value (breaking)
Pw transverse load value
Pf effective load for centrifugal loading
ffav factor for favourable load positions
X[m] location along load train
L[m] length of loading
y[m] excentricity of loading
hw[m] height of lateral acting force
hs[m] height of centrifugal mass center
b[m] spacing of wheels
cont@ connected to node number of vehicle model
P load Type (P) = axle/pointload, (B) = distributed load
bw[m] width of wheel contact area
lw[m] length of wheel contact area

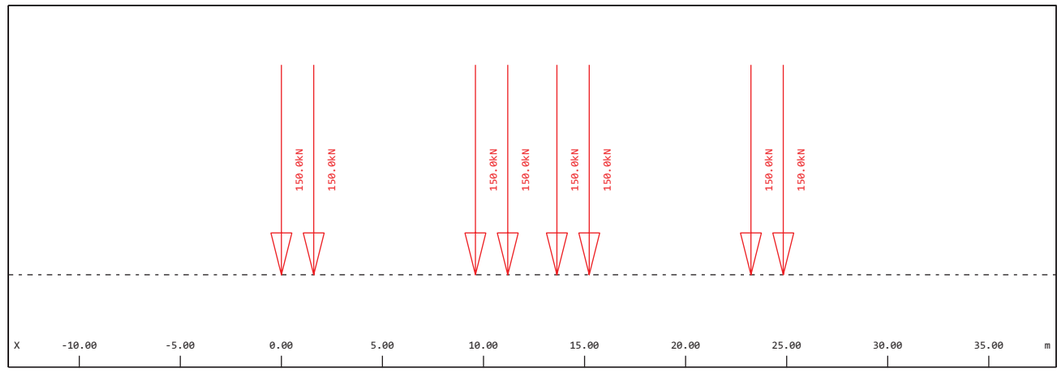
**Load Train 86 2xTolva 62000**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |

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Trenes




**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 9.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 9.600 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 11.200 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 11.200 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 13.633 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 13.633 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 15.233 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 15.233 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 23.233 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 23.233 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 24.833 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 24.833 | | 0.535 | 0.000 | 0.000 | | |

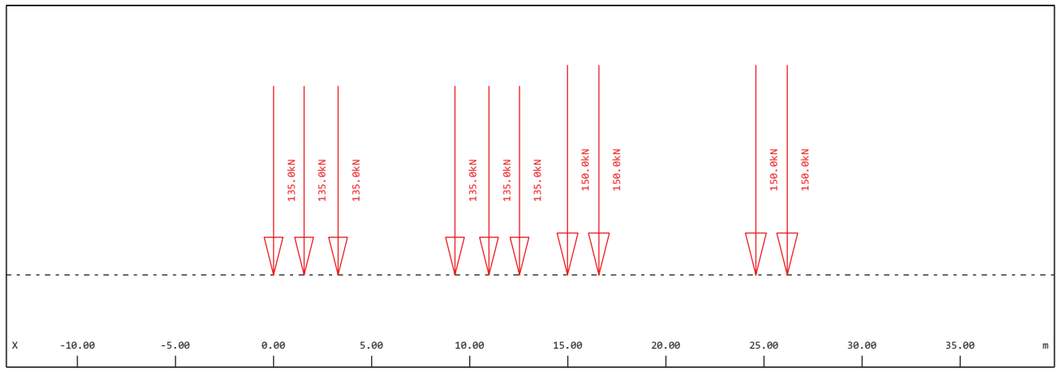
Pv vertical load value
Pl longitudinal load value (breaking)
Pw transverse load value
Pf effective load for centrifugal loading
ffav factor for favourable load positions
X[m] location along load train
L[m] length of loading
y[m] excentricity of loading
hw[m] height of lateral acting force
hs[m] height of centrifugal mass center
b[m] spacing of wheels
cont@ connected to node number of vehicle model
P load Type (P) = axle/pointload, (B) = distributed load
bw[m] width of wheel contact area
lw[m] length of wheel contact area

**Load Train 87 254+Tolva 62000**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |

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Trenes




**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 0.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 0.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 1.556 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 1.556 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 3.289 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 3.289 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 9.247 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 9.247 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 10.980 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 10.980 | | 0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 12.536 | | -0.535 | 0.000 | 0.000 | | |
| P | 67.5 | 0.0 | 0.0 | 67.5 | 0.0 | 12.536 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 14.984 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 14.984 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 16.584 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 16.584 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 24.584 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 24.584 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 26.184 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 26.184 | | 0.535 | 0.000 | 0.000 | | |

Pv vertical load value
Pl longitudinal load value (breaking)
Pw transverse load value
Pf effective load for centrifugal loading
ffav factor for favourable load positions
X[m] location along load train
L[m] length of loading
y[m] excentricity of loading
hw[m] height of lateral acting force
hs[m] height of centrifugal mass center
b[m] spacing of wheels
cont@ connected to node number of vehicle model
P load Type (P) = axle/pointload, (B) = distributed load
bw[m] width of wheel contact area
lw[m] length of wheel contact area

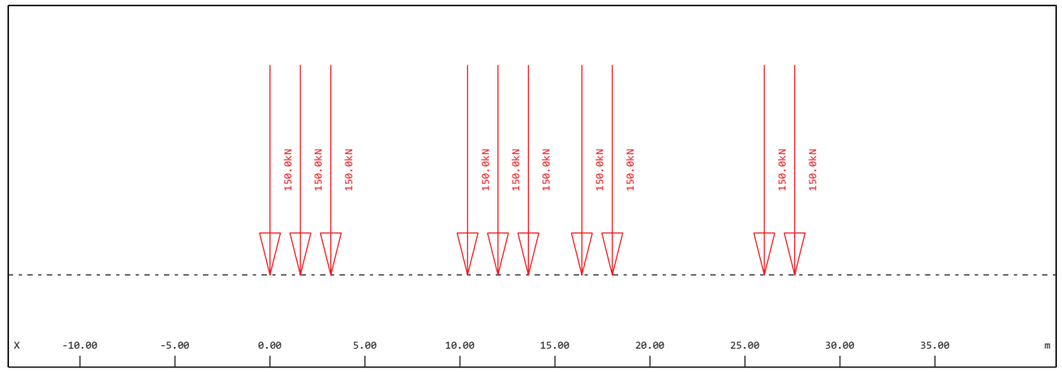
**Load Train 88 257+Tolva 62000**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |

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Pont Carretera Vic
Trenes




**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 0.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 1.600 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 3.200 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 3.200 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 10.400 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 10.400 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 12.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 12.000 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 13.600 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 13.600 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 16.416 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 16.416 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 18.016 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 18.016 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 26.016 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 26.016 | | 0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 27.616 | | -0.535 | 0.000 | 0.000 | | |
| P | 75.0 | 0.0 | 0.0 | 75.0 | 0.0 | 27.616 | | 0.535 | 0.000 | 0.000 | | |

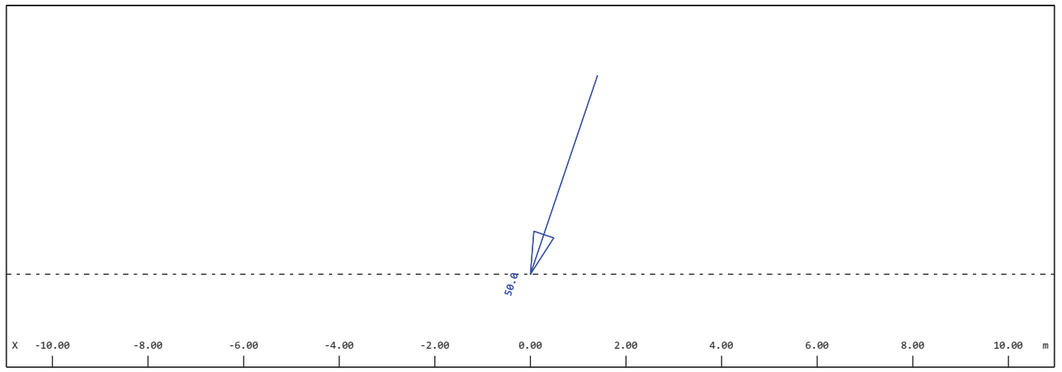
Pv vertical load value
Pl longitudinal load value (breaking)
Pw transverse load value
Pf effective load for centrifugal loading
ffav factor for favourable load positions
X[m] location along load train
L[m] length of loading
y[m] excentricity of loading
hw[m] height of lateral acting force
hs[m] height of centrifugal mass center
b[m] spacing of wheels
cont@ connected to node number of vehicle model
P load Type (P) = axle/pointload, (B) = distributed load
bw[m] width of wheel contact area
lw[m] length of wheel contact area

**Load Train 89 Lazo**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |

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Pont Carretera Vic
Trenes



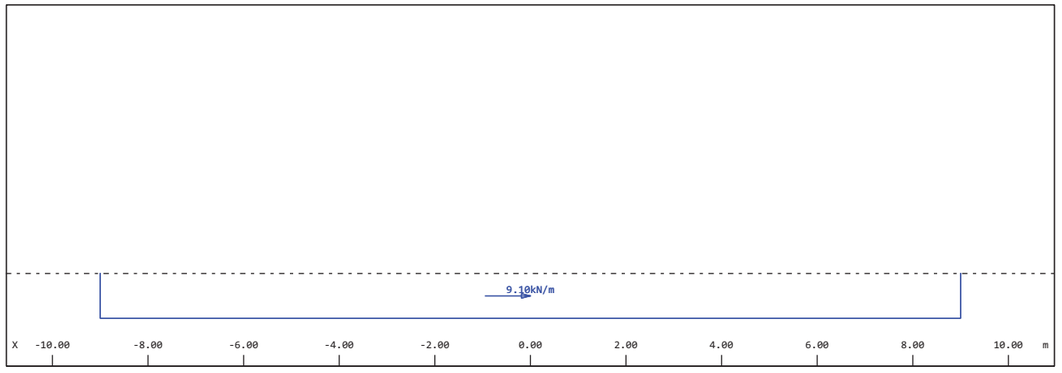

**Load elements of Load Train**

| P | Pv [kN] | Pl [kN] | Pw [kN] | Pf [kN] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ lw[m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | 0.0 | 0.0 | 50.0 | 0.0 | 0.0 | 0.000 | | -0.535 | 0.000 | 0.000 | | |
| P | 0.0 | 0.0 | 50.0 | 0.0 | 0.0 | 0.000 | | 0.535 | 0.000 | 0.000 | | |

| | | | |
|---|---|---|---|
| Pv | vertical load value | hw[m] | height of lateral acting force |
| Pl | longitudinal load value (breaking) | hs[m] | height of centrifugal mass center |
| Pw | transverse load value | b[m] | spacing of wheels |
| Pf | effective load for centrifugal loading | cont@ | connected to node number of vehicle model |
| ffav | factor for favourable load positions | P | load Type (P) = axle/pointload, (B) = distributed load |
| X[m] | location along load train | bw[m] | width of wheel contact area |
| L[m] | length of loading | lw[m] | length of wheel contact area |
| y[m] | excentricity of loading | | |

**Load Train 90 Aceleración**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |




**Load elements of Load Train**

| B | Pv [kN/m] | Pl [kN/m] | Pw [kN/m] | Pf [kN/m] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | 0.00 | 9.10 | 0.00 | 0.00 | 0.0 | | | -0.535 | 0.000 | 0.000 | | |
| B | 0.00 | 9.10 | 0.00 | 0.00 | 0.0 | | | 0.535 | 0.000 | 0.000 | | |

| | | | |
|---|---|---|---|
| Pv | vertical load value | y[m] | excentricity of loading |
| Pl | longitudinal load value (breaking) | hw[m] | height of lateral acting force |
| Pw | transverse load value | hs[m] | height of centrifugal mass center |
| Pf | effective load for centrifugal loading | b[m] | spacing of wheels |
| ffav | factor for favourable load positions | cont@ | connected to node number of vehicle model |
| X[m] | location along load train | B | load Type (P) = axle/pointload, (B) = distributed load |
| L[m] | length of loading | bw[m] | width of wheel contact area |

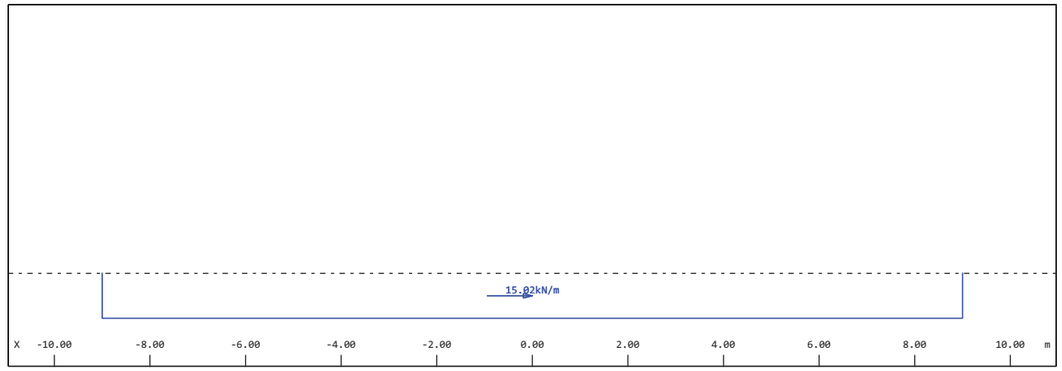
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Pont Carretera Vic
Trenes

**Load Train 91 Frenado**
**USER User defined**

| Load elements of Load Train | Load value | Remark |
|---|---|---|
| Total factor | 1.000 [-] | |
| Fact.centrifugal | 1.000 [-] | |
| Loading travels in both directions | | |
| Transverse loading in unfavourable direction | | |




**Load elements of Load Train**

| B | Pv [kN/m] | Pl [kN/m] | Pw [kN/m] | Pf [kN/m] | ffav [-] | X[m] | L[m] | y[m] | hw[m] | hs[m] | b[m] bw[m] | cont@ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | 0.00 | 15.02 | 0.00 | 0.00 | 0.0 | | | -0.535 | 0.000 | 0.000 | | |
| B | 0.00 | 15.02 | 0.00 | 0.00 | 0.0 | | | 0.535 | 0.000 | 0.000 | | |

| | | | |
|---|---|---|---|
| Pv | vertical load value | y[m] | excentricity of loading |
| Pl | longitudinal load value (breaking) | hw[m] | height of lateral acting force |
| Pw | transverse load value | hs[m] | height of centrifugal mass center |
| Pf | effective load for centrifugal loading | b[m] | spacing of wheels |
| ffav | factor for favourable load positions | cont@ | connected to node number of vehicle model |
| X[m] | location along load train | B | load Type (P) = axle/pointload, (B) = distributed load |
| L[m] | length of loading | bw[m] | width of wheel contact area |

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Pont Carretera Vic
rigidez

**Elementgroups**

| No. | Fac-S | Fac-B | Fac-L | LC-P |
|---|---|---|---|---|
| 0 | 1.000 | 1.000 | 1.000 | 0 |
| 1 | 1.000 | 1.000 | 1.000 | 0 |
| 2 | 1.000 | 1.000 | 1.000 | 0 |
| 3 | 1.000 | 1.000 | 1.000 | 0 |
| 4 | 1.000 | 1.000 | 1.000 | 0 |
| 5 | 1.000 | 1.000 | 1.000 | 0 |
| 6 | 1.000 | 1.000 | 1.000 | 0 |
| 7 | 1.000 | 1.000 | 1.000 | 0 |
| 8 | 1.000 | 1.000 | 1.000 | 0 |
| 9 | 1.000 | 1.000 | 1.000 | 0 |
| 11 | 1.000 | 1.000 | 1.000 | 0 |
| 12 | 1.000 | 1.000 | 1.000 | 0 |
| 13 | 1.000 | 1.000 | 1.000 | 0 |
| 14 | 1.000 | 1.000 | 1.000 | 0 |
| 21 | 1.000 | 1.000 | 1.000 | 0 |
| 22 | 1.000 | 1.000 | 1.000 | 0 |
| 23 | 1.000 | 1.000 | 1.000 | 0 |
| 24 | 1.000 | 1.000 | 1.000 | 0 |
| 31 | 1.000 | 1.000 | 1.000 | 0 |
| 41 | 1.000 | 1.000 | 1.000 | 0 |
| 42 | 1.000 | 1.000 | 1.000 | 0 |
| 43 | 1.000 | 1.000 | 1.000 | 0 |
| 51 | 1.000 | 1.000 | 1.000 | 0 |
| 52 | 1.000 | 1.000 | 1.000 | 0 |
| 53 | 1.000 | 1.000 | 1.000 | 0 |

No. group number
Fac-S factor stiffness
Fac-B factor stiffness quad bedding
Fac-L factor loads from primary stress state
LC-P primary loadcase

**Load Case 2**

Factor forces and moments 1.000
Factor dead weight DL-ZZ -1.000

**Sum of Loadings**

| Loadcase | Σ(Loads) X[kN] | Σ(Loads) Y[kN] | Σ(Loads) Z[kN] | Designation |
|---|---|---|---|---|
| 2 | 0.0 | 0.0 | -605.9 | |

**Sum of Reactions and Loadings**

| Loadcase | Σ(Reactions) X[kN] | Σ(Reactions) Y[kN] | Σ(Reactions) Z[kN] | Designation |
|---|---|---|---|---|
| | Σ(Loads) | | | |
| 2 | 0.0 | 0.0 | 605.9 | DLZ= -1.00 sum_PZ=-605.9 kN . |
| | 0.0 | 0.0 | -605.9 | |

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Pont Carretera Vic
Evaluación Carga Viva (LL)

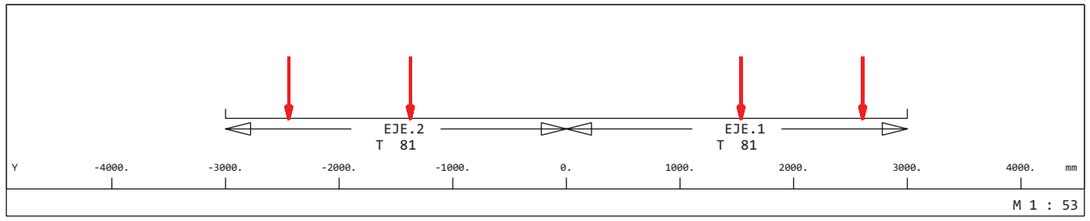
**Geometry of lane EJE**

flexible load distribution dY= 99.000 dZ= 0.250

**Evaluation : Case 1 LL-Serie 254**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 81 | LL-Serie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.2 | 81 | LL-Serie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

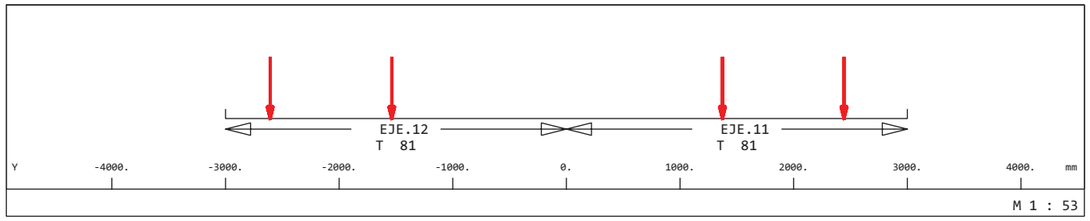
p[kN/m2] residual loading — RDL* factor on residual loads
v[km/h] velocity of the load train — BRK* factor on longitudinal loads
yex[m] eccentricity of load train — TRA* factor on transverse loads
PL* factor on single loads — FUG* factor on centrifugal loads
UDL* factor on uniform loads — WIND factor on wind loading




**Evaluation : Case 2 LL-Serie 254**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.11 | 81 | LL-Serie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 81 | LL-Serie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

p[kN/m2] residual loading — RDL* factor on residual loads
v[km/h] velocity of the load train — BRK* factor on longitudinal loads
yex[m] eccentricity of load train — TRA* factor on transverse loads
PL* factor on single loads — FUG* factor on centrifugal loads
UDL* factor on uniform loads — WIND factor on wind loading



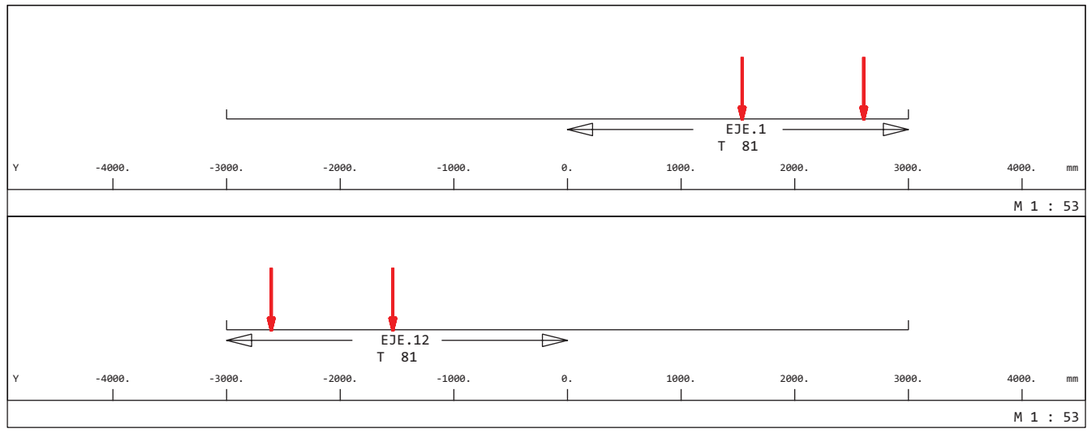

**Evaluation : Case 3 LL-Serie 254**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 81 | LL-Serie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 81 | LL-Serie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

p[kN/m2] residual loading — RDL* factor on residual loads
v[km/h] velocity of the load train — BRK* factor on longitudinal loads
yex[m] eccentricity of load train — TRA* factor on transverse loads
PL* factor on single loads — FUG* factor on centrifugal loads
UDL* factor on uniform loads — WIND factor on wind loading

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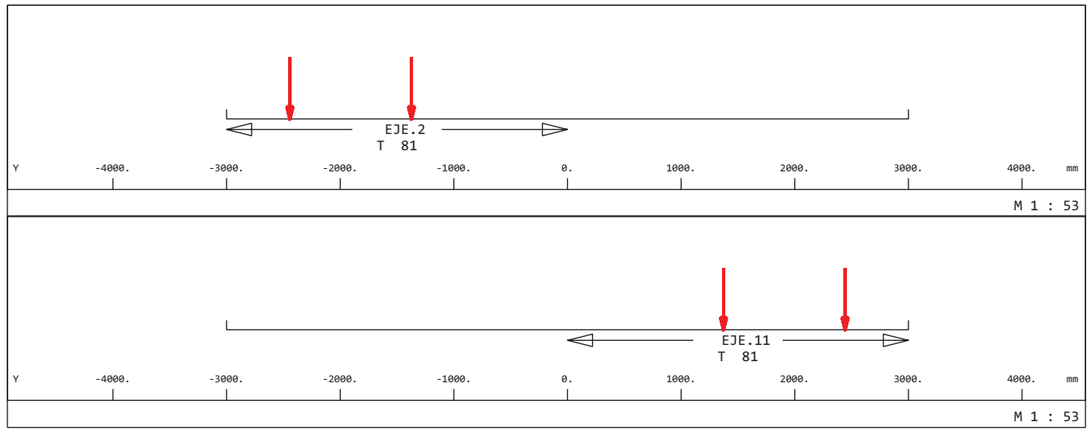
Pont Carretera Vic
Evaluación Carga Viva (LL)




**Evaluation : Case 4 LL-Serie 254**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.2 | 81 | LL-Serie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.11 | 81 | LL-Serie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Load Cases**

**Superposition combinations**

| Type | case | fact | case | fact | case | fact | case | fact | case | fact | case | fact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A0 | 1:4 | 1.00 | | | | | | | | | | |

**Evaluation : Case 1 LL-Serie 257**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 82 | LL-Serie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.2 | 82 | LL-Serie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |

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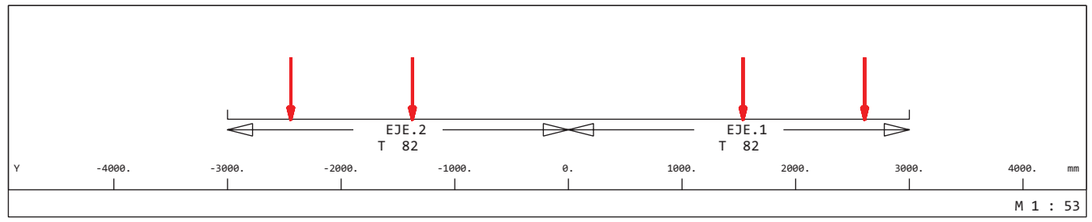


Pont Carretera Vic
Evaluación Carga Viva (LL)

**Evaluation : Case 1 LL-Serie 257**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transverse loading in unfavourable direction | | | | | | | | | | | | |

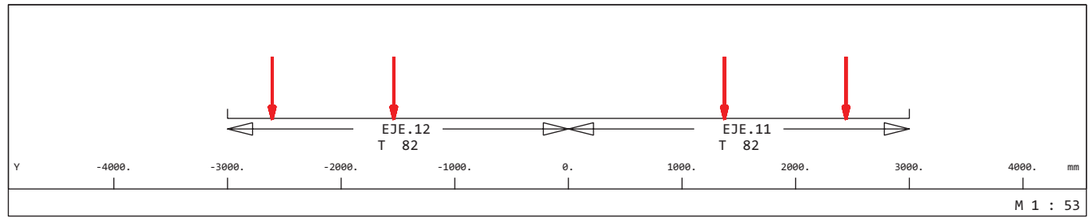
| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 2 LL-Serie 257**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.11 | 82 | LL-Serie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 82 | LL-Serie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |

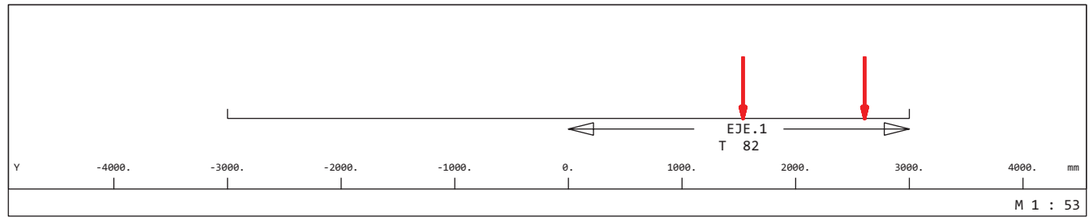
| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 3 LL-Serie 257**

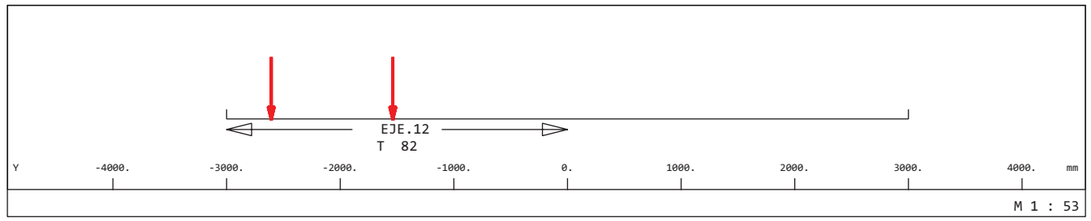
| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 82 | LL-Serie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 82 | LL-Serie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




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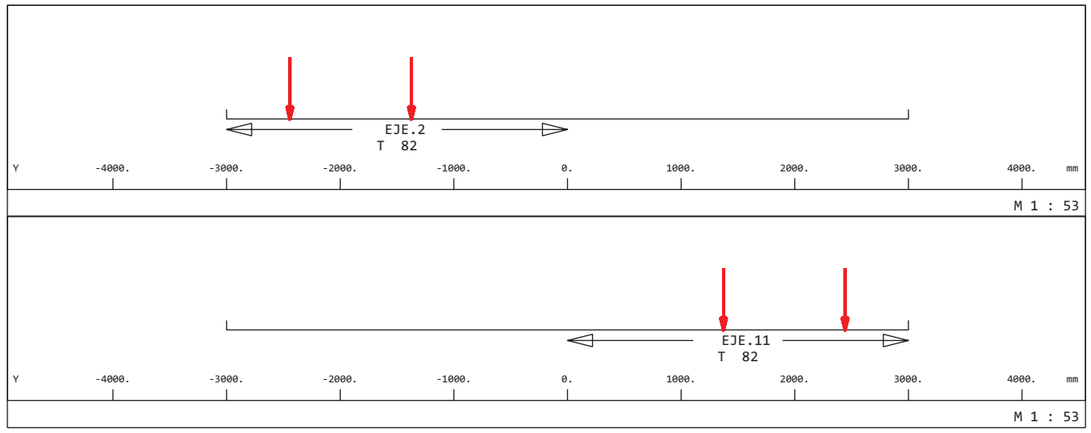
Pont Carretera Vic
Evaluación Carga Viva (LL)




**Evaluation : Case 4 LL-Serie 257**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.2 | 82 | LL-Serie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.11 | 82 | LL-Serie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Load Cases**

**Superposition combinations**

| Type | case | fact | case | fact | case | fact | case | fact | case | fact | case | fact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A0 | 1:4 | 1.00 | | | | | | | | | | |

**Evaluation : Case 1 Tolva 62000**

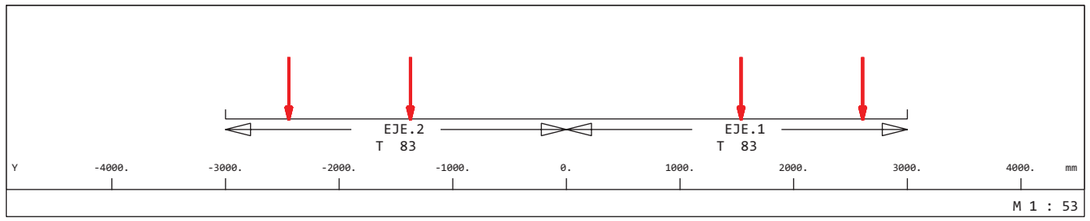
| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 83 | Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.2 | 83 | Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |

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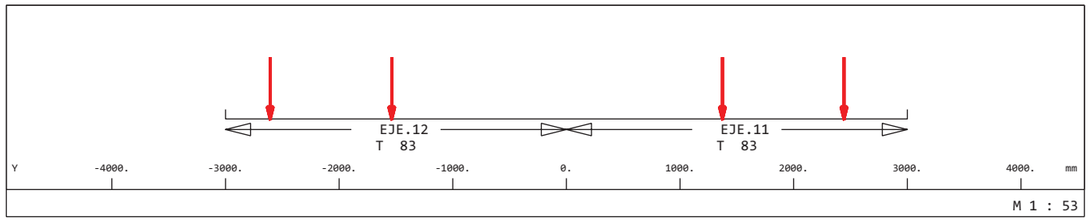
Pont Carretera Vic
Evaluación Carga Viva (LL)




**Evaluation : Case 2 Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.11 | 83 | Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 83 | Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

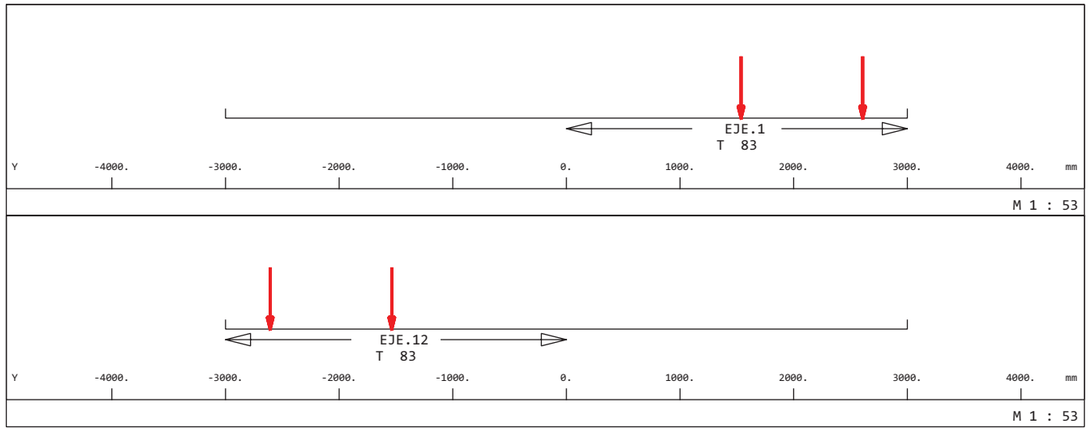
| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 3 Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 83 | Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 83 | Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |



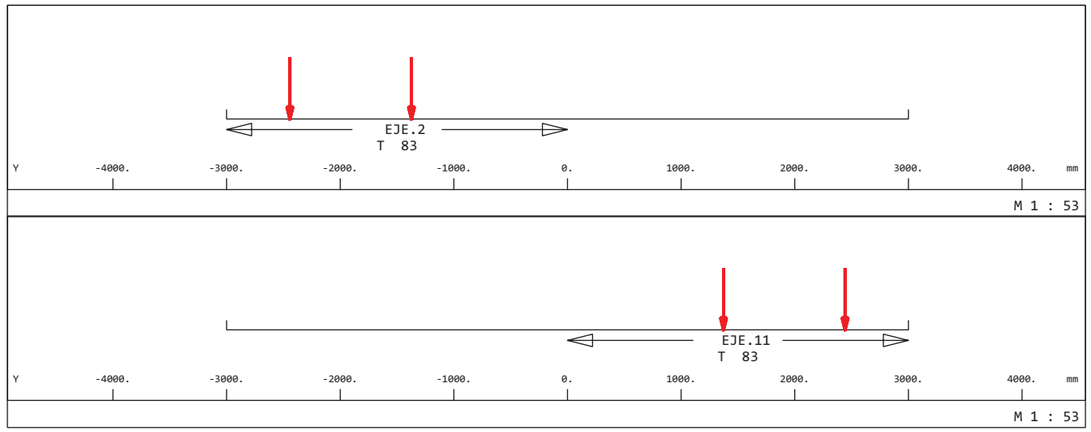

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Pont Carretera Vic
Evaluación Carga Viva (LL)

**Evaluation : Case 4 Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.2 | 83 | Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.11 | 83 | Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Load Cases**

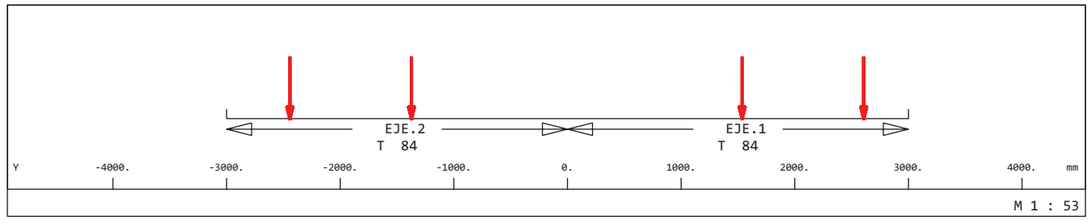
**Superposition combinations**

| Type | case | fact | case | fact | case | fact | case | fact | case | fact | case | fact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A0 | 1:4 | 1.00 | | | | | | | | | | |

**Evaluation : Case 1 LL-2xSerie 254**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 84 | LL-2xSerie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.2 | 84 | LL-2xSerie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




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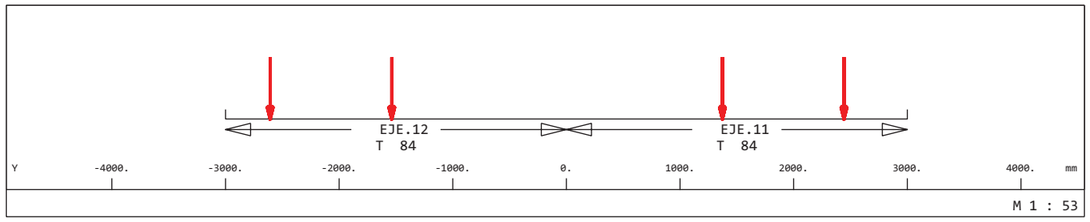


Pont Carretera Vic
Evaluación Carga Viva (LL)

**Evaluation : Case 2 LL-2xSerie 254**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.11 | 84 | LL-2xSerie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 84 | LL-2xSerie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |

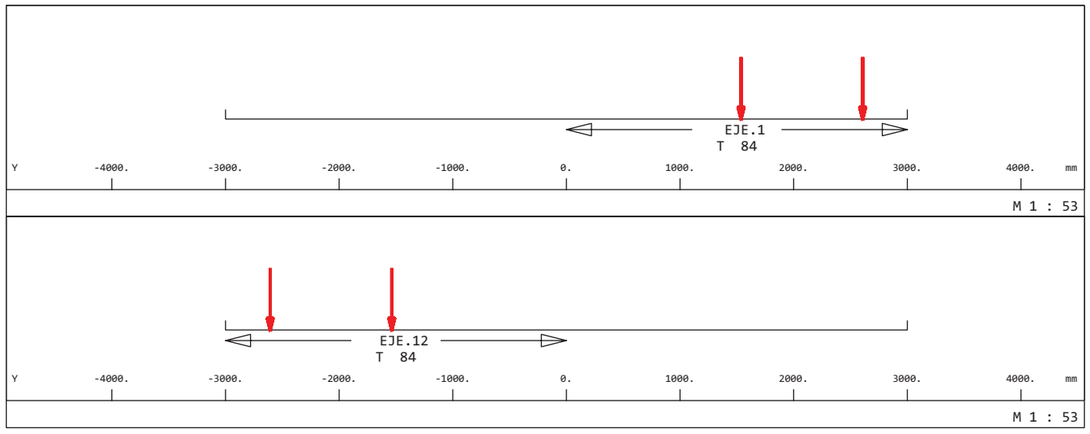
| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 3 LL-2xSerie 254**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 84 | LL-2xSerie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 84 | LL-2xSerie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |



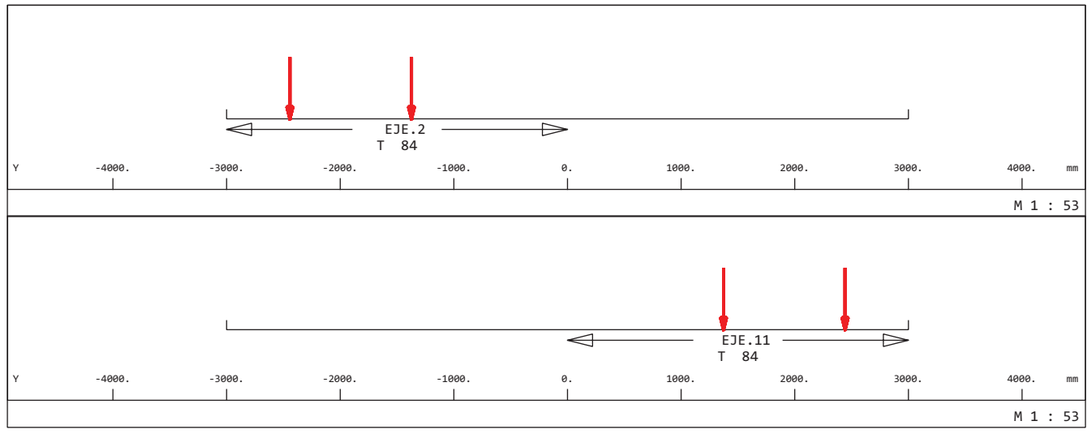

**Evaluation : Case 4 LL-2xSerie 254**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.2 | 84 | LL-2xSerie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.11 | 84 | LL-2xSerie 254 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions | | | | | | | | | | | | |
| Transverse loading in unfavourable direction | | | | | | | | | | | | |

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Pont Carretera Vic
Evaluación Carga Viva (LL)

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Load Cases**

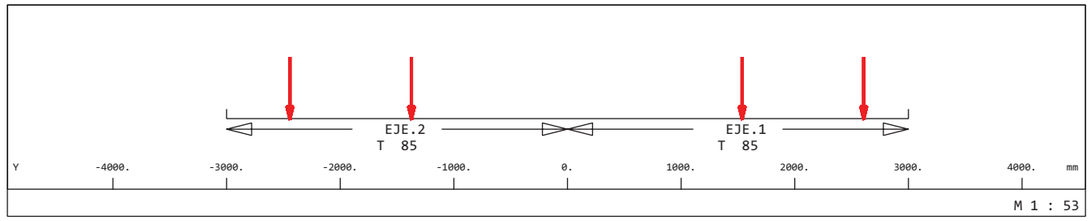
**Superposition combinations**

| Type | case | fact | case | fact | case | fact | case | fact | case | fact | case | fact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A0 | 1:4 | 1.00 | | | | | | | | | | |

**Evaluation : Case 1 LL-2xSerie 257**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 85 | LL-2xSerie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.2 | 85 | LL-2xSerie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 2 LL-2xSerie 257**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.11 | 85 | LL-2xSerie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 85 | LL-2xSerie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

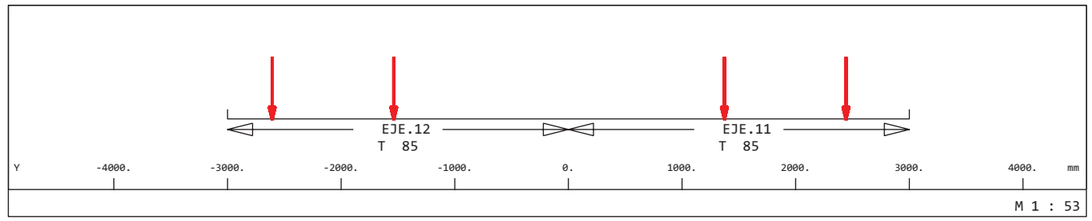
| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |

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Pont Carretera Vic
Evaluación Carga Viva (LL)

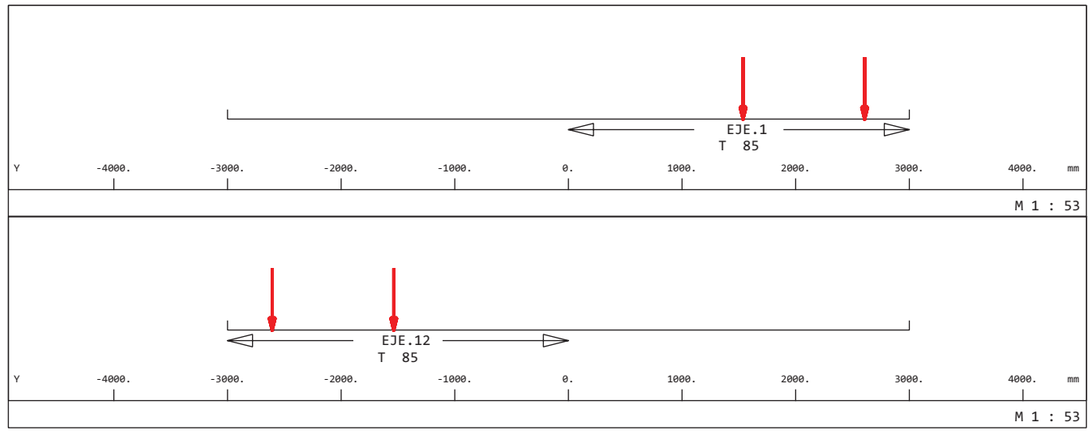
| | | | |
|---|---|---|---|
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 3 LL-2xSerie 257**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 85 | LL-2xSerie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 85 | LL-2xSerie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |



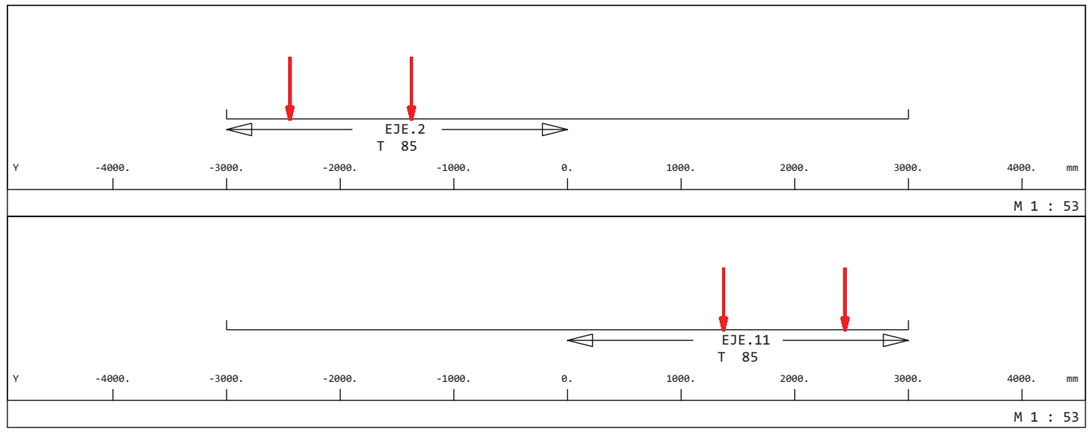

**Evaluation : Case 4 LL-2xSerie 257**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.2 | 85 | LL-2xSerie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.11 | 85 | LL-2xSerie 257 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |

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Pont Carretera Vic
Evaluación Carga Viva (LL)




**Load Cases**

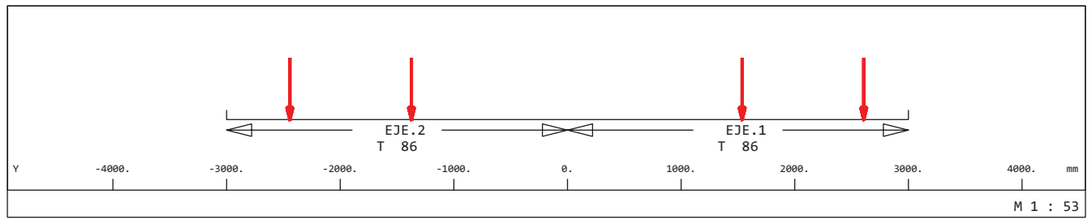
**Superposition combinations**

| Type | case | fact | case | fact | case | fact | case | fact | case | fact | case | fact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A0 | 1:4 | 1.00 | | | | | | | | | | |

**Evaluation : Case 1 2xTolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 86 | 2xTolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.2 | 86 | 2xTolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 2 2xTolva 62000**

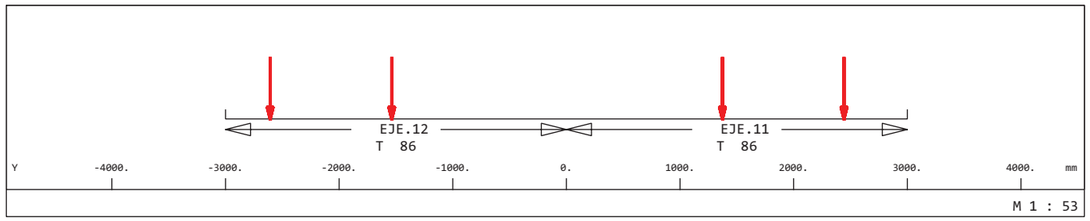
| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.11 | 86 | 2xTolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 86 | 2xTolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |

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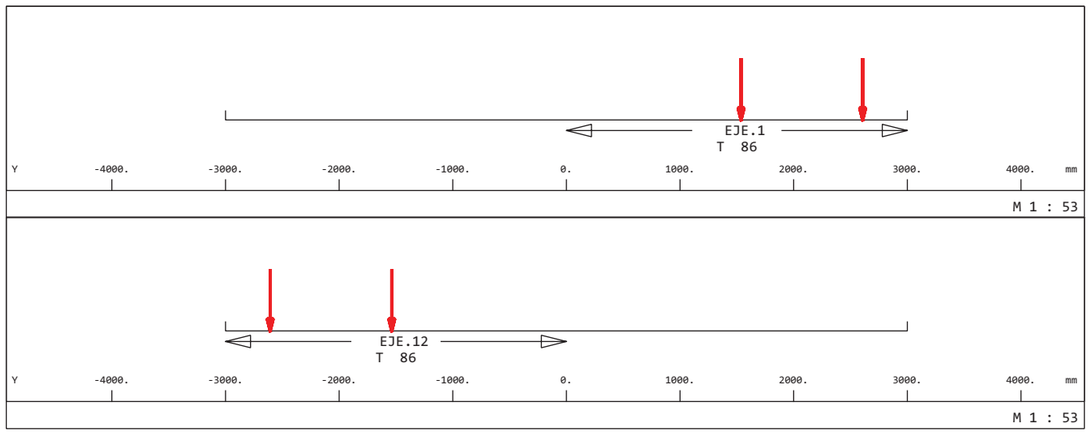
Pont Carretera Vic
Evaluación Carga Viva (LL)




**Evaluation : Case 3 2xTolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 86 | 2xTolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 86 | 2xTolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

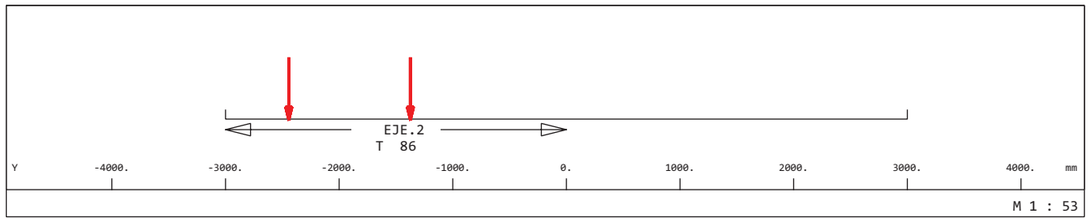
| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 4 2xTolva 62000**

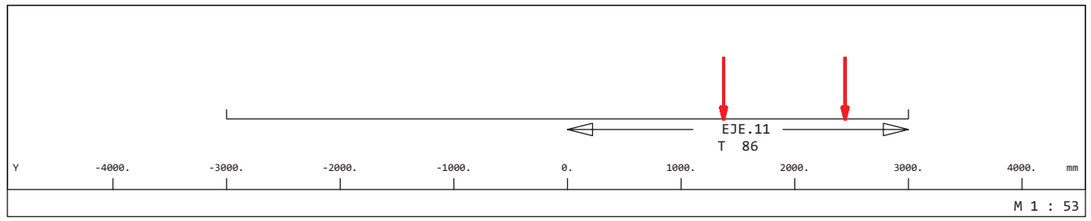
| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.2 | 86 | 2xTolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.11 | 86 | 2xTolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




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Evaluación Carga Viva (LL)




**Load Cases**

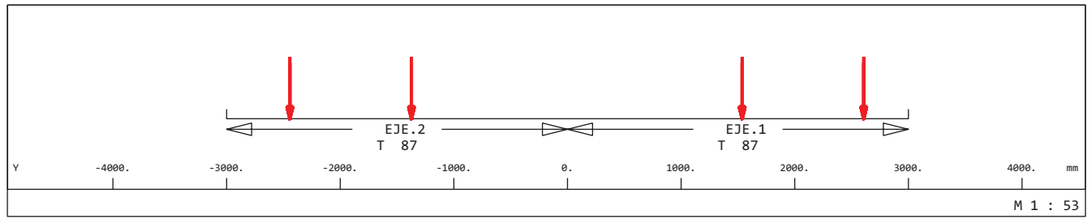
**Superposition combinations**

| Type | case | fact | case | fact | case | fact | case | fact | case | fact | case | fact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A0 | 1:4 | 1.00 | | | | | | | | | | |

**Evaluation : Case 1 254+Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 87 | 254+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.2 | 87 | 254+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

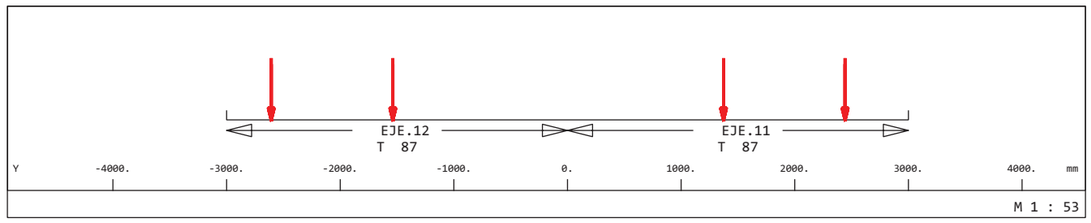
| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 2 254+Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.11 | 87 | 254+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 87 | 254+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




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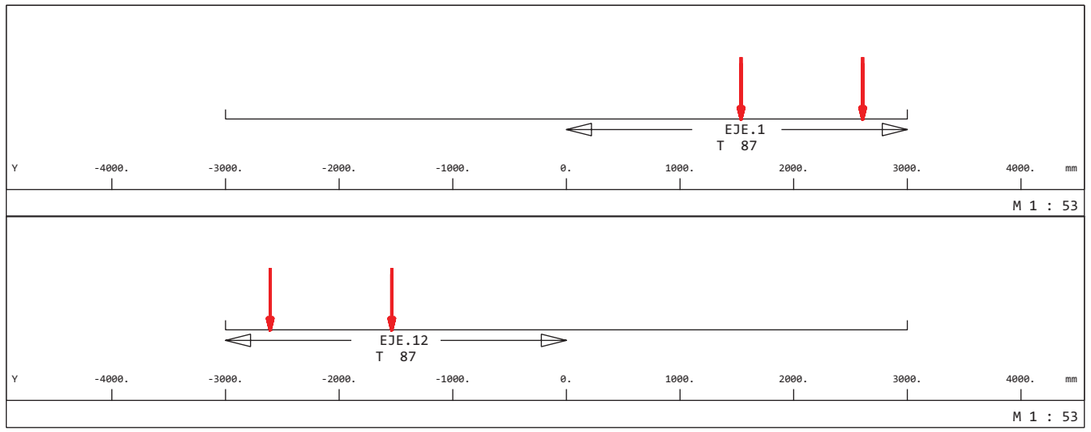


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Evaluación Carga Viva (LL)

**Evaluation : Case 3 254+Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 87 | 254+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 87 | 254+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

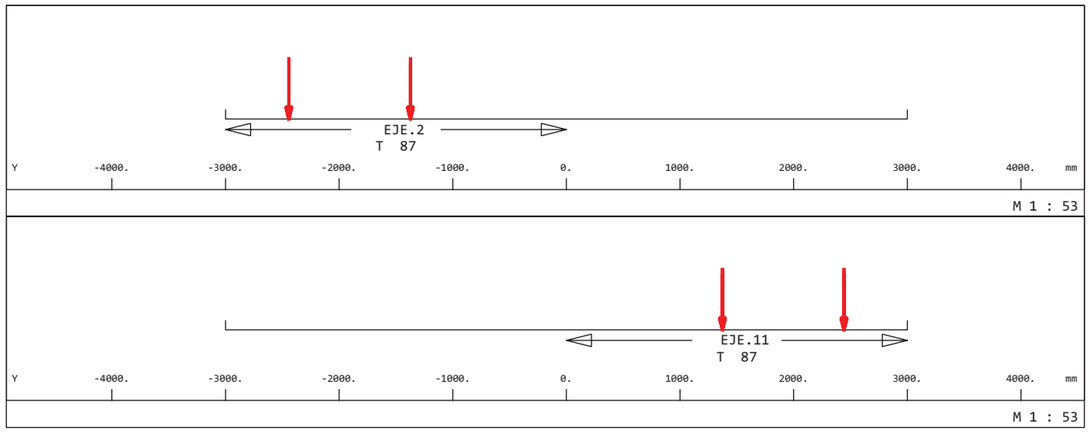
| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 4 254+Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.2 | 87 | 254+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.11 | 87 | 254+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




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Pont Carretera Vic
Evaluación Carga Viva (LL)

**Load Cases**

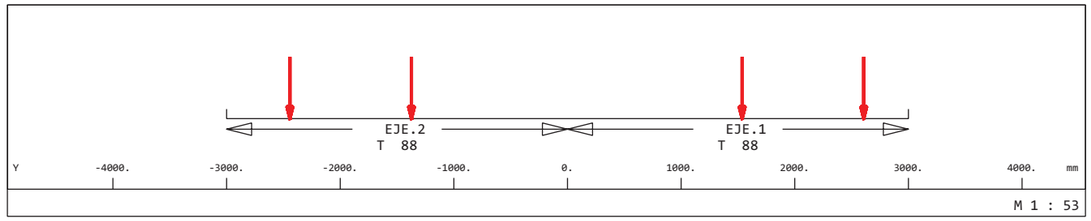
**Superposition combinations**

| Type | case | fact | case | fact | case | fact | case | fact | case | fact | case | fact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A0 | 1:4 | 1.00 | | | | | | | | | | |

**Evaluation : Case 1 257+Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 88 | 257+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.2 | 88 | 257+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

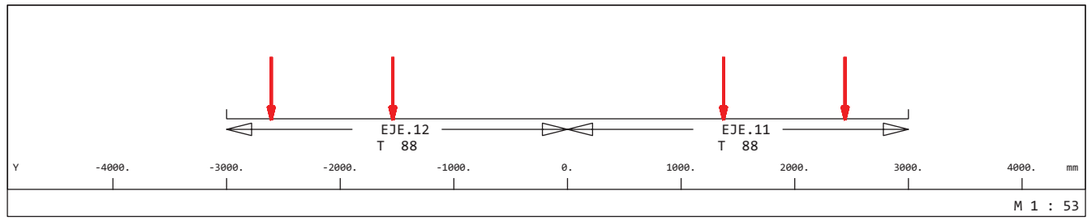
| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 2 257+Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.11 | 88 | 257+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 88 | 257+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Evaluation : Case 3 257+Tolva 62000**

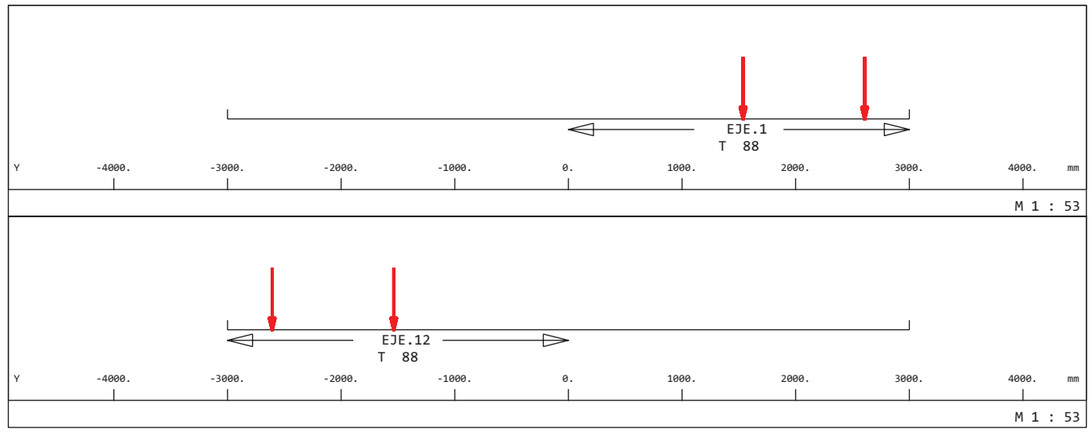
| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.1 | 88 | 257+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.12 | 88 | 257+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |

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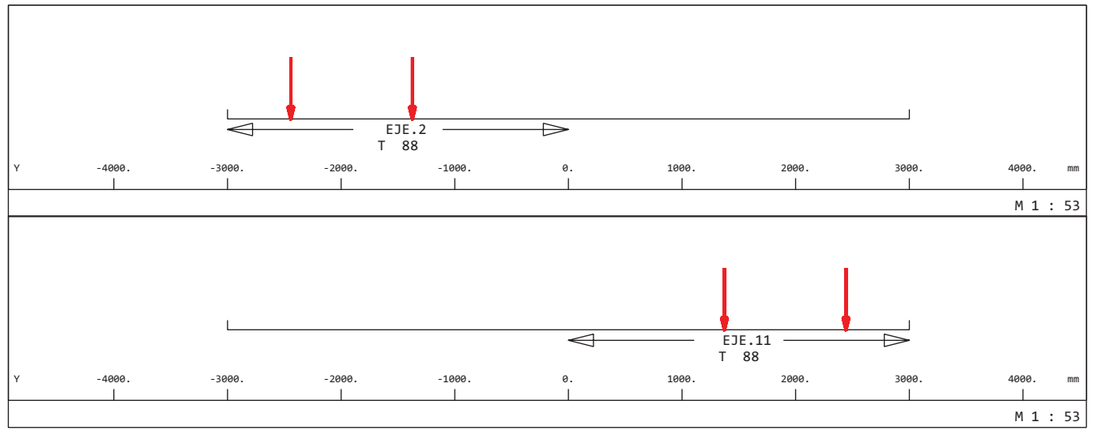
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Evaluación Carga Viva (LL)




**Evaluation : Case 4 257+Tolva 62000**

| Lane | LC | | p[kN/m2] | v[km/h] | yex[m] | PL* | UDL* | RDL* | BRK* | TRA* | FUG* | WIND |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EJE.2 | 88 | 257+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |
| EJE.11 | 88 | 257+Tolva 62000 | 0.00 | 0.0 | 0.000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Loading travels in both directions<br>Transverse loading in unfavourable direction | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| p[kN/m2] | residual loading | RDL* | factor on residual loads |
| v[km/h] | velocity of the load train | BRK* | factor on longitudinal loads |
| yex[m] | eccentricity of load train | TRA* | factor on transverse loads |
| PL* | factor on single loads | FUG* | factor on centrifugal loads |
| UDL* | factor on uniform loads | WIND | factor on wind loading |




**Load Cases**

**Superposition combinations**

| Type | case | fact | case | fact | case | fact | case | fact | case | fact | case | fact |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A0 | 1:4 | 1.00 | | | | | | | | | | |

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Horizontales

**Load Case 11001 (GR_2) Lazo D 0**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 24 | ZZ | 0.000 | 0.000 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 0.000 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11002 (GR_2) Lazo D 1**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 0.455 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.455 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11003 (GR_2) Lazo D 2**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 0.910 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.910 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11004 (GR_2) Lazo D 3**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 1.365 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 1.365 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11005 (GR_2) Lazo D 4**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 1.820 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 1.820 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11006 (GR_2) Lazo D 5**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 2.275 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.275 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11007 (GR_2) Lazo D 6**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 2.730 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.730 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11008 (GR_2) Lazo D 7**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 3.185 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 3.185 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11009 (GR_2) Lazo D 8**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 3.640 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 3.640 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11010 (GR_2) Lazo D 9**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 4.095 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.095 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11011 (GR_2) Lazo D 10**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 4.550 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.550 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11012 (GR_2) Lazo D 11**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 5.005 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.005 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11013 (GR_2) Lazo D 12**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 5.460 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 5.460 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11014 (GR_2) Lazo D 13**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 5.915 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.915 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11015 (GR_2) Lazo D 14**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 6.370 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.370 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11016 (GR_2) Lazo D 15**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 6.825 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.825 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11017 (GR_2) Lazo D 16**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 7.280 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 7.280 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11018 (GR_2) Lazo D 17**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 7.735 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 7.735 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11019 (GR_2) Lazo D 18**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 8.190 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.190 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11020 (GR_2) Lazo D 19**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 8.645 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.645 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11021 (GR_2) Lazo D 20**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 9.100 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 9.100 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11022 (GR_2) Lazo D 21**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 9.555 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 9.555 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11023 (GR_2) Lazo D 22**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 10.010 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.010 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11024 (GR_2) Lazo D 23**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 10.465 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.465 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11025 (GR_2) Lazo D 24**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 10.920 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 10.920 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11026 (GR_2) Lazo D 25**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 11.375 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.375 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11027 (GR_2) Lazo D 26**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 11.830 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.830 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11028 (GR_2) Lazo D 27**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 12.285 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 12.285 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11029 (GR_2) Lazo D 28**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 12.740 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 12.740 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11030 (GR_2) Lazo D 29**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 13.195 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.195 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11031 (GR_2) Lazo D 30**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 13.650 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.650 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11032 (GR_2) Lazo D 31**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 14.105 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 14.105 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11033 (GR_2) Lazo D 32**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 14.560 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 14.560 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11034 (GR_2) Lazo D 33**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 15.015 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.015 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11035 (GR_2) Lazo D 34**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 15.470 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.470 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11036 (GR_2) Lazo D 35**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 15.925 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.925 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11037 (GR_2) Lazo D 36**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 24 | ZZ | 0.000 | 16.380 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 16.380 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11101 (GR_2) Lazo I 0**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 24 | ZZ | 0.000 | 0.000 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 0.000 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11102 (GR_2) Lazo I 1**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 0.455 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.455 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11103 (GR_2) Lazo I 2**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 0.910 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.910 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11104 (GR_2) Lazo I 3**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 1.365 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 1.365 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11105 (GR_2) Lazo I 4**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 1.820 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 1.820 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11106 (GR_2) Lazo I 5**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 2.275 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.275 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11107 (GR_2) Lazo I 6**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 2.730 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.730 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11108 (GR_2) Lazo I 7**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 3.185 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 3.185 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11109 (GR_2) Lazo I 8**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 3.640 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 3.640 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11110 (GR_2) Lazo I 9**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 4.095 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.095 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11111 (GR_2) Lazo I 10**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 4.550 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.550 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11112 (GR_2) Lazo I 11**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 5.005 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.005 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11113 (GR_2) Lazo I 12**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 5.460 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 5.460 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11114 (GR_2) Lazo I 13**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 5.915 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.915 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11115 (GR_2) Lazo I 14**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 6.370 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.370 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11116 (GR_2) Lazo I 15**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 6.825 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.825 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11117 (GR_2) Lazo I 16**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 7.280 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 7.280 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11118 (GR_2) Lazo I 17**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 7.735 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 7.735 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11119 (GR_2) Lazo I 18**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 8.190 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.190 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11120 (GR_2) Lazo I 19**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 8.645 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.645 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11121 (GR_2) Lazo I 20**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 9.100 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 9.100 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11122 (GR_2) Lazo I 21**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 9.555 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 9.555 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11123 (GR_2) Lazo I 22**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 10.010 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.010 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11124 (GR_2) Lazo I 23**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 10.465 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.465 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11125 (GR_2) Lazo I 24**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 10.920 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 10.920 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11126 (GR_2) Lazo I 25**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 11.375 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.375 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11127 (GR_2) Lazo I 26**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 11.830 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.830 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11128 (GR_2) Lazo I 27**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 12.285 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 12.285 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11129 (GR_2) Lazo I 28**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 12.740 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 12.740 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11130 (GR_2) Lazo I 29**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 13.195 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.195 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11131 (GR_2) Lazo I 30**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 13.650 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.650 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11132 (GR_2) Lazo I 31**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 14.105 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 14.105 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11133 (GR_2) Lazo I 32**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 14.560 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 14.560 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11134 (GR_2) Lazo I 33**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 15.015 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.015 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11135 (GR_2) Lazo I 34**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 15.470 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.470 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

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**Load Case 11136 (GR_2) Lazo I 35**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 15.925 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.925 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11137 (GR_2) Lazo I 36**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 24 | ZZ | 0.000 | 16.380 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 16.380 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11201 (GR_2) Lazo D+I 0**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 24 | ZZ | 0.000 | 0.000 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 0.000 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 0.000 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 0.000 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11202 (GR_2) Lazo D+I 1**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 0.455 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.455 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.455 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.455 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11203 (GR_2) Lazo D+I 2**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 0.910 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.910 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.910 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 0.910 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11204 (GR_2) Lazo D+I 3**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 1.365 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 1.365 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 1.365 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 1.365 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11205 (GR_2) Lazo D+I 4**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 1.820 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 1.820 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 1.820 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 1.820 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11206 (GR_2) Lazo D+I 5**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 2.275 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.275 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.275 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.275 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11207 (GR_2) Lazo D+I 6**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 2.730 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.730 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.730 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 2.730 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11208 (GR_2) Lazo D+I 7**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 3.185 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 3.185 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 3.185 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 3.185 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11209 (GR_2) Lazo D+I 8**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 3.640 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 3.640 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 3.640 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 3.640 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11210 (GR_2) Lazo D+I 9**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 4.095 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.095 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.095 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.095 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11211 (GR_2) Lazo D+I 10**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 4.550 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.550 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.550 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 4.550 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11212 (GR_2) Lazo D+I 11**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 5.005 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.005 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.005 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.005 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11213 (GR_2) Lazo D+I 12**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 5.460 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 5.460 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 5.460 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 5.460 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11214 (GR_2) Lazo D+I 13**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 5.915 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.915 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.915 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 5.915 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11215 (GR_2) Lazo D+I 14**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 6.370 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.370 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.370 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.370 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11216 (GR_2) Lazo D+I 15**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 6.825 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.825 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.825 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 6.825 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11217 (GR_2) Lazo D+I 16**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 7.280 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 7.280 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 7.280 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 7.280 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11218 (GR_2) Lazo D+I 17**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 7.735 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 7.735 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 7.735 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 7.735 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11219 (GR_2) Lazo D+I 18**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 8.190 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.190 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.190 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.190 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11220 (GR_2) Lazo D+I 19**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 8.645 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.645 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.645 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 8.645 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11221 (GR_2) Lazo D+I 20**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 9.100 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 9.100 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 9.100 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 9.100 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11222 (GR_2) Lazo D+I 21**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 9.555 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 9.555 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 9.555 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 9.555 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11223 (GR_2) Lazo D+I 22**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 10.010 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.010 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.010 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.010 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11224 (GR_2) Lazo D+I 23**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 10.465 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.465 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.465 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 10.465 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11225 (GR_2) Lazo D+I 24**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 10.920 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 10.920 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 10.920 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 10.920 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11226 (GR_2) Lazo D+I 25**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 11.375 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.375 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.375 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.375 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11227 (GR_2) Lazo D+I 26**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 11.830 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.830 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.830 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 11.830 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11228 (GR_2) Lazo D+I 27**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 12.285 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 12.285 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 12.285 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 12.285 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11229 (GR_2) Lazo D+I 28**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 12.740 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 12.740 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 12.740 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 12.740 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11230 (GR_2) Lazo D+I 29**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 13.195 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.195 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.195 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.195 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11231 (GR_2) Lazo D+I 30**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 13.650 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.650 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.650 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 13.650 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11232 (GR_2) Lazo D+I 31**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 14.105 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 14.105 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 14.105 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 14.105 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11233 (GR_2) Lazo D+I 32**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 14 | ZZ | 0.000 | 14.560 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 14.560 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 14.560 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 14 | ZZ | 0.000 | 14.560 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11234 (GR_2) Lazo D+I 33**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 15.015 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.015 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.015 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.015 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11235 (GR_2) Lazo D+I 34**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 15.470 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.470 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.470 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.470 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11236 (GR_2) Lazo D+I 35**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 31 | ZZ | 0.000 | 15.925 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.925 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.925 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 31 | ZZ | 0.000 | 15.925 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 11237 (GR_2) Lazo D+I 36**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 89 with factor 1.000
Selected loads copied from load case 89 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Point | Qgrp 24 | ZZ | 0.000 | 16.380 | -1.537 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 16.380 | -2.607 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 16.380 | 2.443 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |
| Point | Qgrp 24 | ZZ | 0.000 | 16.380 | 1.373 | 0.460 | PYY | -50.0 [kN] |
| | | | | | | activated | | 100.00 percent |

**Load Case 12001 (GR_1) Frenado D**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 91 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -1.537 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | -1.537 | 0.460 | | 15.02 [kN/m] |
| | | | | | | activated (--) | | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -2.607 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | -2.607 | 0.460 | | 15.02 [kN/m] |
| | | | | | | activated (--) | | 80.37 percent |

**Load Case 12002 (GR_1) Frenado I**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 91 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 2.443 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | 2.443 | 0.460 | | 15.02 [kN/m] |
| | | | | | | activated (--) | | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 1.373 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | 1.373 | 0.460 | | 15.02 [kN/m] |
| | | | | | | activated (--) | | 80.37 percent |

**Load Case 12003 (GR_1) Fr+Acc 1**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 91 with factor 1.000
Selected loads copied from load case 90 with factor 1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -1.537 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | -1.537 | 0.460 | | 15.02 [kN/m] |
| | | | | | | activated (--) | | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -2.607 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | -2.607 | 0.460 | | 15.02 [kN/m] |
| | | | | | | activated (--) | | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 2.443 | 0.460 | PXX | 9.10 [kN/m] |
| | | | | 18.380 | 2.443 | 0.460 | | 9.10 [kN/m] |
| | | | | | | activated (--) | | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 1.373 | 0.460 | PXX | 9.10 [kN/m] |
| | | | | 18.380 | 1.373 | 0.460 | | 9.10 [kN/m] |
| | | | | | | activated (--) | | 80.37 percent |

**Load Case 12004 (GR_1) Fr+Acc 2**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 90 with factor 1.000
Selected loads copied from load case 91 with factor 1.000

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -1.537 | 0.460 | PXX | 9.10 [kN/m] |
| | | | | 18.380 | -1.537 | 0.460 | | 9.10 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -2.607 | 0.460 | PXX | 9.10 [kN/m] |
| | | | | 18.380 | -2.607 | 0.460 | | 9.10 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 2.443 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | 2.443 | 0.460 | | 15.02 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 1.373 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | 1.373 | 0.460 | | 15.02 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |

**Load Case 12005 (GR_1) Fr+Acc 3**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 91 with factor 1.000
Selected loads copied from load case 90 with factor -1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -1.537 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | -1.537 | 0.460 | | 15.02 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -2.607 | 0.460 | PXX | 15.02 [kN/m] |
| | | | | 18.380 | -2.607 | 0.460 | | 15.02 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 2.443 | 0.460 | PXX | -9.10 [kN/m] |
| | | | | 18.380 | 2.443 | 0.460 | | -9.10 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 1.373 | 0.460 | PXX | -9.10 [kN/m] |
| | | | | 18.380 | 1.373 | 0.460 | | -9.10 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |

**Load Case 12006 (GR_1) Fr+Acc 4**

Factor forces and moments 1.000
unfavourable partial safety factor 1.350
favourable partial safety factor 0.000

Selected loads copied from load case 90 with factor 1.000
Selected loads copied from load case 91 with factor -1.000

**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -1.537 | 0.460 | PXX | 9.10 [kN/m] |
| | | | | 18.380 | -1.537 | 0.460 | | 9.10 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | -2.607 | 0.460 | PXX | 9.10 [kN/m] |
| | | | | 18.380 | -2.607 | 0.460 | | 9.10 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 2.443 | 0.460 | PXX | -15.02 [kN/m] |
| | | | | 18.380 | 2.443 | 0.460 | | -15.02 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |

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**Loads**

| Kind | Reference to | Projection Designation | W[m] | Coordinates X[m] | Y[m] | Z[m] | Type | Load value |
|---|---|---|---|---|---|---|---|---|
| Curve | Qgrp -mult- | ZZ | 0.000 | -2.000 | 1.373 | 0.460 | PXX | -15.02 [kN/m] |
| | | | | 18.380 | 1.373 | 0.460 | | -15.02 [kN/m] |
| | | | | | | | activated (--) | 80.37 percent |

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**Actions**

| type | part | sup | Designation | γ-u | γ-f | γ-a | $\psi_0$ | $\psi_1$ | $\psi_2$ | $\psi_1$inf |
|---|---|---|---|---|---|---|---|---|---|---|
| C_1 | G | perm | Fluencia t_0 | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C_2 | G | cond | Fluencia t_inf | 1.35 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G | G | perm | dead load | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G_1 | G | perm | Peso propio | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G_2 | G | perm | | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G_3 | G | perm | Firme | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| PP | G | perm | Peso propio | 1.35 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| C | P | perm | creep + shrinkage | 1.35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| CL_1 | Q | exex | V+SC | 1.50 | 0.00 | 1.00 | 1.00 | 0.33 | 0.00 | 0.33 |
| GR_1 | Q | exex | grp1 | 1.35 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| GR_2 | Q | exex | grp2 | 1.35 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| GR_6 | Q | exex | grp1f | 1.35 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| L1_T | Q | excl | gr1a LM1 TS | 1.35 | 0.00 | 0.00 | 0.75 | 0.75 | 0.00 | 0.75 |
| L1_U | Q | excl | gr1a LM1 UDL | 1.35 | 0.00 | 0.00 | 0.40 | 0.40 | 0.00 | 0.40 |
| LL_1 | Q | excl | LL-Serie 254 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_2 | Q | excl | LL-Serie 257 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_3 | Q | excl | LL-Tolva 62000 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_4 | Q | excl | LL-2x254 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_5 | Q | excl | LL-2x257 | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_6 | Q | excl | LL-2xtolvas | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_7 | Q | excl | LL-254+tolvas | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LL_8 | Q | excl | LL-257+tolvas | 1.75 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | Reliability factor Kfi | 1.000 | | | | | | |
| | | | Reduction factor xsi | 0.850 | | | | | | |

type action γ-u,γ-f,γ-a partial safety factors for unfavourable/favourable/accidental
part partition of the action $\psi_0,\psi_1,\psi_2,\psi_1$inf combination coefficients
sup superposition type

**Load Case 21 (CL_1) Viento**

Factor forces and moments 1.000
unfavourable partial safety factor 1.500
favourable partial safety factor 0.000
Combination coefficient $\psi_0$ 1.000 (rare)
Combination coefficient $\psi_1$inf 0.330 (infrequent)
Combination coefficient $\psi_1$ 0.330 (frequent)
Combination coefficient $\psi_2$ 0.000 (permanent)

**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[m] | za[m] | ye[m] | ze[m] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100001 | PYY | 0.000 | 0.172 | 0.33 | | [kN/m] | | | | | |
| 100002 | PYY | 0.000 | 0.128 | 0.33 | | [kN/m] | | | | | |
| 100003 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 100004 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 100005 | PYY | 0.000 | 1.170 | 0.33 | | [kN/m] | | | | | |
| 100006 | PYY | 0.000 | 1.170 | 0.33 | | [kN/m] | | | | | |
| 100007 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 100008 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 100009 | PYY | 0.000 | 0.128 | 0.33 | | [kN/m] | | | | | |
| 100010 | PYY | 0.000 | 0.172 | 0.33 | | [kN/m] | | | | | |
| 100011 | PYY | 0.000 | 0.172 | 0.33 | | [kN/m] | | | | | |
| 100012 | PYY | 0.000 | 0.128 | 0.33 | | [kN/m] | | | | | |
| 100013 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 100014 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 100015 | PYY | 0.000 | 1.170 | 0.33 | | [kN/m] | | | | | |
| 100016 | PYY | 0.000 | 1.170 | 0.33 | | [kN/m] | | | | | |
| 100017 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 100018 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 100019 | PYY | 0.000 | 0.128 | 0.33 | | [kN/m] | | | | | |
| 100020 | PYY | 0.000 | 0.172 | 0.33 | | [kN/m] | | | | | |

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**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[m] | za[m] | ye[m] | ze[m] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 200001 | PYY | 0.000 | 0.650 | 0.33 | | [kN/m] | | | | | |
| 200002 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200003 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200004 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200005 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200006 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200007 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200008 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200009 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200010 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200011 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200012 | PYY | 0.000 | 0.650 | 0.33 | | [kN/m] | | | | | |
| 200013 | PYY | 0.000 | 0.650 | 0.33 | | [kN/m] | | | | | |
| 200014 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200015 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200016 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200017 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200018 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200019 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200020 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200021 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200022 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200023 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 200024 | PYY | 0.000 | 0.650 | 0.33 | | [kN/m] | | | | | |
| 300001 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 300002 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 300003 | PYY | 0.000 | 0.230 | 0.33 | | [kN/m] | | | | | |
| 300004 | PYY | 0.000 | 0.230 | 0.33 | | [kN/m] | | | | | |
| 300005 | PYY | 0.000 | 0.272 | 0.33 | | [kN/m] | | | | | |
| 300006 | PYY | 0.000 | 0.188 | 0.33 | | [kN/m] | | | | | |
| 300007 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 300008 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 300009 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 300010 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 300011 | PYY | 0.000 | 0.188 | 0.33 | | [kN/m] | | | | | |
| 300012 | PYY | 0.000 | 0.272 | 0.33 | | [kN/m] | | | | | |
| 300013 | PYY | 0.000 | 0.230 | 0.33 | | [kN/m] | | | | | |
| 300014 | PYY | 0.000 | 0.230 | 0.33 | | [kN/m] | | | | | |
| 300015 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 300016 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 400001 | PYY | 0.000 | 0.172 | 0.33 | | [kN/m] | | | | | |
| 400002 | PYY | 0.000 | 0.128 | 0.33 | | [kN/m] | | | | | |
| 400003 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 400004 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 400005 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 400006 | PYY | 0.000 | 0.260 | 0.33 | | [kN/m] | | | | | |
| 400007 | PYY | 0.000 | 0.260 | 0.33 | | [kN/m] | | | | | |
| 400008 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 400009 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 400010 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 400011 | PYY | 0.000 | 0.128 | 0.33 | | [kN/m] | | | | | |
| 400012 | PYY | 0.000 | 0.172 | 0.33 | | [kN/m] | | | | | |
| 400013 | PYY | 0.000 | 0.172 | 0.33 | | [kN/m] | | | | | |
| 400014 | PYY | 0.000 | 0.128 | 0.33 | | [kN/m] | | | | | |
| 400015 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 400016 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 400017 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 400018 | PYY | 0.000 | 0.260 | 0.33 | | [kN/m] | | | | | |

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**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[m] | za[m] | ye[m] | ze[m] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 400019 | PYY | 0.000 | 0.260 | 0.33 | | [kN/m] | | | | | |
| 400020 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 400021 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 400022 | PYY | 0.000 | 0.760 | 0.33 | | [kN/m] | | | | | |
| 400023 | PYY | 0.000 | 0.128 | 0.33 | | [kN/m] | | | | | |
| 400024 | PYY | 0.000 | 0.172 | 0.33 | | [kN/m] | | | | | |
| 500001 | PYY | 0.000 | 0.650 | 0.33 | | [kN/m] | | | | | |
| 500002 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500003 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500004 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500005 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500006 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500007 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500008 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500009 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500010 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500011 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500012 | PYY | 0.000 | 0.650 | 0.33 | | [kN/m] | | | | | |
| 500013 | PYY | 0.000 | 0.650 | 0.33 | | [kN/m] | | | | | |
| 500014 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500015 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500016 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500017 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500018 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500019 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500020 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500021 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500022 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500023 | PYY | 0.000 | 0.910 | 0.33 | | [kN/m] | | | | | |
| 500024 | PYY | 0.000 | 0.650 | 0.33 | | [kN/m] | | | | | |
| 600001 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 600002 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 600003 | PYY | 0.000 | 0.203 | 0.33 | | [kN/m] | | | | | |
| 600004 | PYY | 0.000 | 0.257 | 0.33 | | [kN/m] | | | | | |
| 600005 | PYY | 0.000 | 0.230 | 0.33 | | [kN/m] | | | | | |
| 600006 | PYY | 0.000 | 0.230 | 0.33 | | [kN/m] | | | | | |
| 600007 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 600008 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 600009 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 600010 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 600011 | PYY | 0.000 | 0.230 | 0.33 | | [kN/m] | | | | | |
| 600012 | PYY | 0.000 | 0.230 | 0.33 | | [kN/m] | | | | | |
| 600013 | PYY | 0.000 | 0.256 | 0.33 | | [kN/m] | | | | | |
| 600014 | PYY | 0.000 | 0.204 | 0.33 | | [kN/m] | | | | | |
| 600015 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 600016 | PYY | 0.000 | 0.150 | 0.33 | | [kN/m] | | | | | |
| 700001 | PYY | 0.000 | 0.185 | 0.15 | | [kN/m] | | | | | |
| 700002 | PYY | 0.000 | 0.257 | 0.15 | | [kN/m] | | | | | |
| 700003 | PYY | 0.000 | 0.410 | 0.15 | | [kN/m] | | | | | |
| 700004 | PYY | 0.000 | 0.410 | 0.15 | | [kN/m] | | | | | |
| 700005 | PYY | 0.000 | 0.370 | 0.15 | | [kN/m] | | | | | |
| 700006 | PYY | 0.000 | 0.370 | 0.15 | | [kN/m] | | | | | |
| 700007 | PYY | 0.000 | 0.221 | 0.15 | | [kN/m] | | | | | |
| 700008 | PYY | 0.000 | 0.221 | 0.15 | | [kN/m] | | | | | |
| 700009 | PYY | 0.000 | 0.410 | 0.15 | | [kN/m] | | | | | |
| 700010 | PYY | 0.000 | 0.410 | 0.15 | | [kN/m] | | | | | |
| 700011 | PYY | 0.000 | 0.370 | 0.15 | | [kN/m] | | | | | |
| 700012 | PYY | 0.000 | 0.370 | 0.15 | | [kN/m] | | | | | |

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**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[m] | za[m] | ye[m] | ze[m] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 700013 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700014 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700015 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700016 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700017 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700018 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700019 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700020 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700021 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700022 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700023 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700024 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700025 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700026 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700027 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700028 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700029 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700030 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700031 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700032 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700033 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700034 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700035 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700036 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700037 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700038 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700039 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700040 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700041 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700042 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700043 | PYY | 0.000 | 0.820 | 0.15 | | [kN/m] | | | | | |
| 700044 | PYY | 0.000 | 0.740 | 0.15 | | [kN/m] | | | | | |
| 700045 | PYY | 0.000 | 0.221 | 0.15 | | [kN/m] | | | | | |
| 700046 | PYY | 0.000 | 0.221 | 0.15 | | [kN/m] | | | | | |
| 700047 | PYY | 0.000 | 0.410 | 0.15 | | [kN/m] | | | | | |
| 700048 | PYY | 0.000 | 0.410 | 0.15 | | [kN/m] | | | | | |
| 700049 | PYY | 0.000 | 0.370 | 0.15 | | [kN/m] | | | | | |
| 700050 | PYY | 0.000 | 0.370 | 0.15 | | [kN/m] | | | | | |
| 700051 | PYY | 0.000 | 0.257 | 0.15 | | [kN/m] | | | | | |
| 700052 | PYY | 0.000 | 0.185 | 0.15 | | [kN/m] | | | | | |
| 700053 | PYY | 0.000 | 0.410 | 0.15 | | [kN/m] | | | | | |
| 700054 | PYY | 0.000 | 0.410 | 0.15 | | [kN/m] | | | | | |
| 700055 | PYY | 0.000 | 0.370 | 0.15 | | [kN/m] | | | | | |
| 700056 | PYY | 0.000 | 0.370 | 0.15 | | [kN/m] | | | | | |
| 800001 | PYY | 0.000 | 0.212 | 0.15 | | [kN/m] | | | | | |
| 800002 | PYY | 0.000 | 0.234 | 0.15 | | [kN/m] | | | | | |
| 800003 | PYY | 0.000 | 0.907 | 0.15 | | [kN/m] | | | | | |
| 800004 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800005 | PYY | 0.000 | 0.223 | 0.15 | | [kN/m] | | | | | |
| 800006 | PYY | 0.000 | 0.223 | 0.15 | | [kN/m] | | | | | |
| 800007 | PYY | 0.000 | 0.907 | 0.15 | | [kN/m] | | | | | |
| 800008 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800009 | PYY | 0.000 | 0.212 | 0.15 | | [kN/m] | | | | | |
| 800010 | PYY | 0.000 | 0.234 | 0.15 | | [kN/m] | | | | | |
| 800011 | PYY | 0.000 | 0.907 | 0.15 | | [kN/m] | | | | | |
| 800012 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800013 | PYY | 0.000 | 0.223 | 0.15 | | [kN/m] | | | | | |
| 800014 | PYY | 0.000 | 0.223 | 0.15 | | [kN/m] | | | | | |

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**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[m] | za[m] | ye[m] | ze[m] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 800015 | PYY | 0.000 | 0.907 | 0.15 | | [kN/m] | | | | | |
| 800016 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800017 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800018 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800019 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800020 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800021 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800022 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800023 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800024 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800025 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800026 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800027 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800028 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800029 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800030 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800031 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800032 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800033 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800034 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800035 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800036 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800037 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800038 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800039 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800040 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800041 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800042 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800043 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800044 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800045 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800046 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800047 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800048 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800049 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800050 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800051 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800052 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800053 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800054 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800055 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800056 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800057 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800058 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800059 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800060 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800061 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800062 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800063 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800064 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800065 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800066 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800067 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800068 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800069 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800070 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800071 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800072 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |

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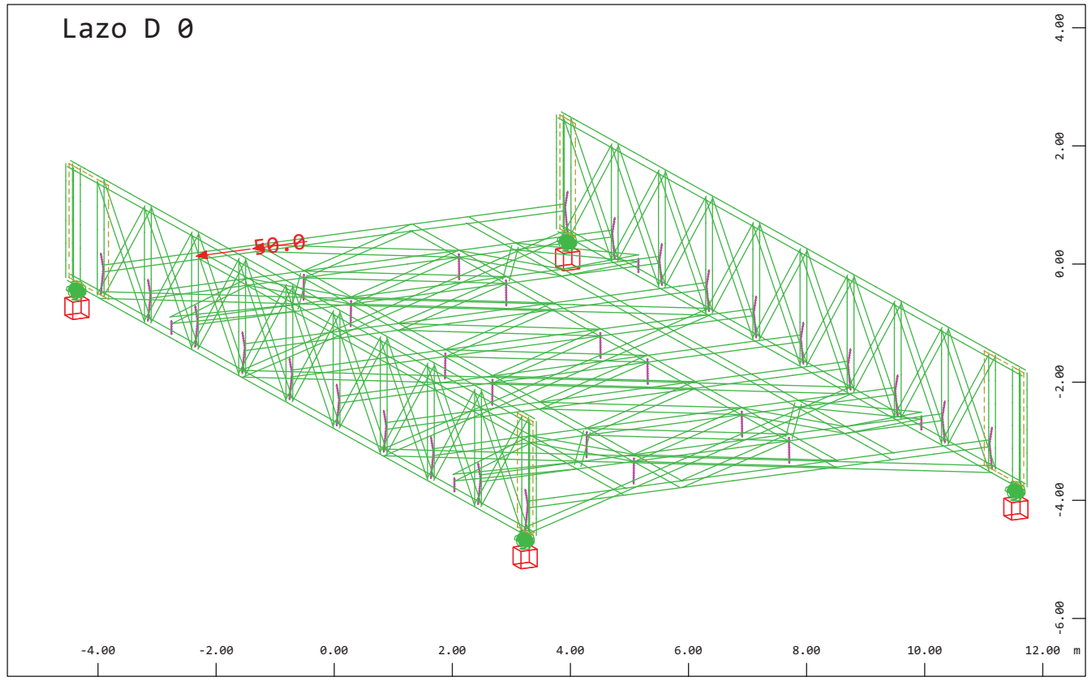
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**Loads acting on Beam elements**

| Number | Type | a[m] | l[m] | Load value | Load value | Unit | ya[m] | za[m] | ye[m] | ze[m] | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 800073 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800074 | PYY | 0.000 | 0.907 | 0.15 | | [kN/m] | | | | | |
| 800075 | PYY | 0.000 | 0.223 | 0.15 | | [kN/m] | | | | | |
| 800076 | PYY | 0.000 | 0.223 | 0.15 | | [kN/m] | | | | | |
| 800077 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800078 | PYY | 0.000 | 0.907 | 0.15 | | [kN/m] | | | | | |
| 800079 | PYY | 0.000 | 0.187 | 0.15 | | [kN/m] | | | | | |
| 800080 | PYY | 0.000 | 0.259 | 0.15 | | [kN/m] | | | | | |
| 800081 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800082 | PYY | 0.000 | 0.907 | 0.15 | | [kN/m] | | | | | |
| 800083 | PYY | 0.000 | 0.223 | 0.15 | | [kN/m] | | | | | |
| 800084 | PYY | 0.000 | 0.223 | 0.15 | | [kN/m] | | | | | |
| 800085 | PYY | 0.000 | 1.353 | 0.15 | | [kN/m] | | | | | |
| 800086 | PYY | 0.000 | 0.907 | 0.15 | | [kN/m] | | | | | |
| 800087 | PYY | 0.000 | 0.187 | 0.15 | | [kN/m] | | | | | |
| 800088 | PYY | 0.000 | 0.259 | 0.15 | | [kN/m] | | | | | |

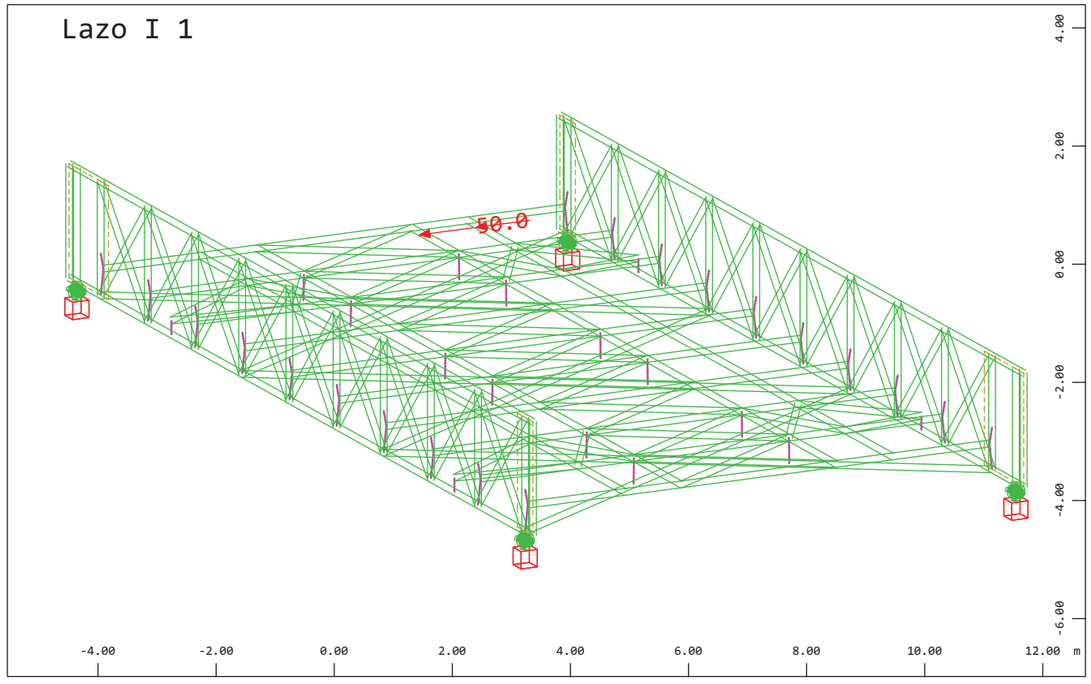
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Cargas




Z
Y X
All loads, Loadcase 11001 Lazo D 0 , (1 cm 3D = unit) Free single load (force) in
global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962



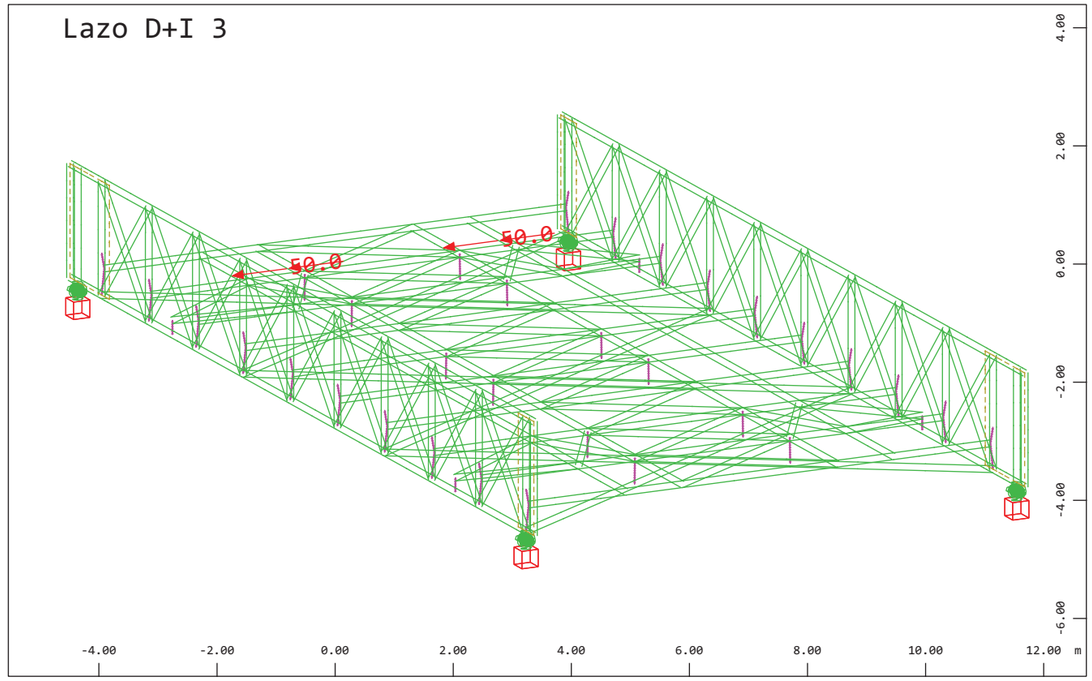

Z
Y X
All loads, Loadcase 11102 Lazo I 1 , (1 cm 3D = unit) Free single load (force) in
global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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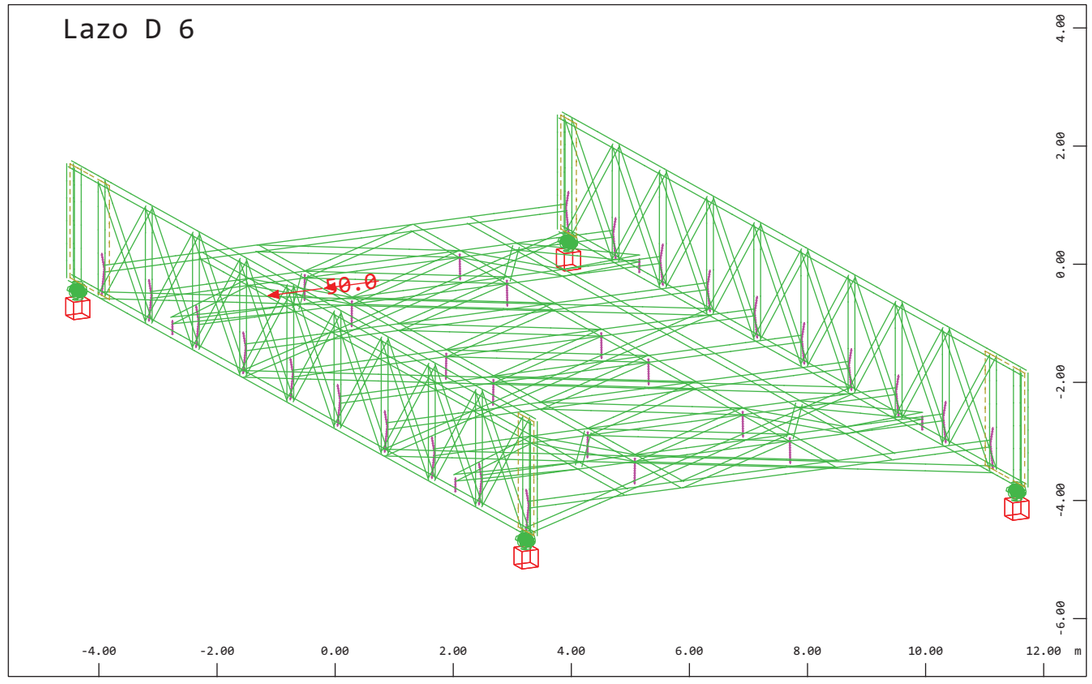


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Z
Y X
All loads, Loadcase 11204 Lazo D+I 3 , (1 cm 3D = unit) Free single load (force) in
global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962



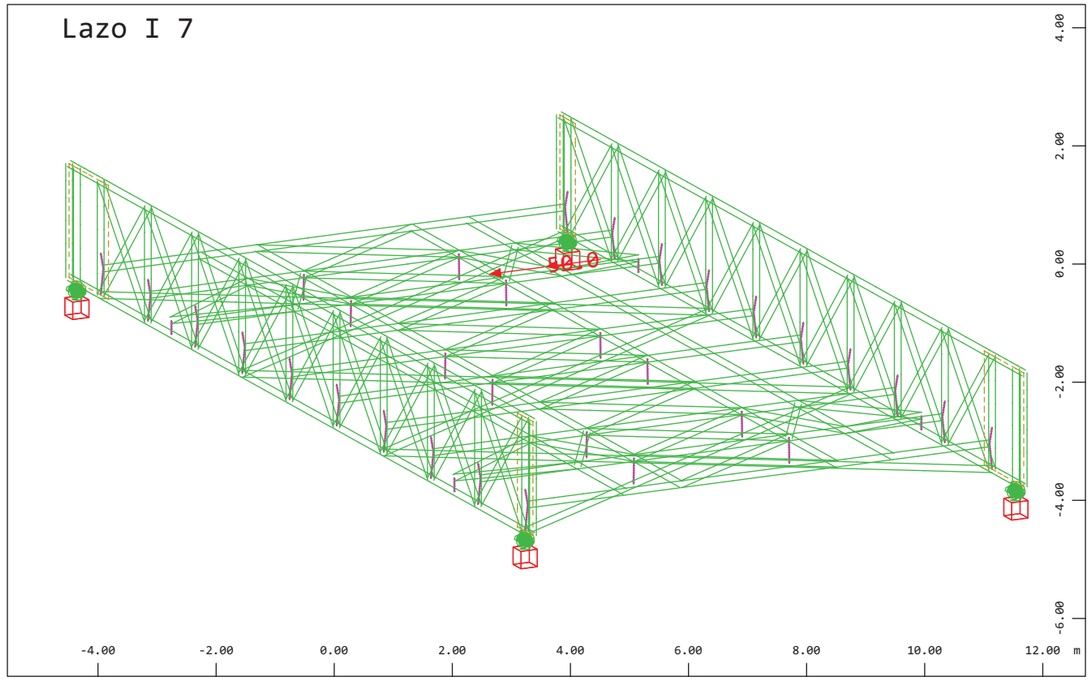

Z
Y X
All loads, Loadcase 11007 Lazo D 6 , (1 cm 3D = unit) Free single load (force) in
global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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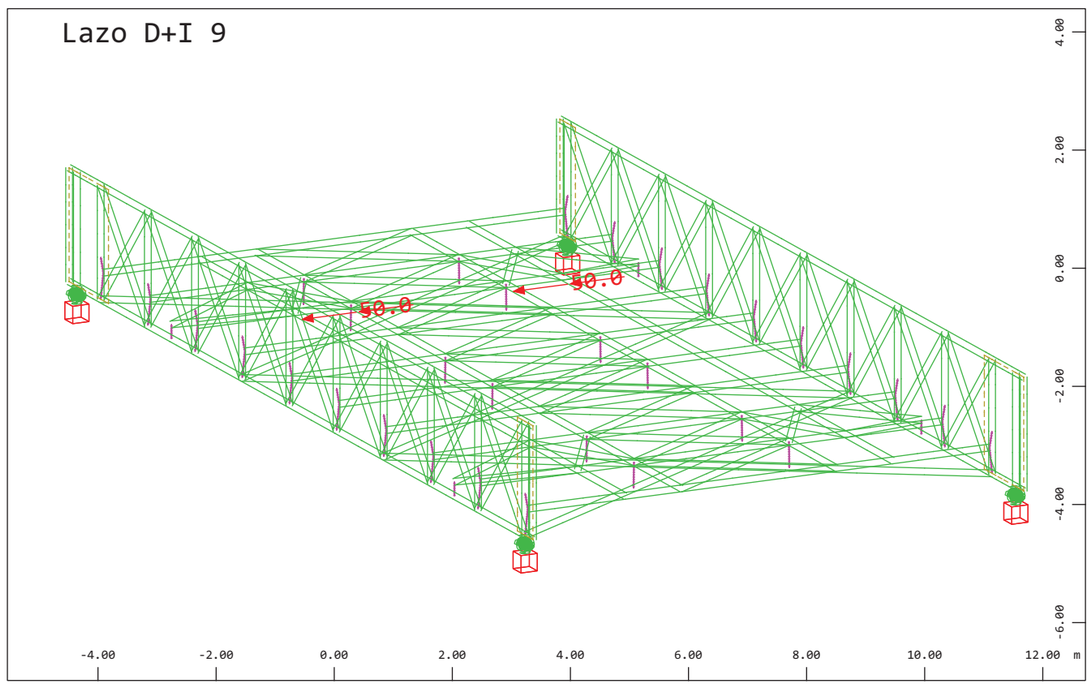
## Lazo I 7




Z Y X All loads, Loadcase 11108 Lazo I 7 , (1 cm 3D = unit) Free single load (force) in global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

## Lazo D+I 9




Z Y X All loads, Loadcase 11210 Lazo D+I 9 , (1 cm 3D = unit) Free single load (force) in global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

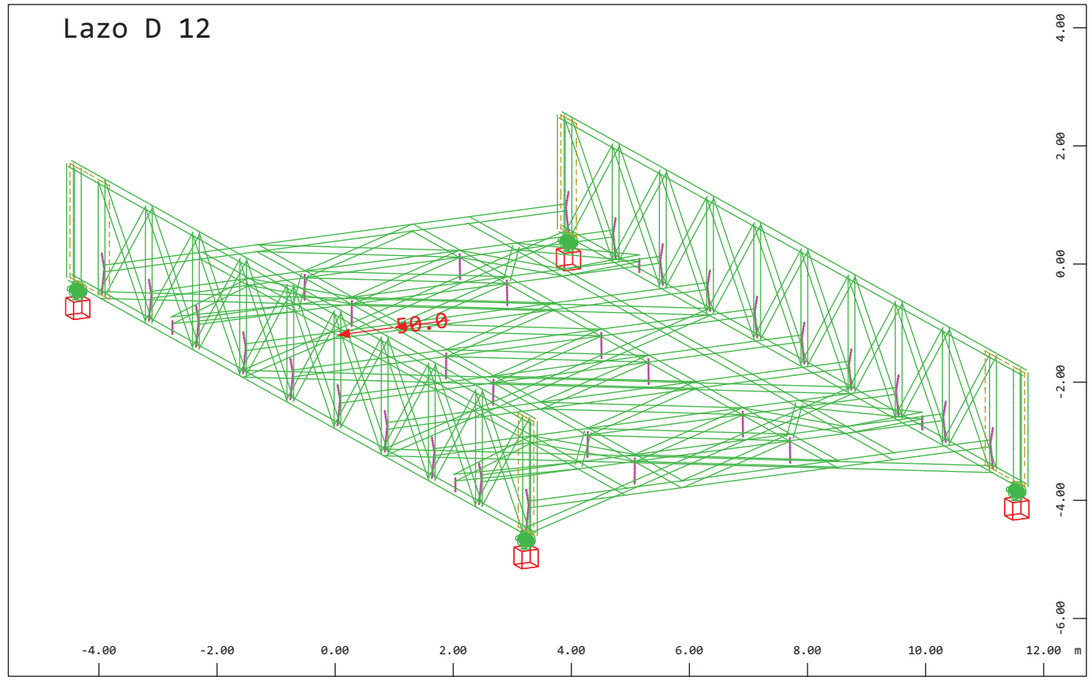
M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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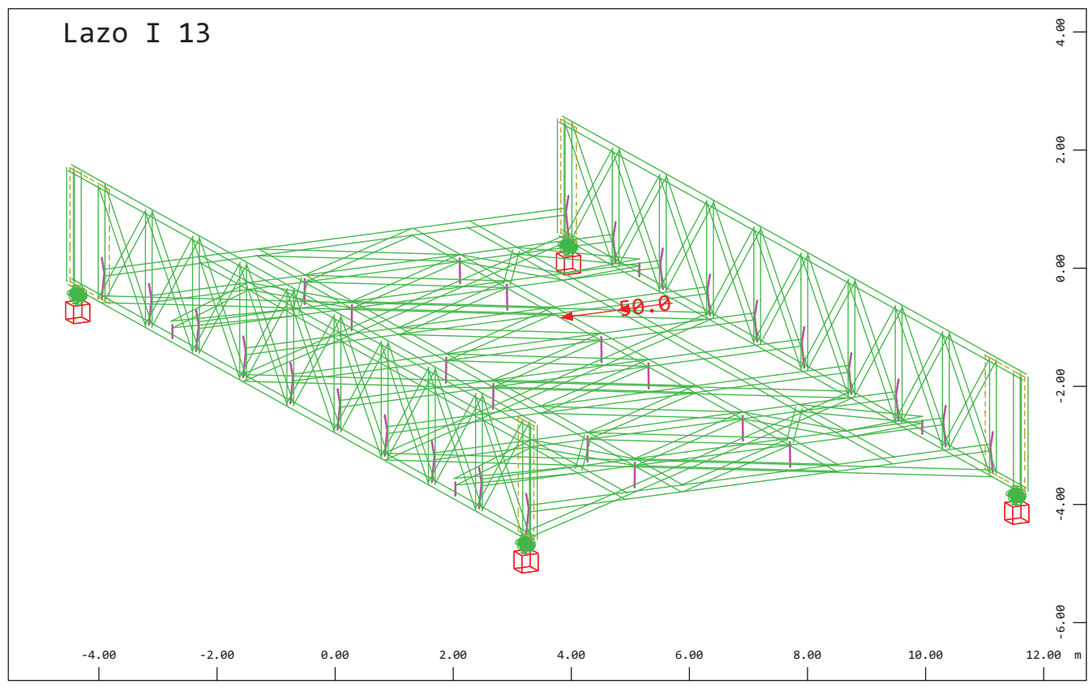
## Lazo D 12




Z Y X All loads, Loadcase 11013 Lazo D 12 , (1 cm 3D = unit) Free single load (force) in global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

## Lazo I 13

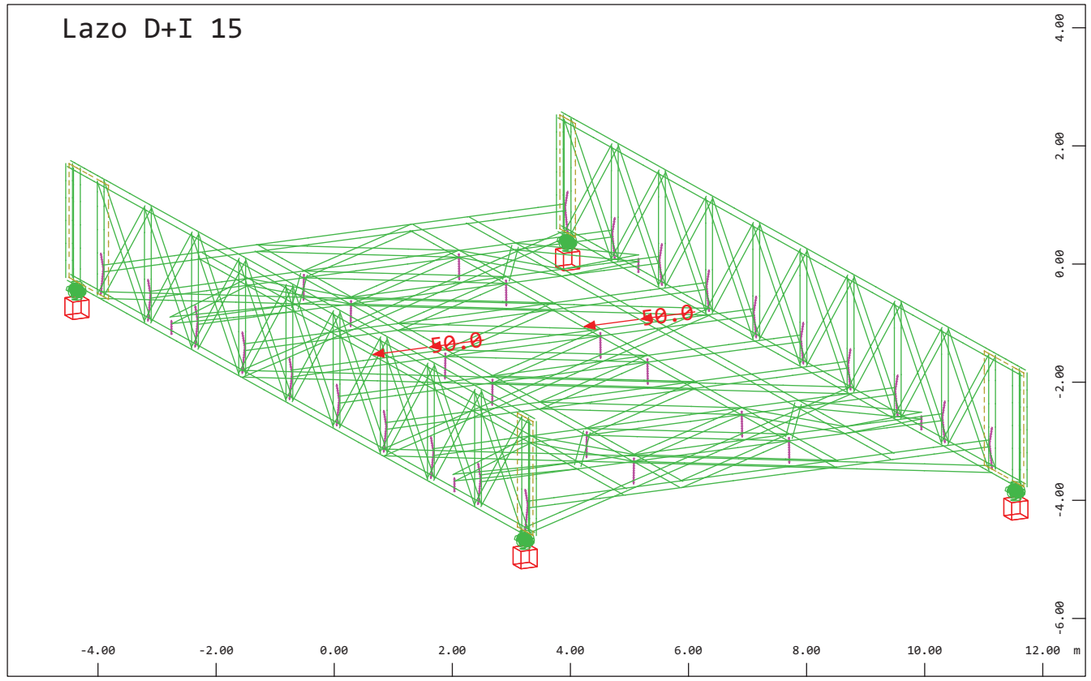


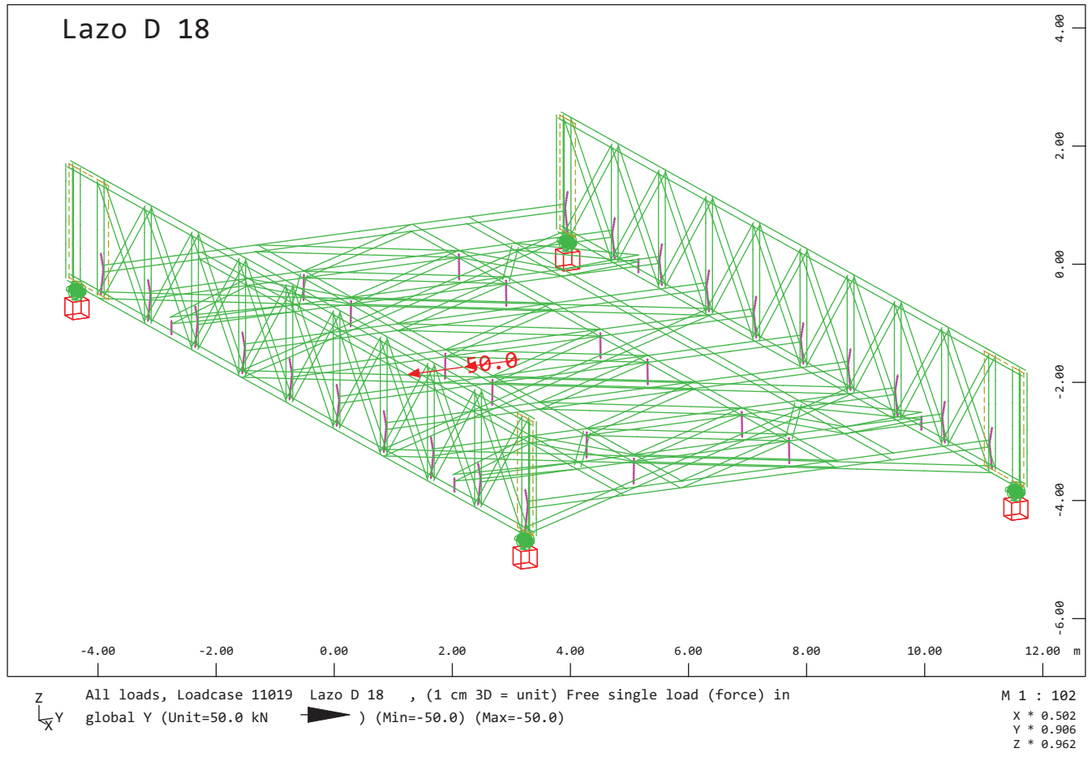

Z Y X All loads, Loadcase 11114 Lazo I 13 , (1 cm 3D = unit) Free single load (force) in global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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Cargas

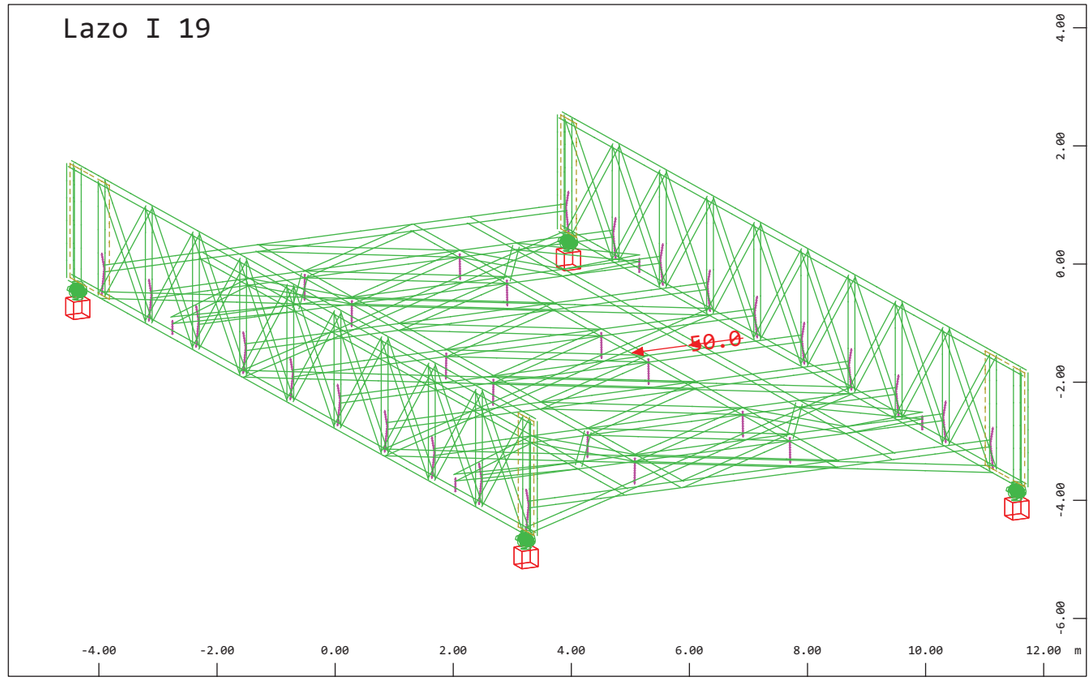


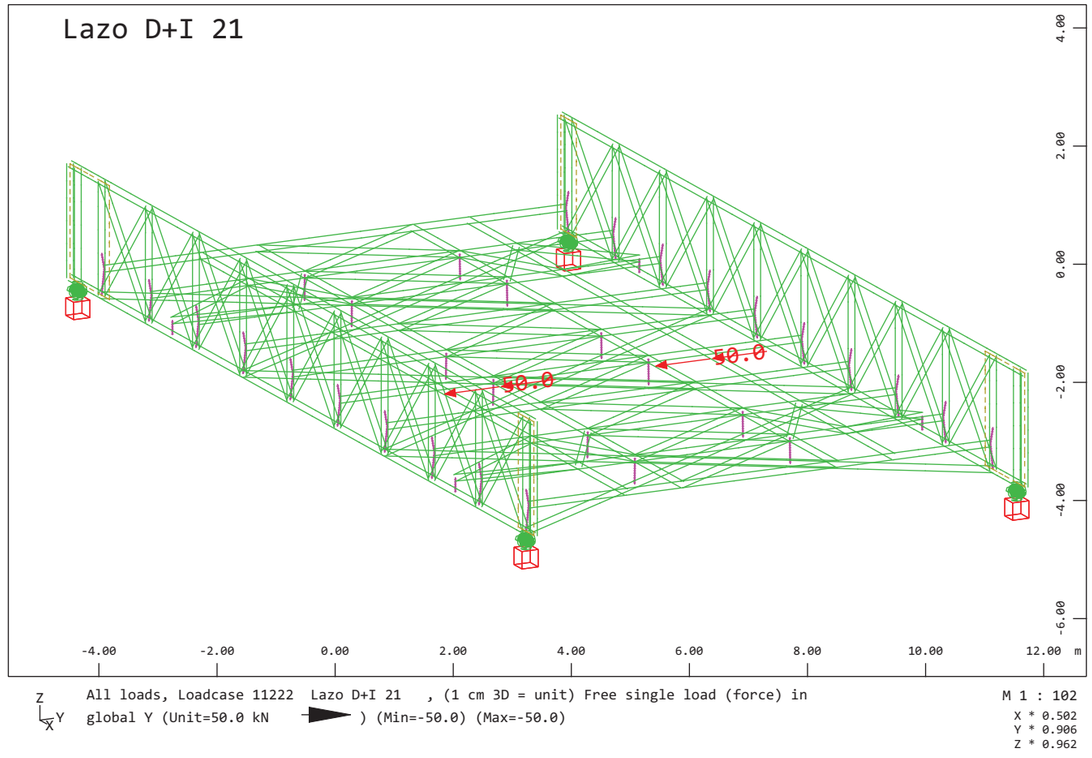




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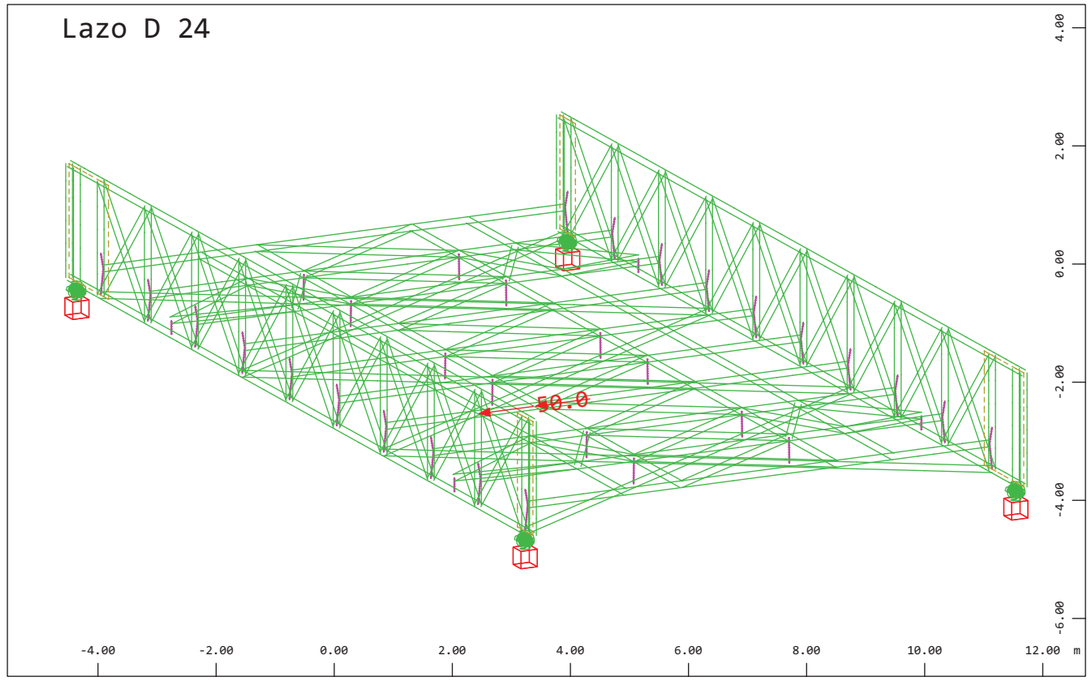
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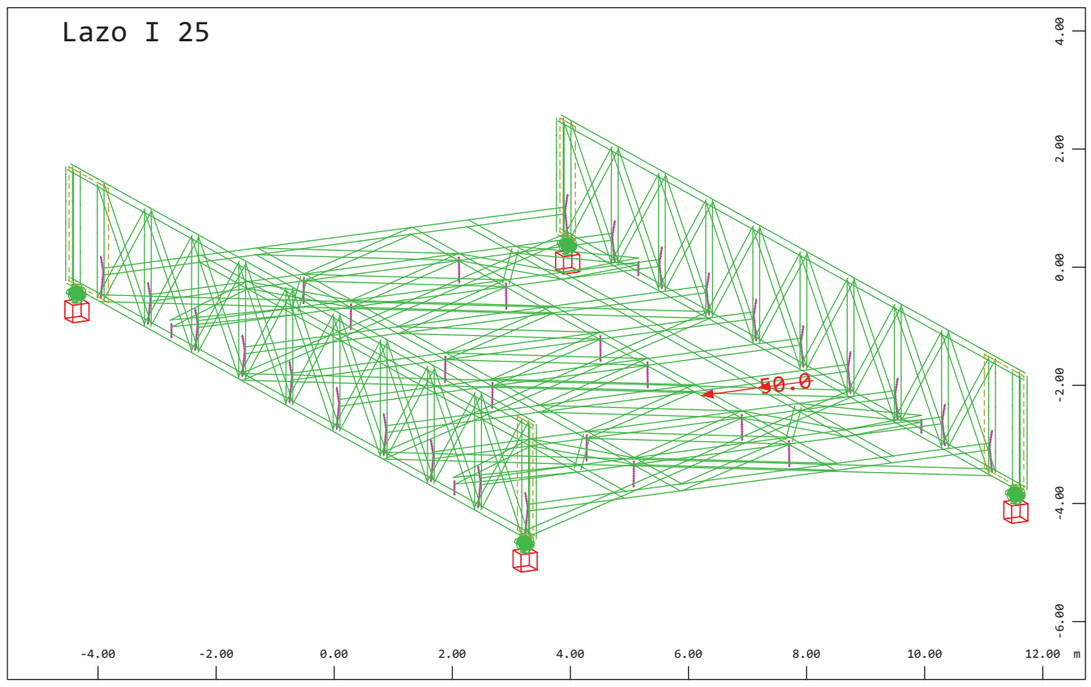

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Cargas




Z Y X All loads, Loadcase 11025 Lazo D 24 , (1 cm 3D = unit) Free single load (force) in
global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962



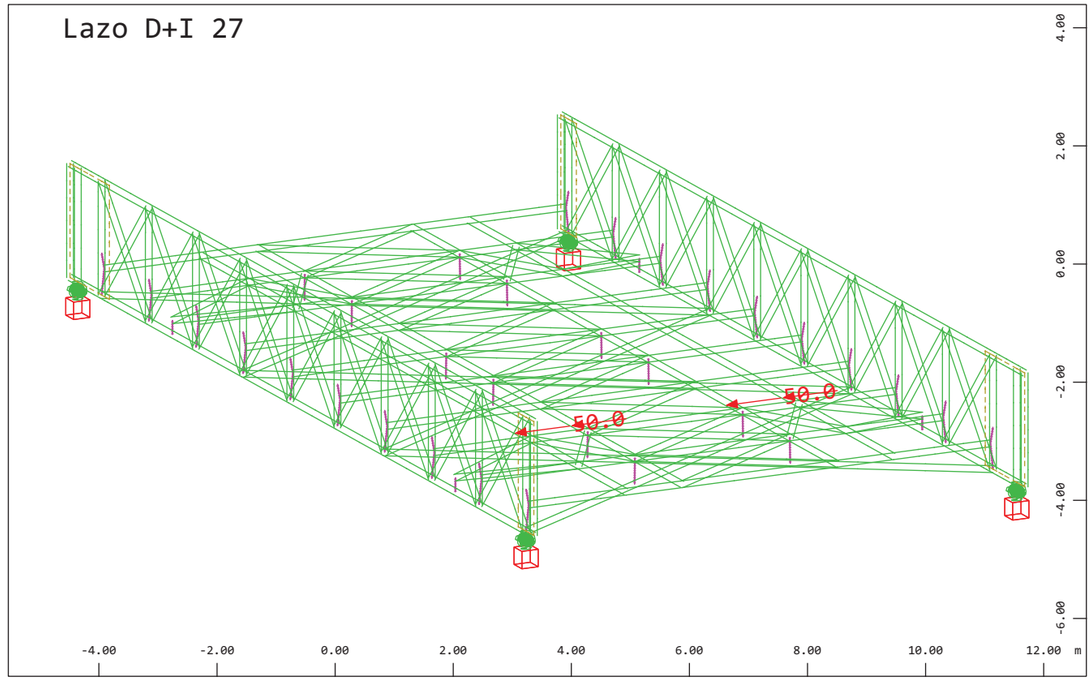

Z Y X All loads, Loadcase 11126 Lazo I 25 , (1 cm 3D = unit) Free single load (force) in
global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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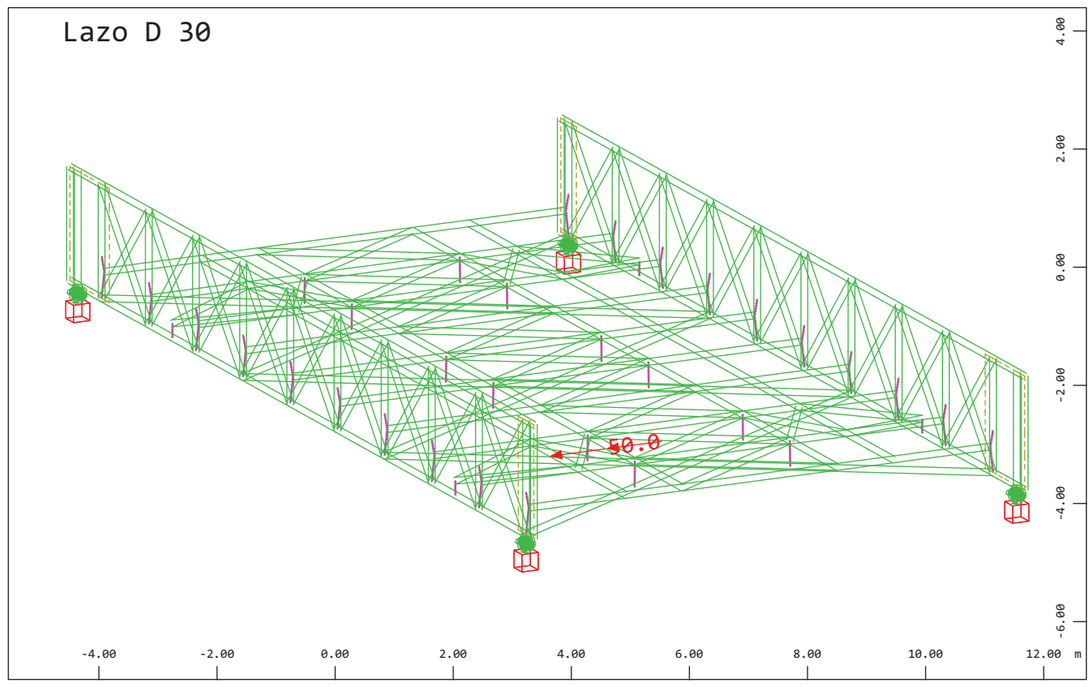


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Cargas




Z Y X All loads, Loadcase 11228 Lazo D+I 27 , (1 cm 3D = unit) Free single load (force) in
global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

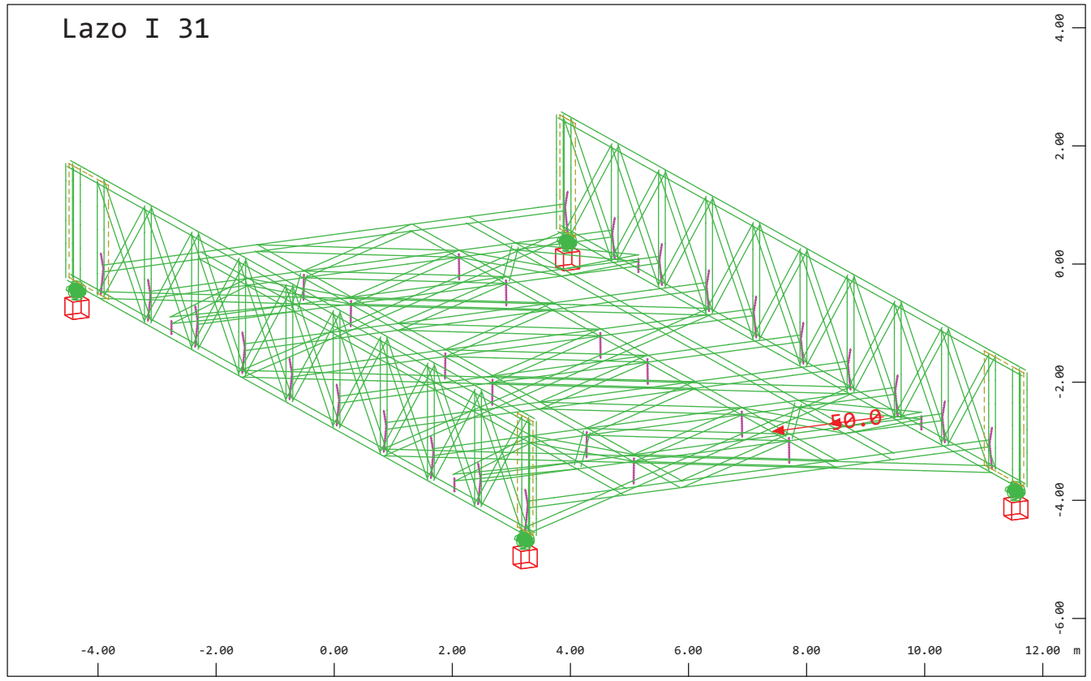



Z Y X All loads, Loadcase 11031 Lazo D 30 , (1 cm 3D = unit) Free single load (force) in
global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

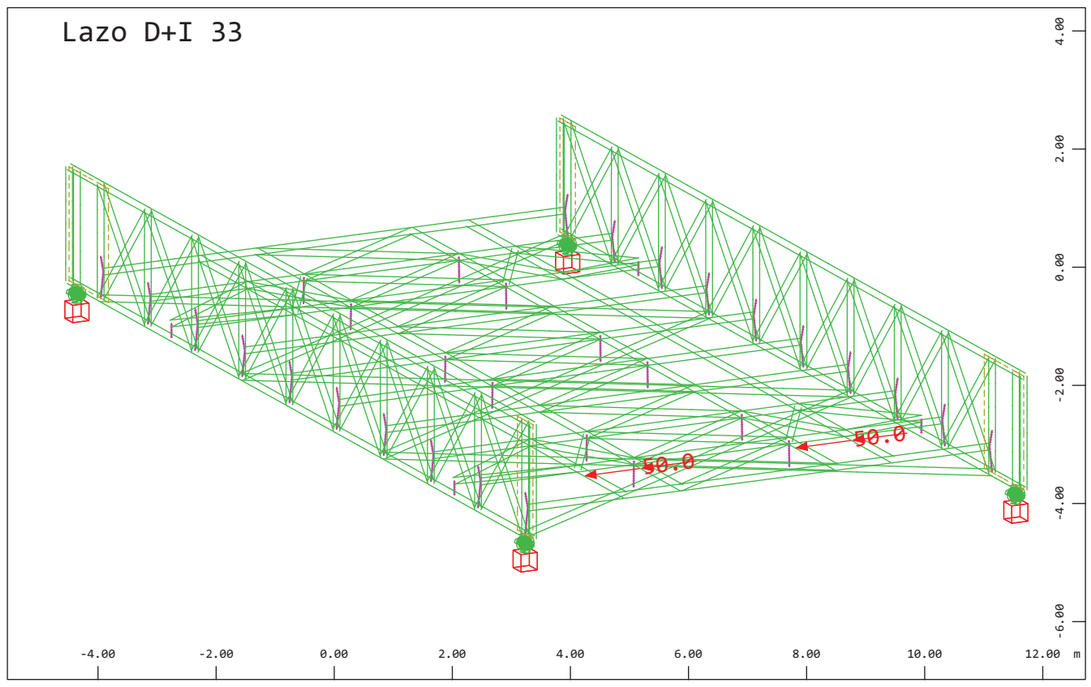
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Z Y X All loads, Loadcase 11132 Lazo I 31 , (1 cm 3D = unit) Free single load (force) in global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962



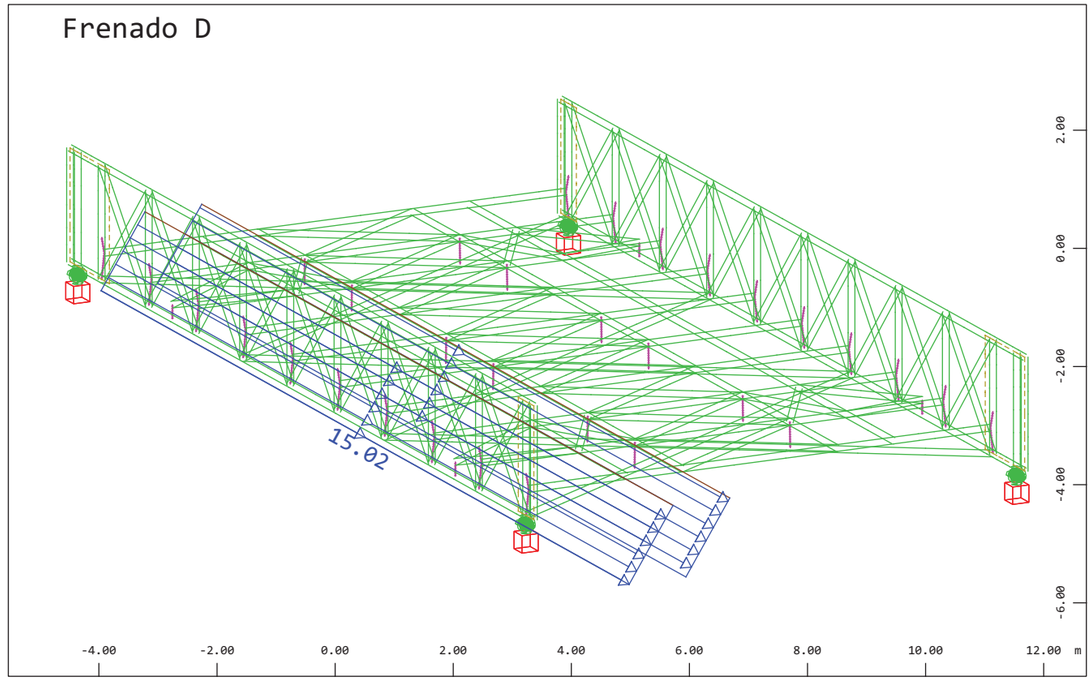

Z Y X All loads, Loadcase 11234 Lazo D+I 33 , (1 cm 3D = unit) Free single load (force) in global Y (Unit=50.0 kN ) (Min=-50.0) (Max=-50.0)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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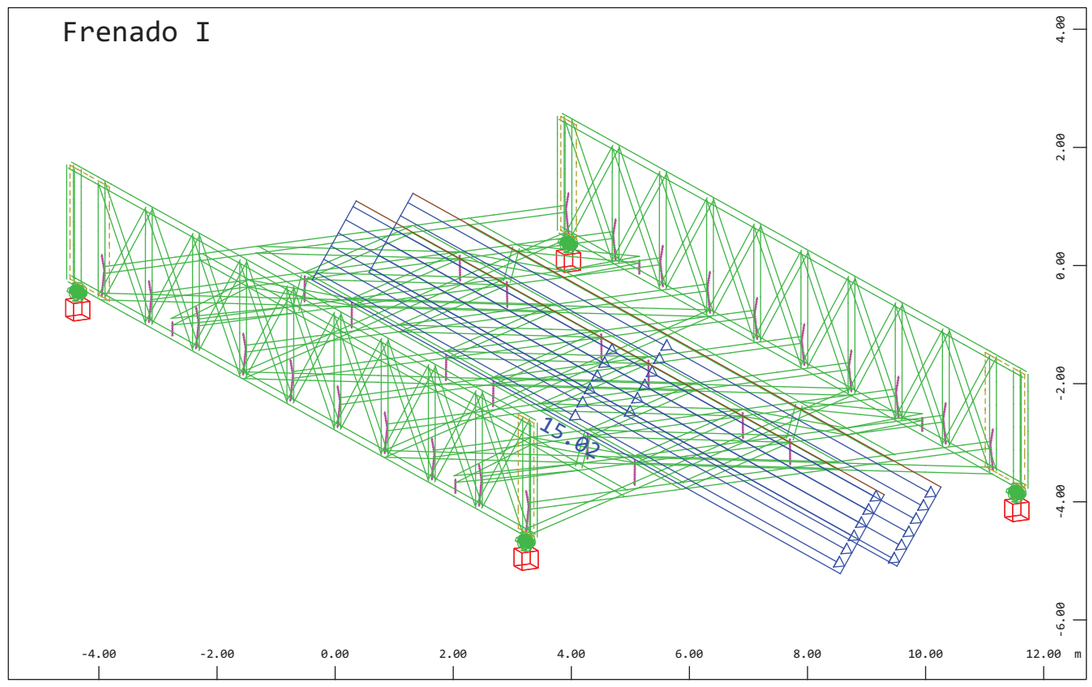


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Cargas




Z Y X All loads, Loadcase 12001 Frenado D , (1 cm 3D = unit) Free line load (force) in global X (Unit=10.00 kN/m ) (Max=15.02)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

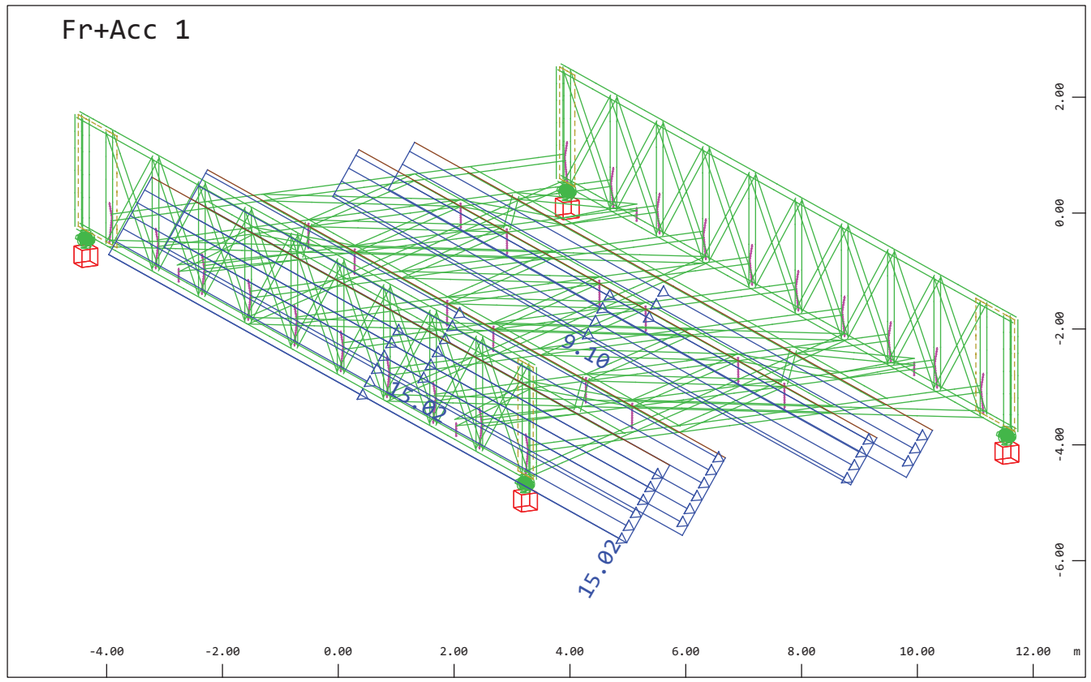



Z Y X All loads, Loadcase 12002 Frenado I , (1 cm 3D = unit) Free line load (force) in global X (Unit=10.00 kN/m ) (Max=15.02)

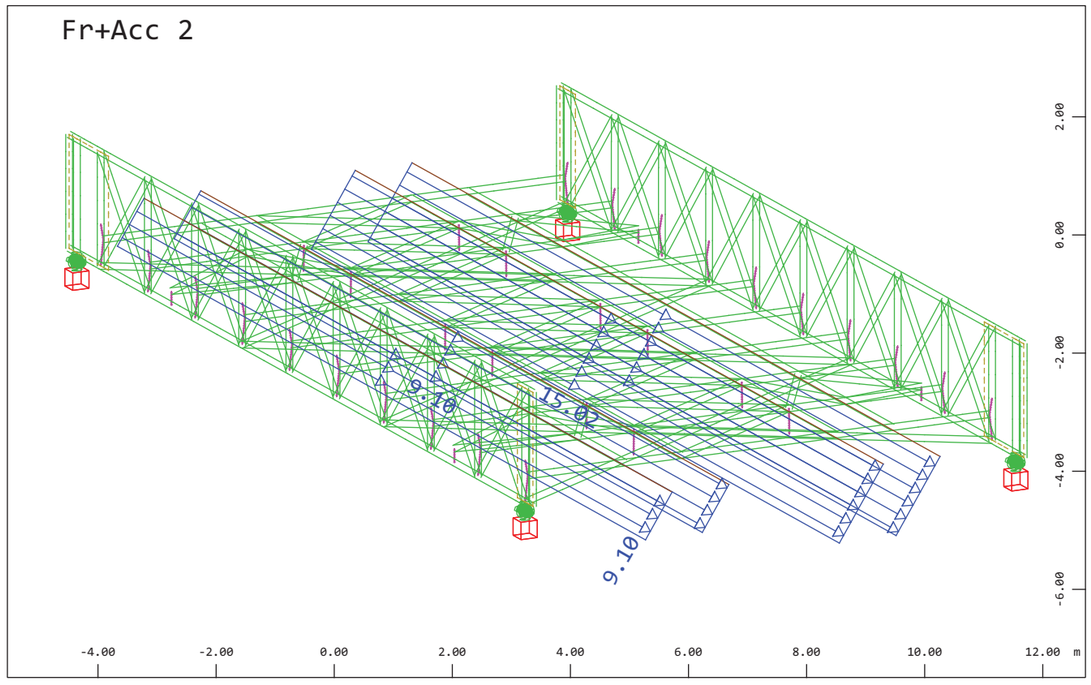
M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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Z Y X
All loads, Loadcase 12003 Fr+Acc 1 , (1 cm 3D = unit) Free line load (force) in global
X (Unit=10.00 kN/m ) (Max=15.02)
M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962

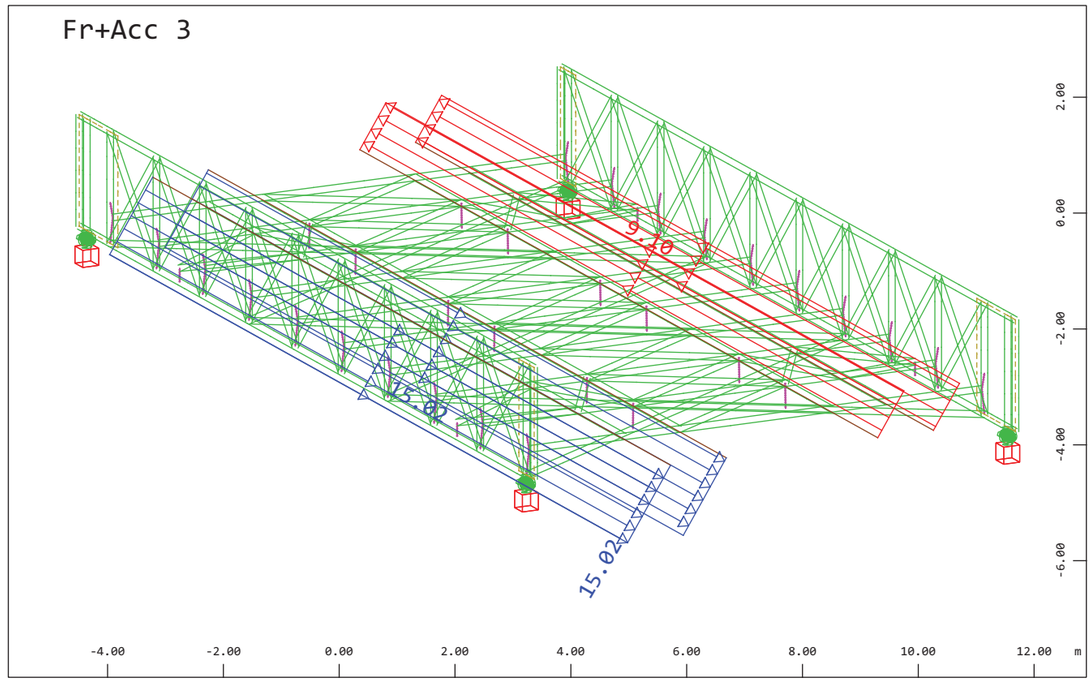



Z Y X
All loads, Loadcase 12004 Fr+Acc 2 , (1 cm 3D = unit) Free line load (force) in global
X (Unit=10.00 kN/m ) (Max=15.02)
M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

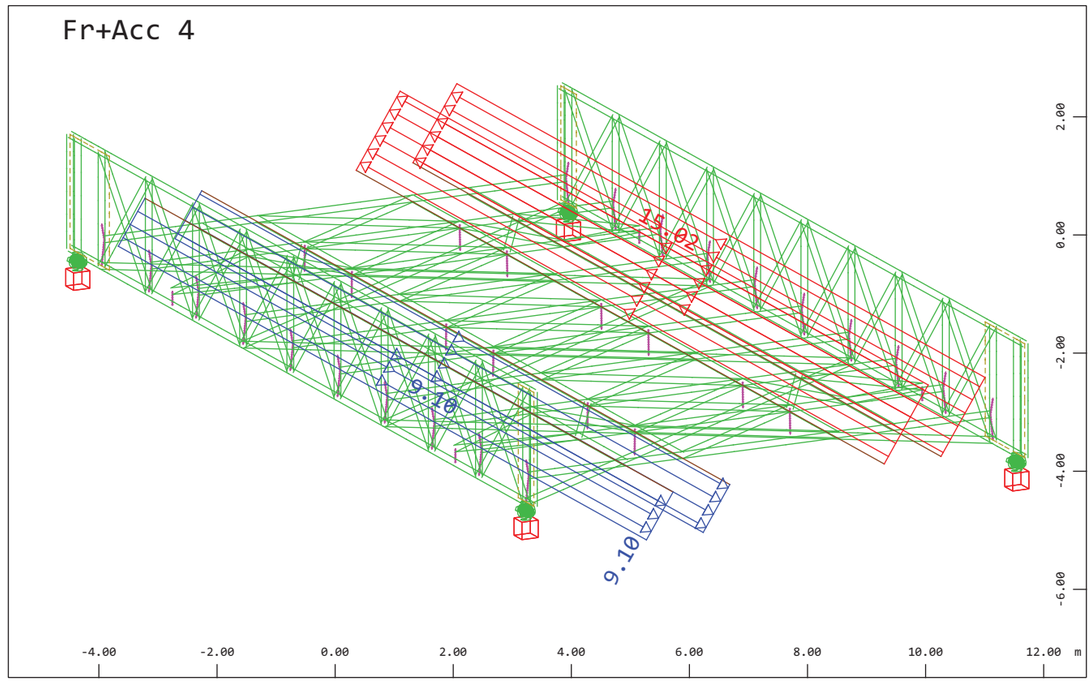
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Pont Carretera Vic
Cargas



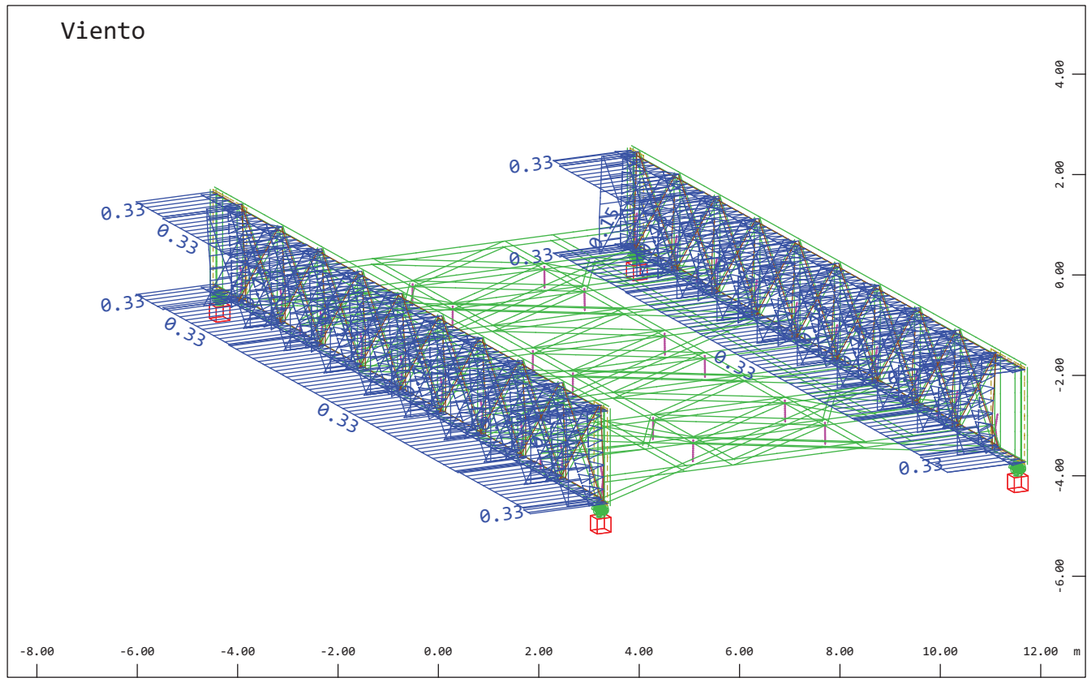

Z Y X
All loads, Loadcase 12005 Fr+Acc 3 , (1 cm 3D = unit) Free line load (force) in global
X (Unit=10.00 kN/m ) (Min=-9.10) (Max=15.02)
M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962




Z Y X
All loads, Loadcase 12006 Fr+Acc 4 , (1 cm 3D = unit) Free line load (force) in global
X (Unit=10.00 kN/m ) (Min=-15.02) (Max=9.10)
M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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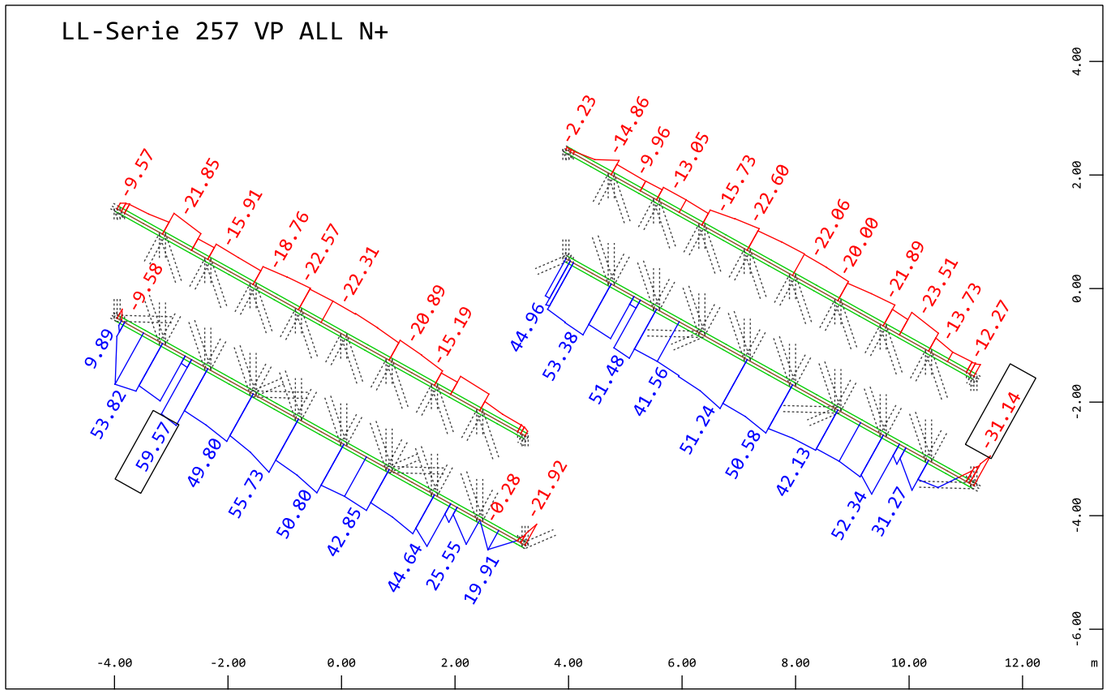
Pont Carretera Vic
Cargas




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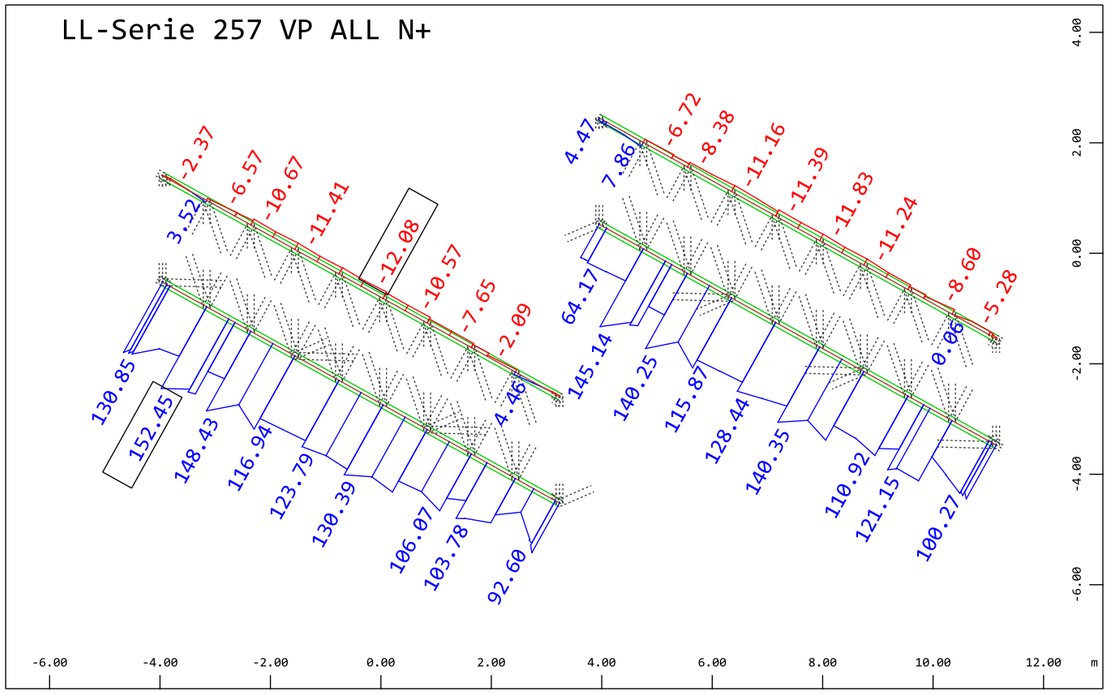
# APÈNDIX 2: TENSIONS

Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1311 LL-Serie 257 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-31.14) (Max=59.57)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962



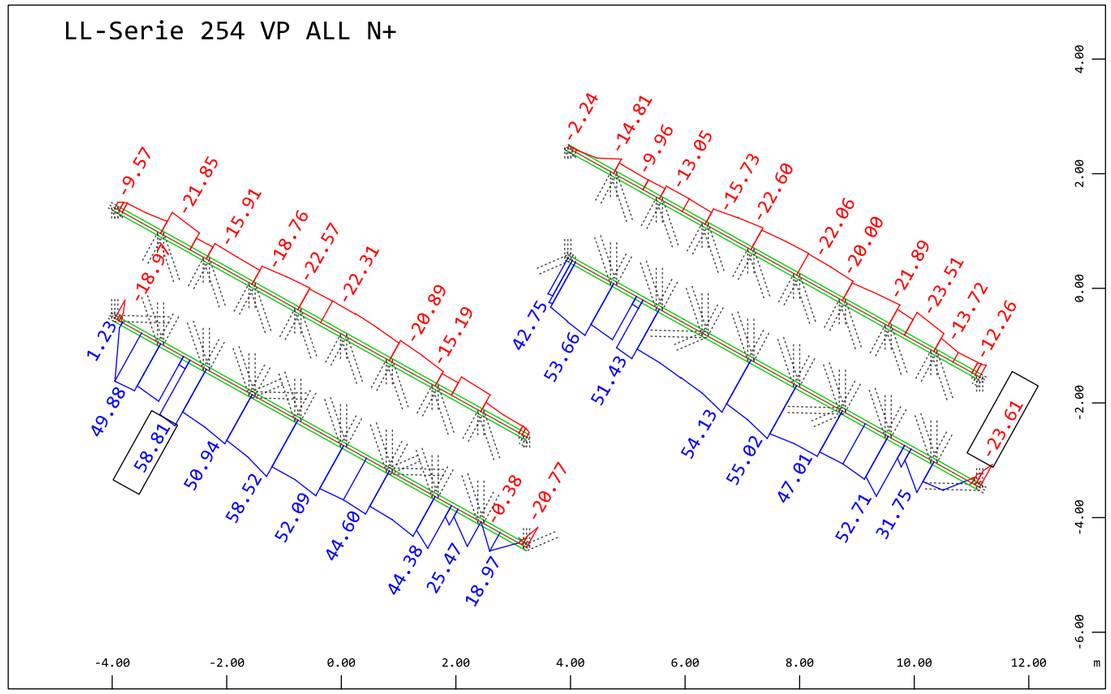

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1311 LL-Serie 257 VP ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.08) (Max=152.45)

M 1 : 111
X * 0.502
Y * 0.906
Z * 0.962

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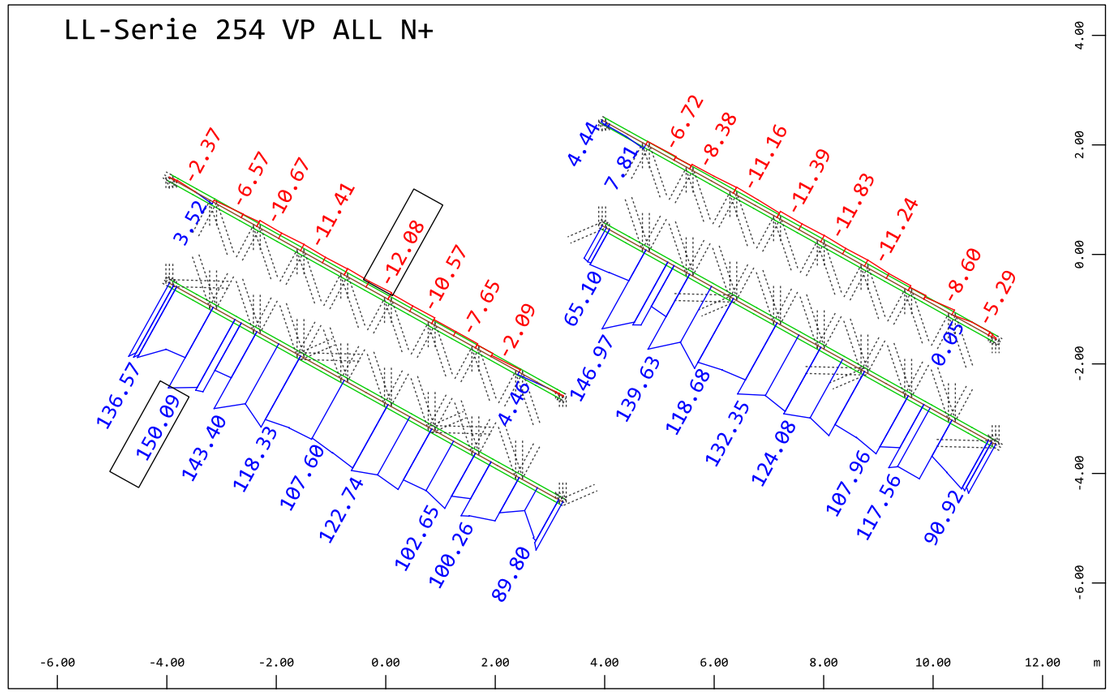


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1301 LL-Serie 254 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-23.61) (Max=58.81)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

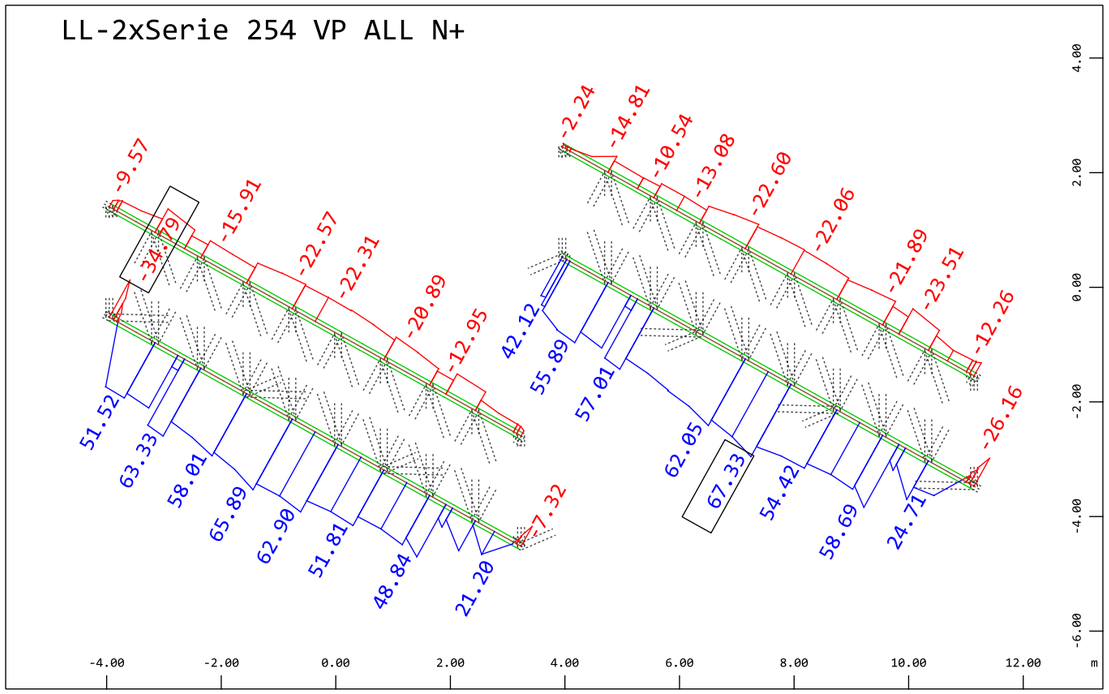



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1301 LL-Serie 254 VP ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.08) (Max=150.09)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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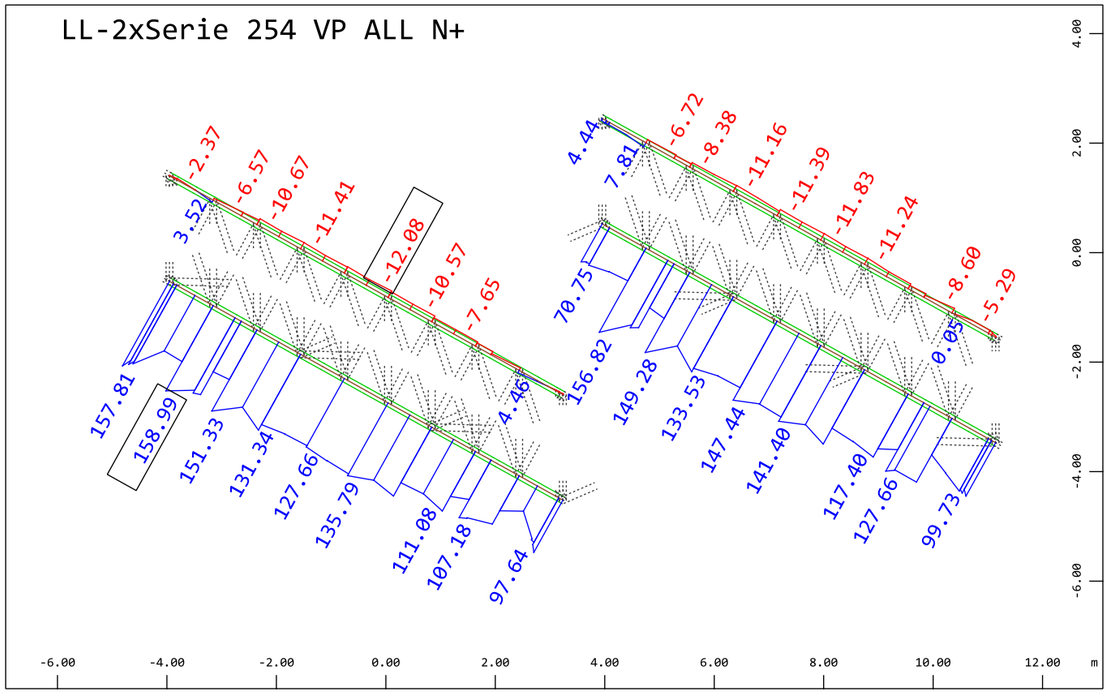
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1331 LL-2xSerie 254 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-34.79) (Max=67.33)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

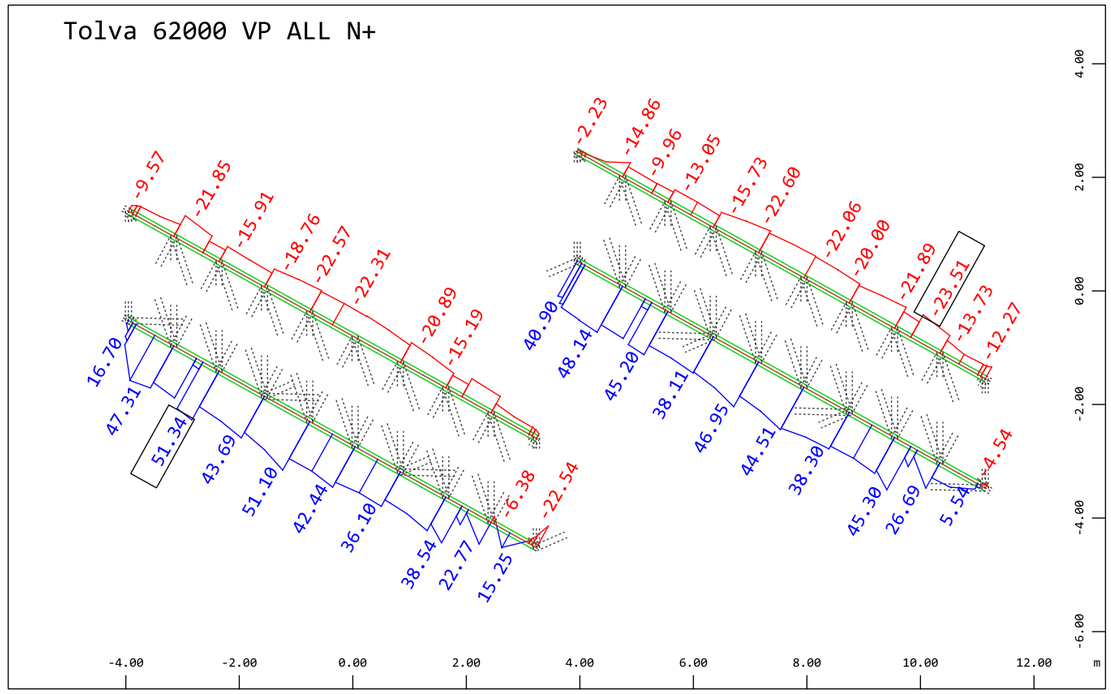
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1331 LL-2xSerie 254 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.08) (Max=158.99)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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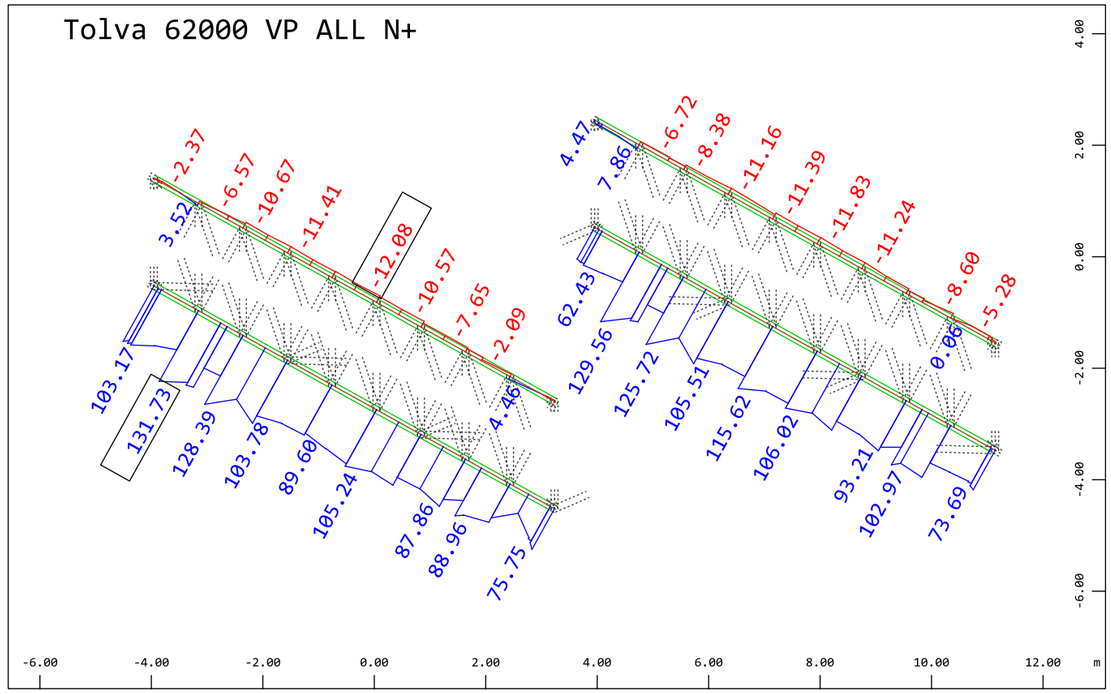
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1321 Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-23.51) (Max=51.34)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962



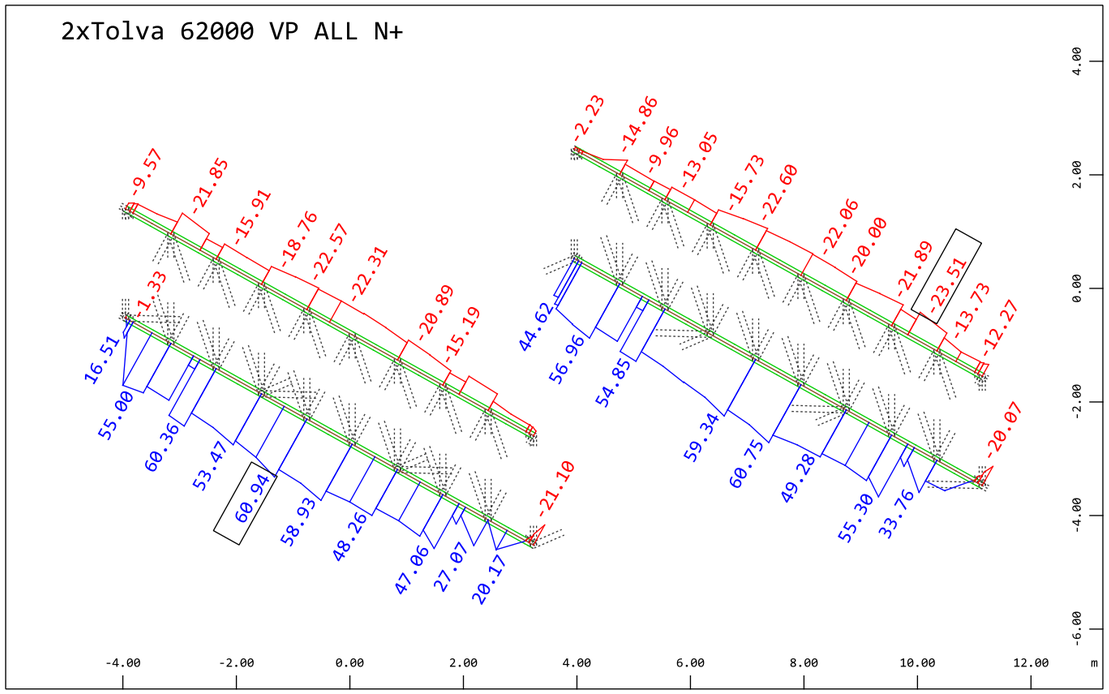

Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1321 Tolva 62000 VP ALL N+, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.08) (Max=131.73)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962

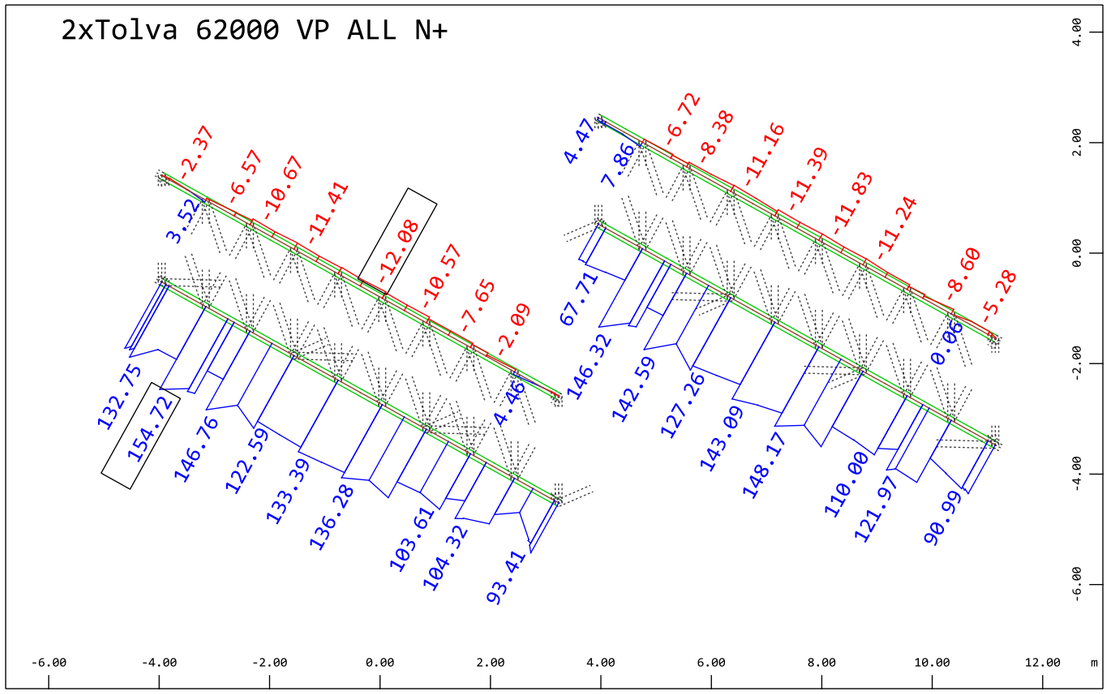
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1351 2xTolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-23.51) (Max=60.94)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962



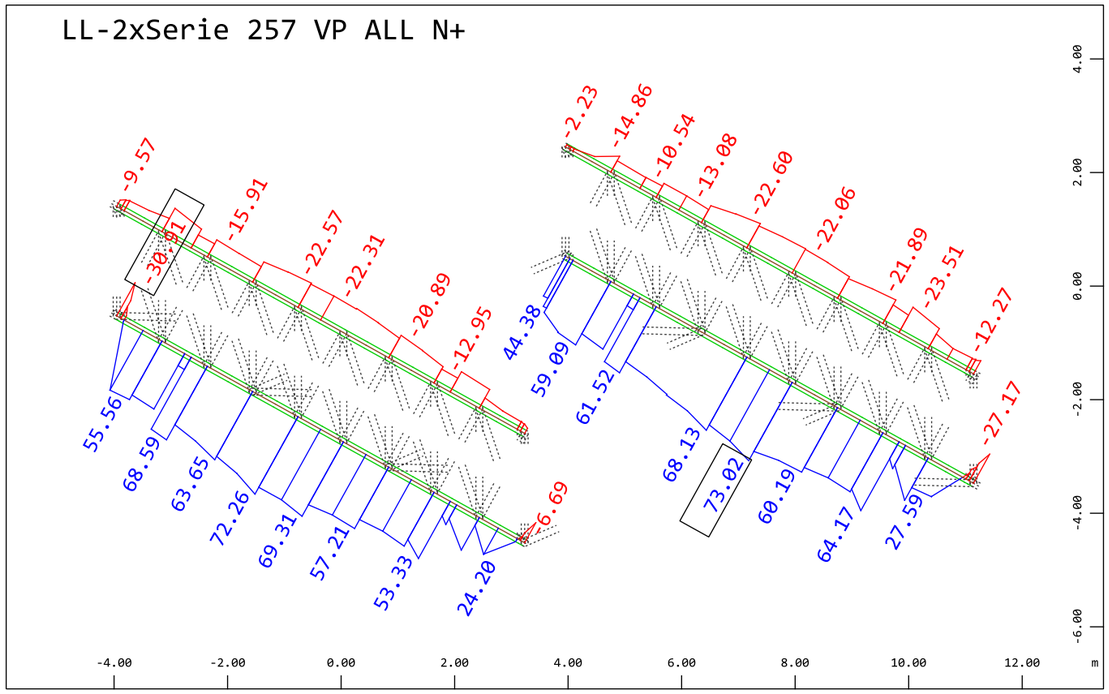

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1351 2xTolva 62000 VP ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.08) (Max=154.72)

M 1 : 111
X * 0.502
Y * 0.906
Z * 0.962

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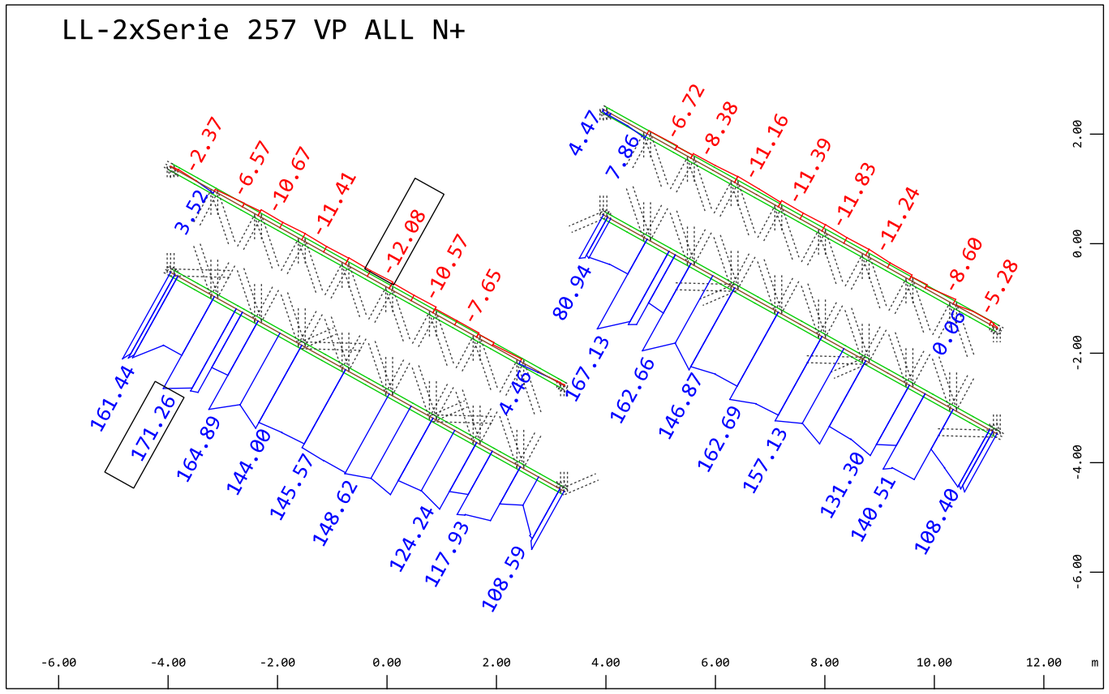


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1341 LL-2xSerie 257 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-30.91) (Max=73.02)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962

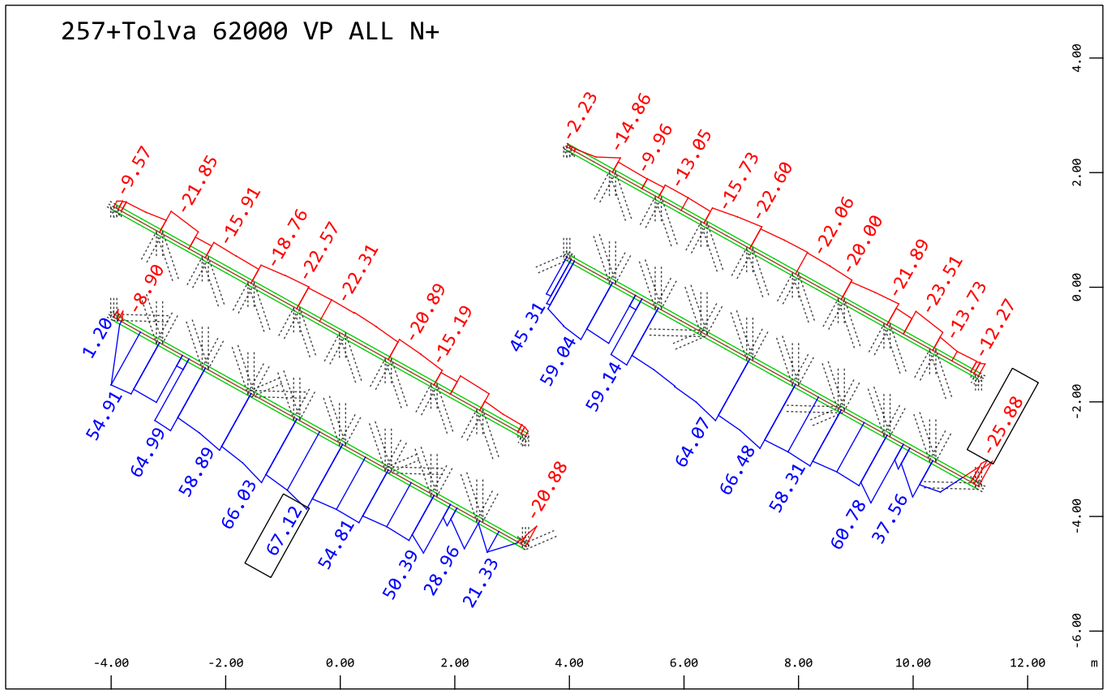



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1341 LL-2xSerie 257 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.08) (Max=171.26)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

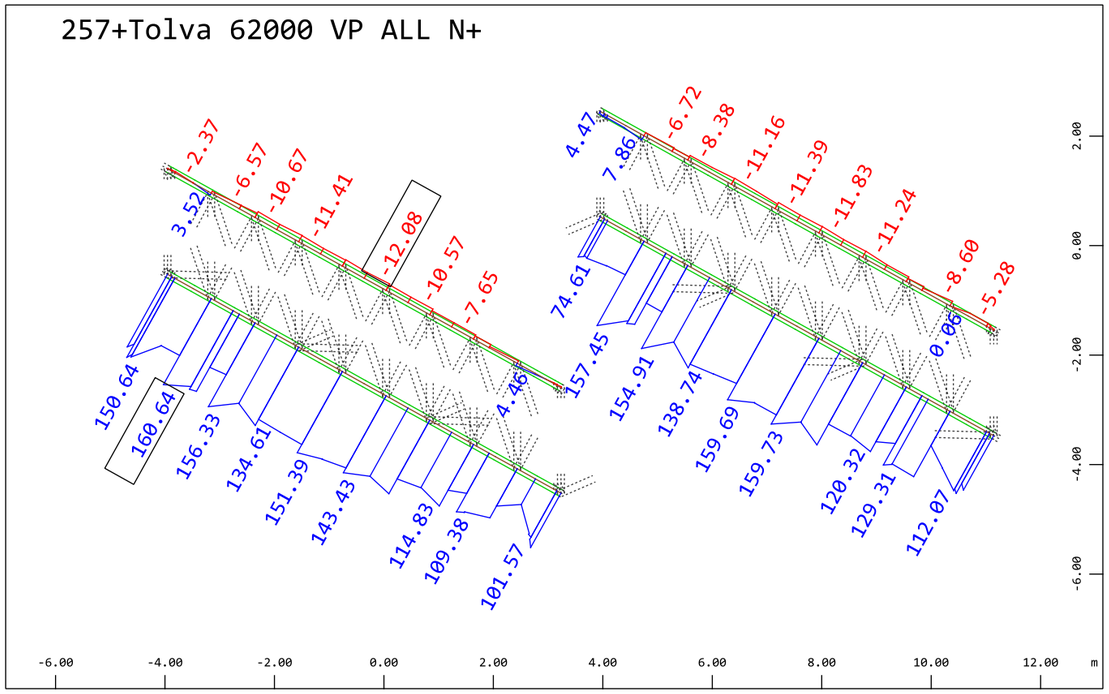
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1371 257+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-25.88) (Max=67.12)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

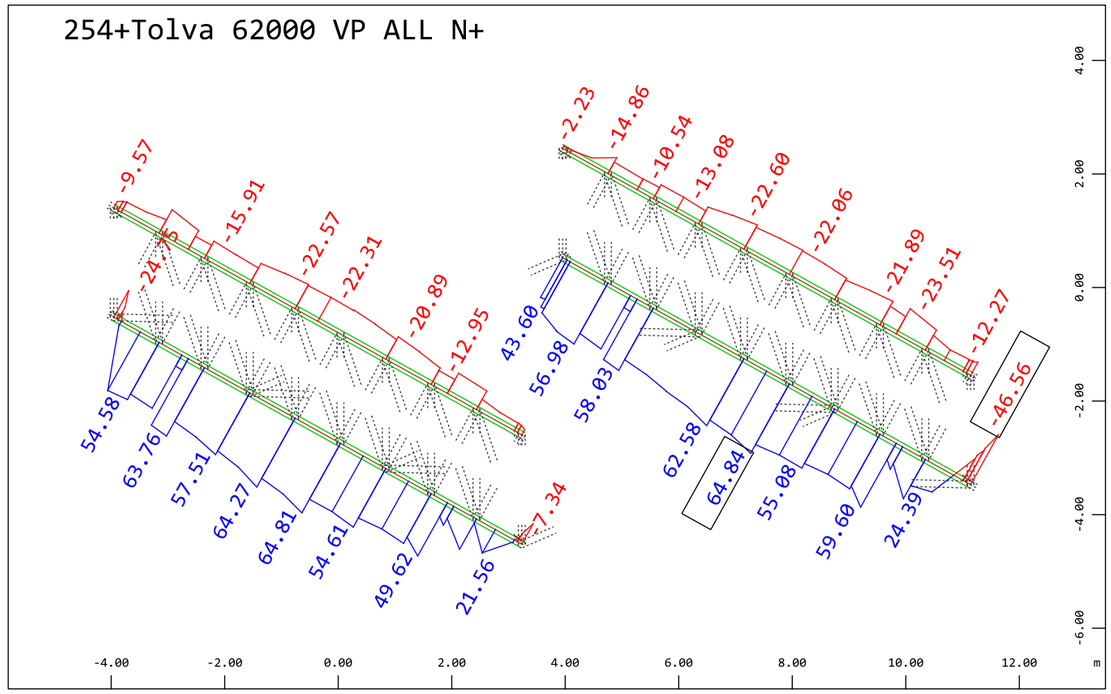



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1371 257+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.08) (Max=160.64)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

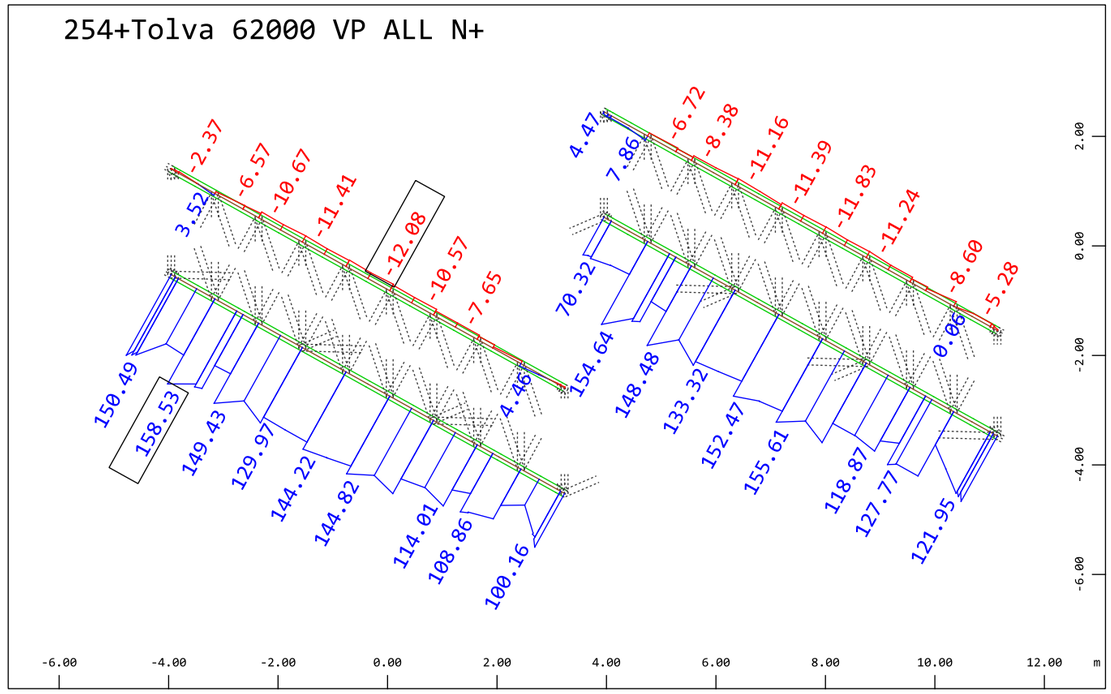


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1361 254+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-46.56) (Max=64.84)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962

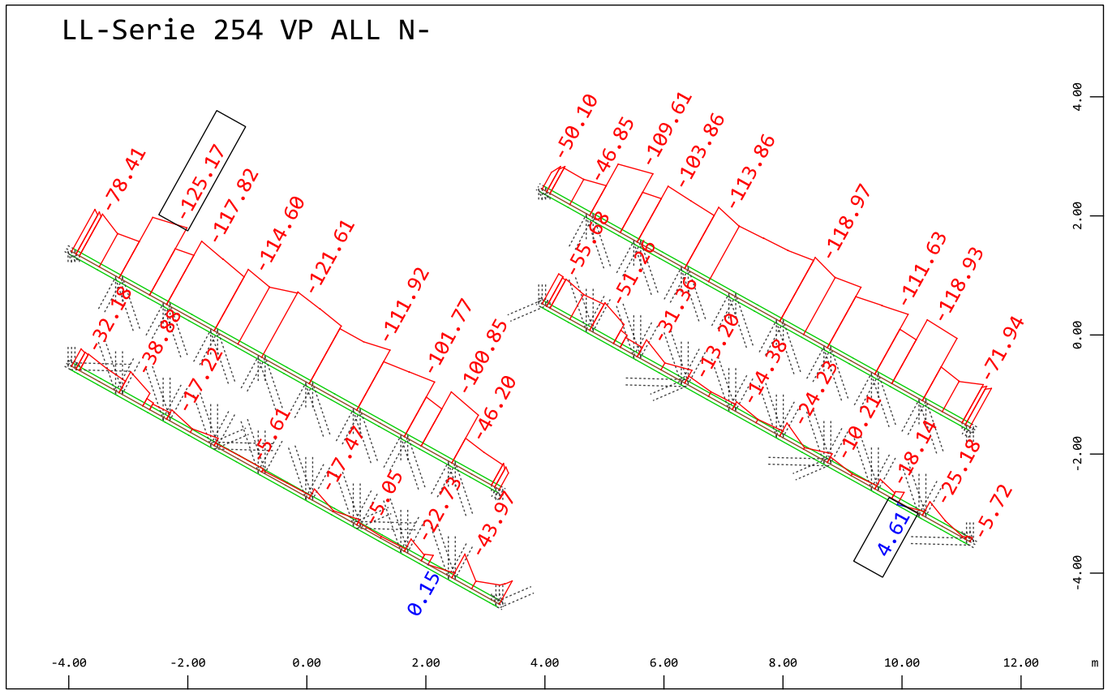



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1361 254+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.08) (Max=158.53)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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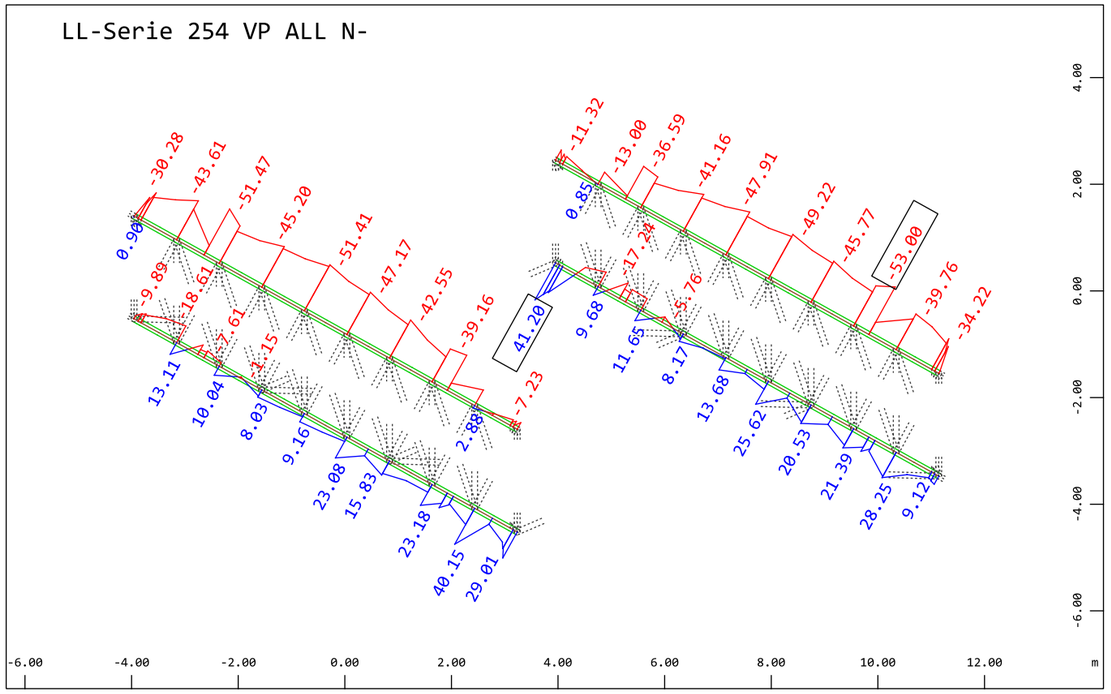
Pont Carretera Vic
Tensiones




Z
Y X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1302 LL-Serie 254 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-125.17) (Max=4.61)

M 1 : 103
X * 0.502
Y * 0.906
Z * 0.962




Z
Y X

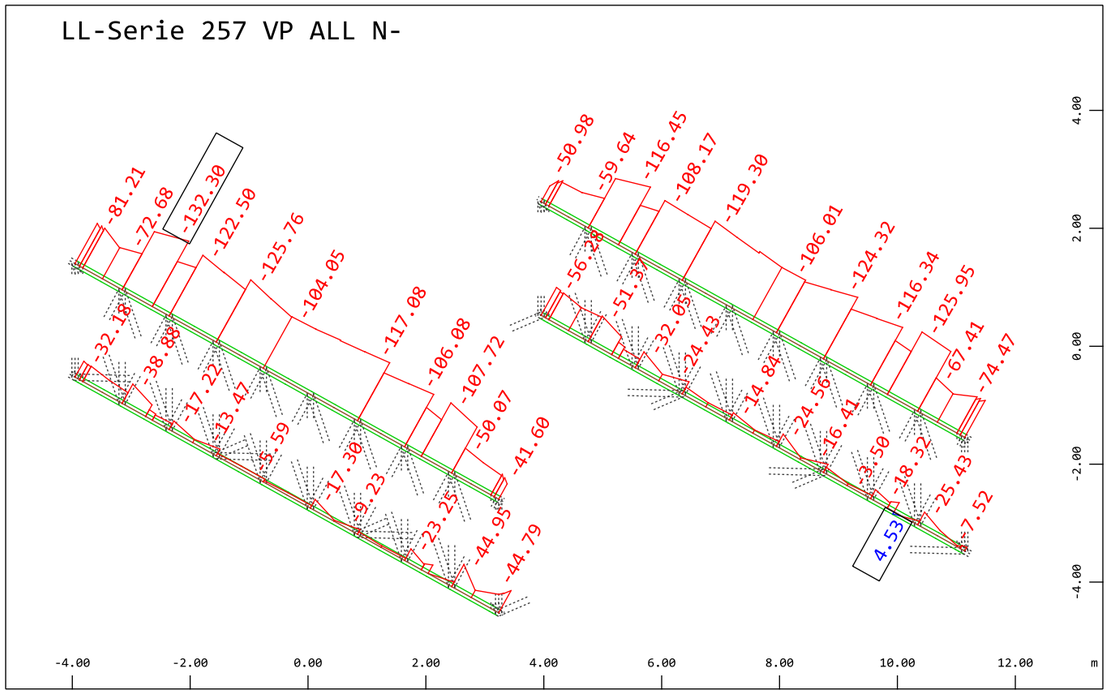
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1302 LL-Serie 254 VP ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-53.00) (Max=41.20)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

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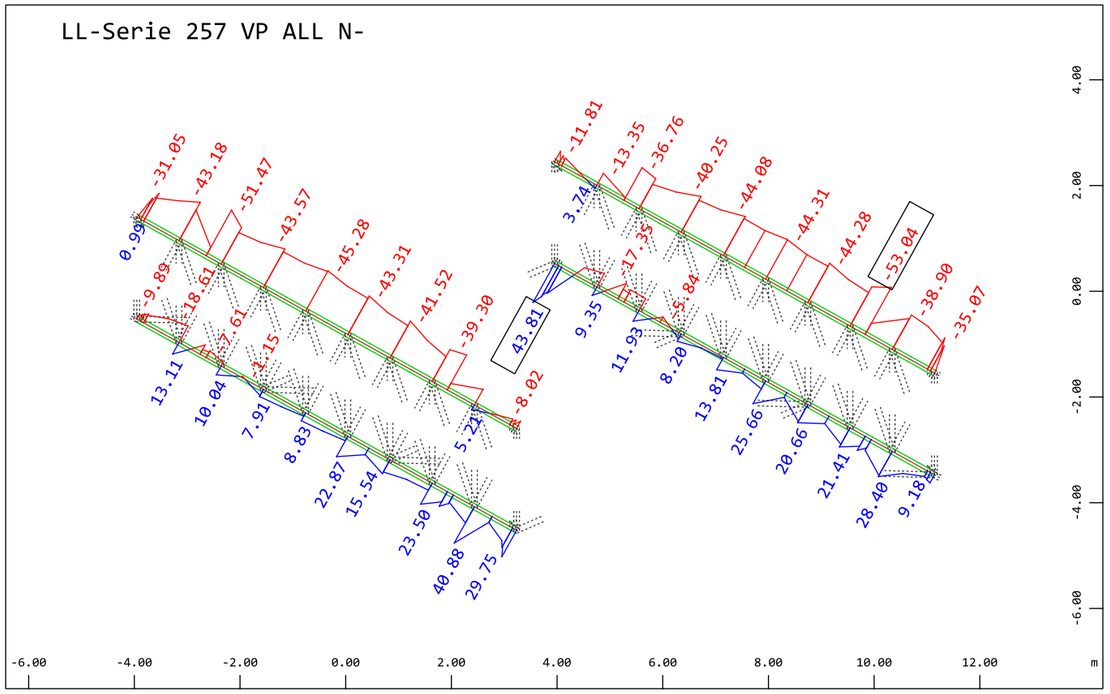
Pont Carretera Vic
Tensiones




Z
Y X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1312 LL-Serie 257 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-132.30) (Max=4.53)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962



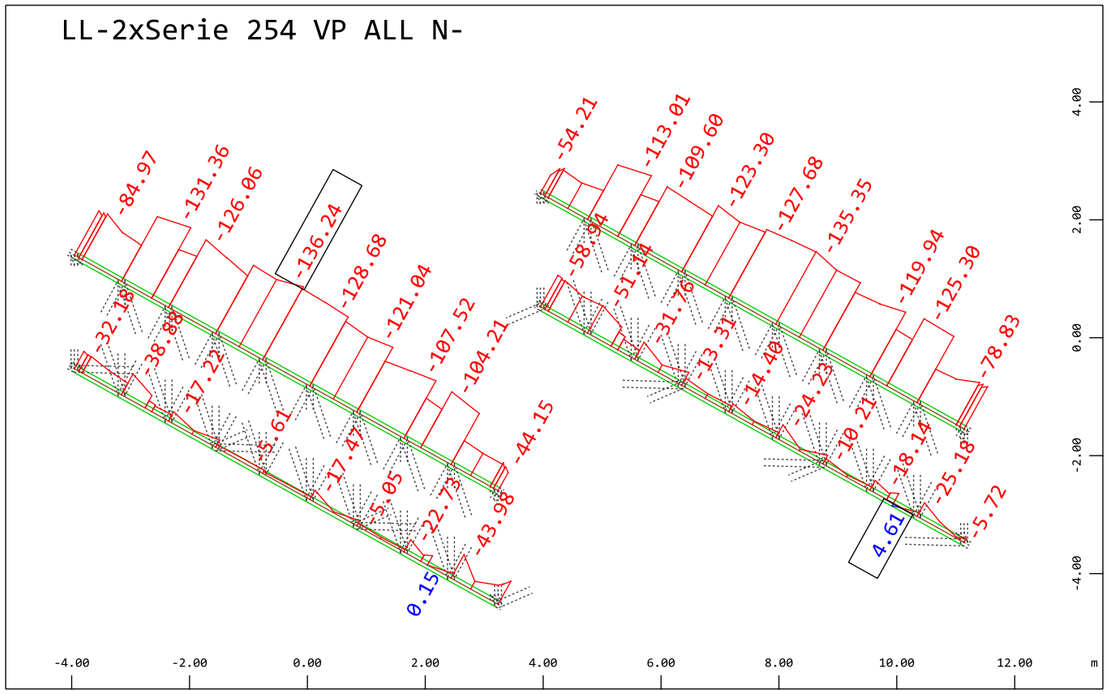

Z
Y X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1312 LL-Serie 257 VP ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-53.04) (Max=43.81)

M 1 : 116
X * 0.502
Y * 0.906
Z * 0.962

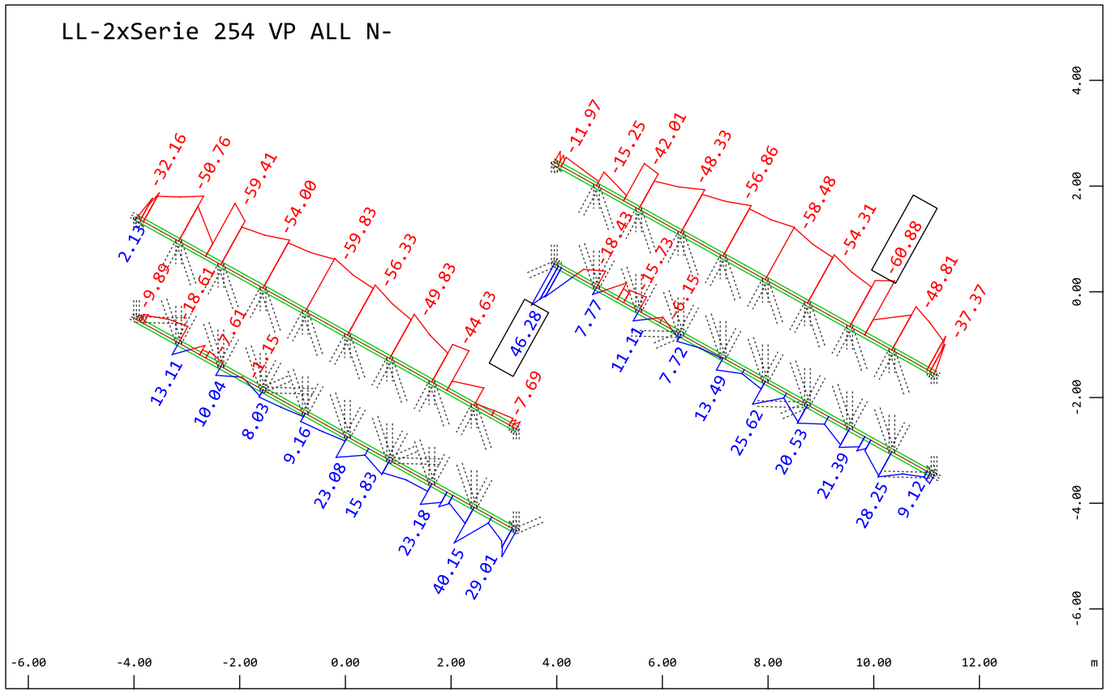
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1332 LL-2xSerie 254 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-136.24) (Max=4.61)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962



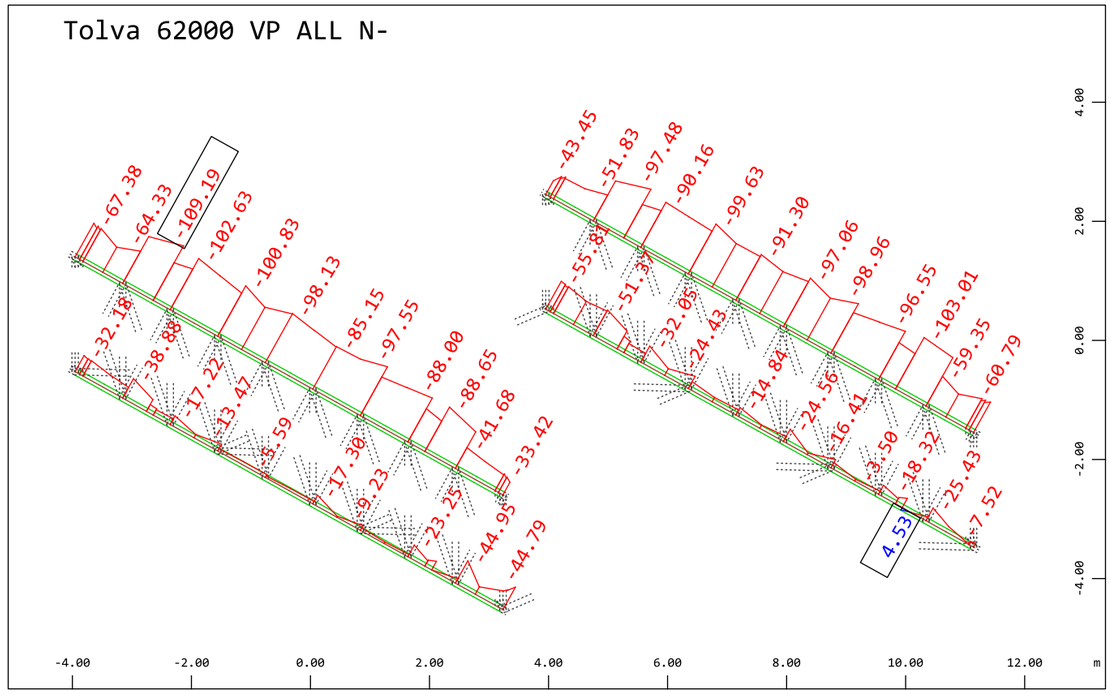

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1332 LL-2xSerie 254 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-60.88) (Max=46.28)

M 1 : 116
X * 0.502
Y * 0.906
Z * 0.962

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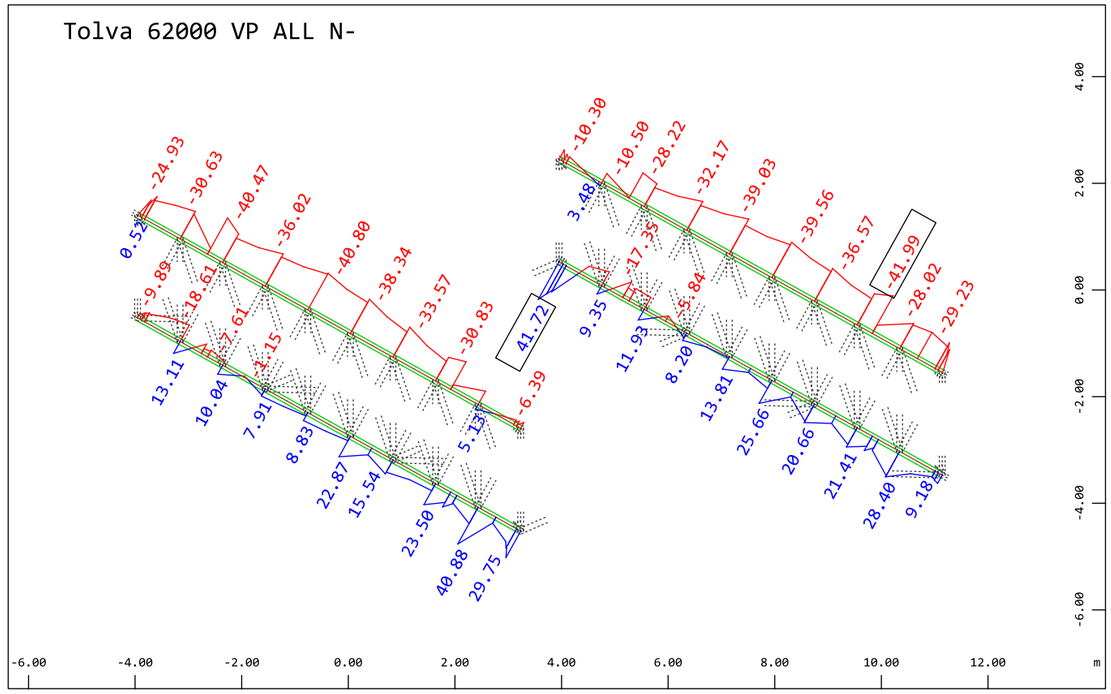


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1322 Tolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-109.19) (Max=4.53)

M 1 : 103
X * 0.502
Y * 0.906
Z * 0.962

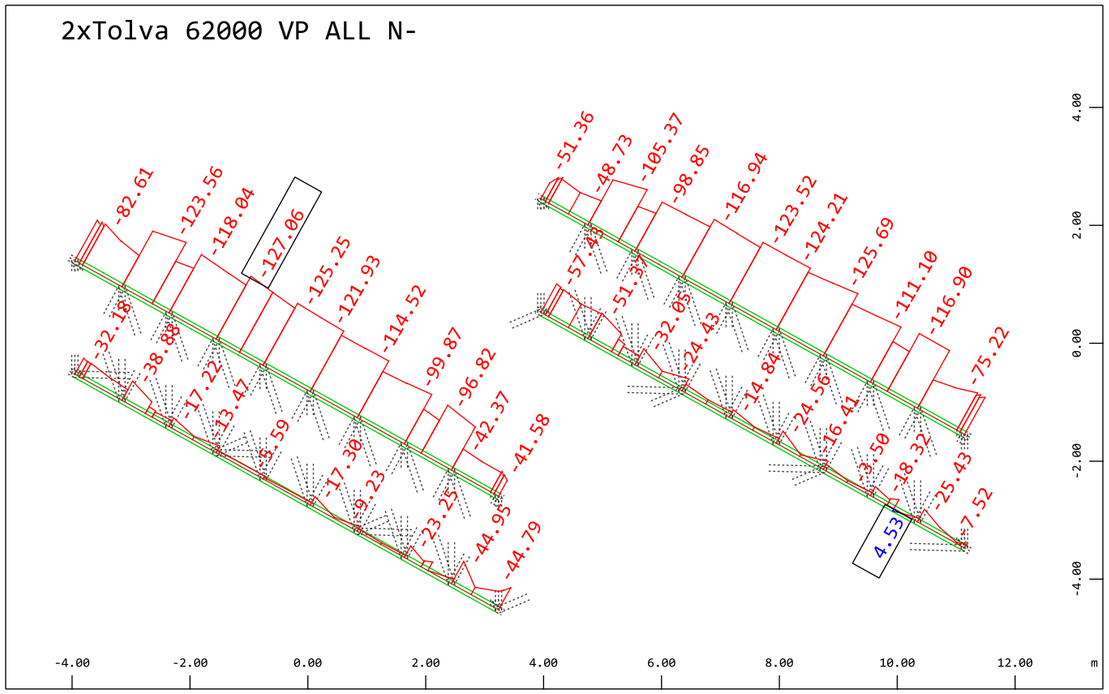



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1322 Tolva 62000 VP ALL N-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-41.99) (Max=41.72)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

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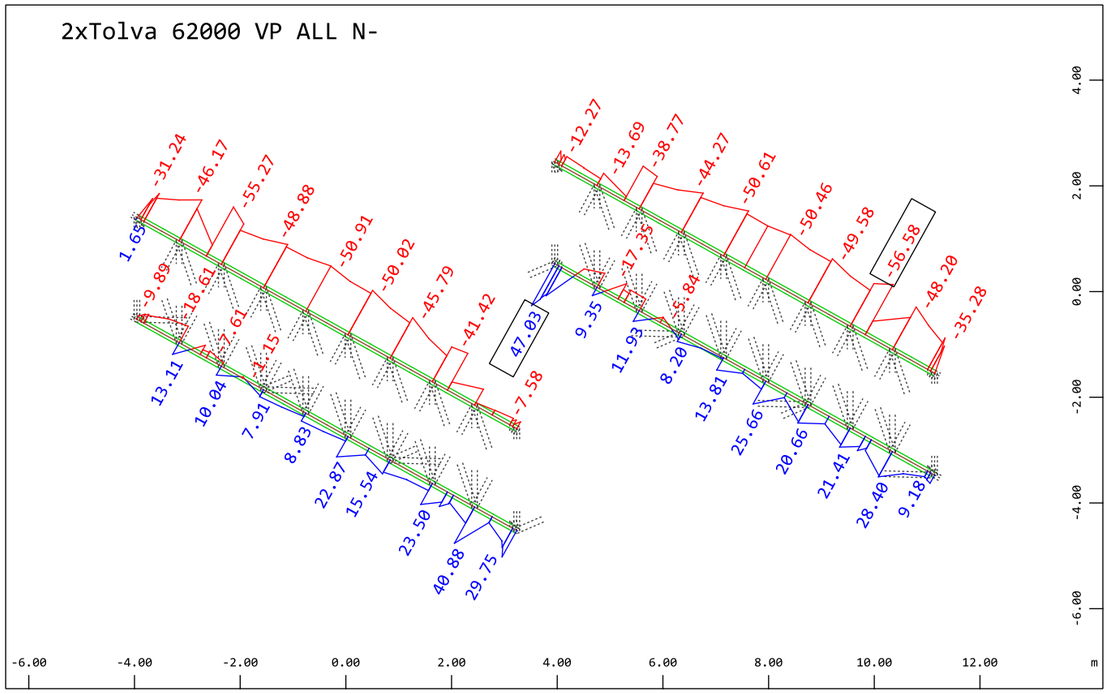
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1352 2xTolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-127.06) (Max=4.53)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

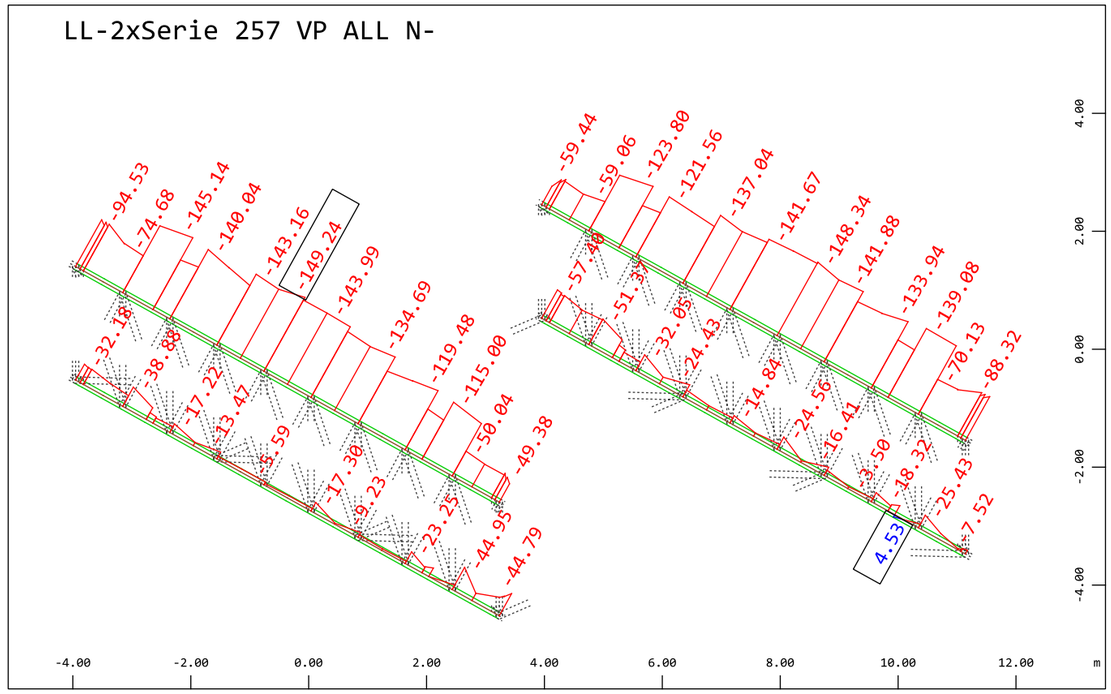
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1352 2xTolva 62000 VP ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-56.58) (Max=47.03)

M 1 : 116
X * 0.502
Y * 0.906
Z * 0.962

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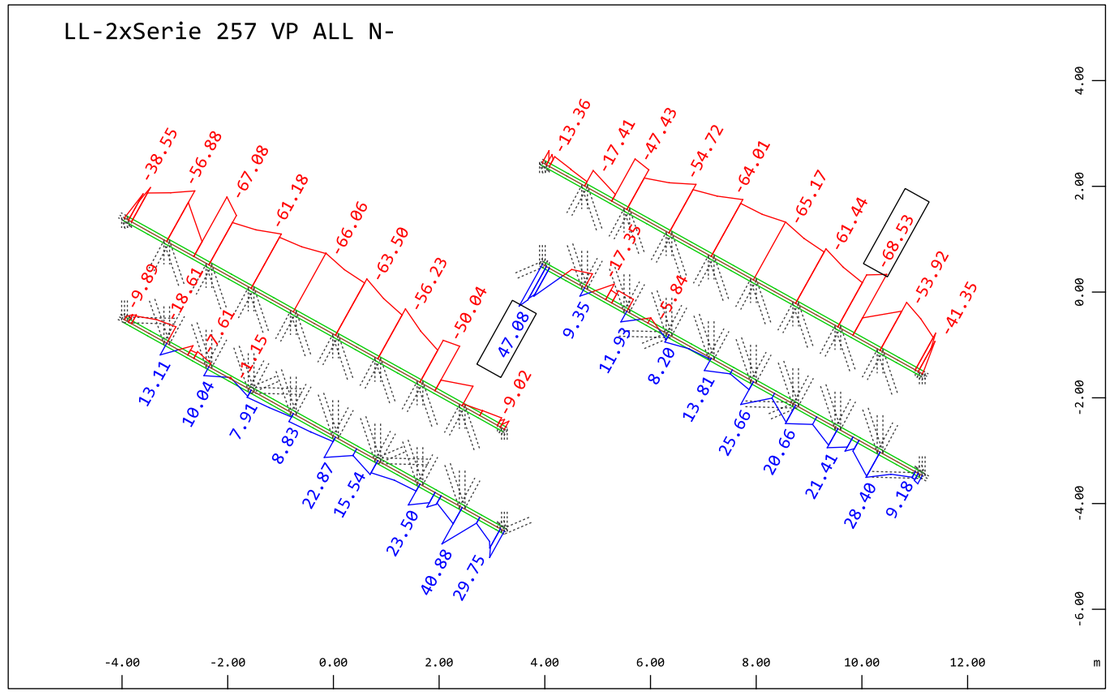
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1342 LL-2xSerie 257 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-149.24) (Max=4.53)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962



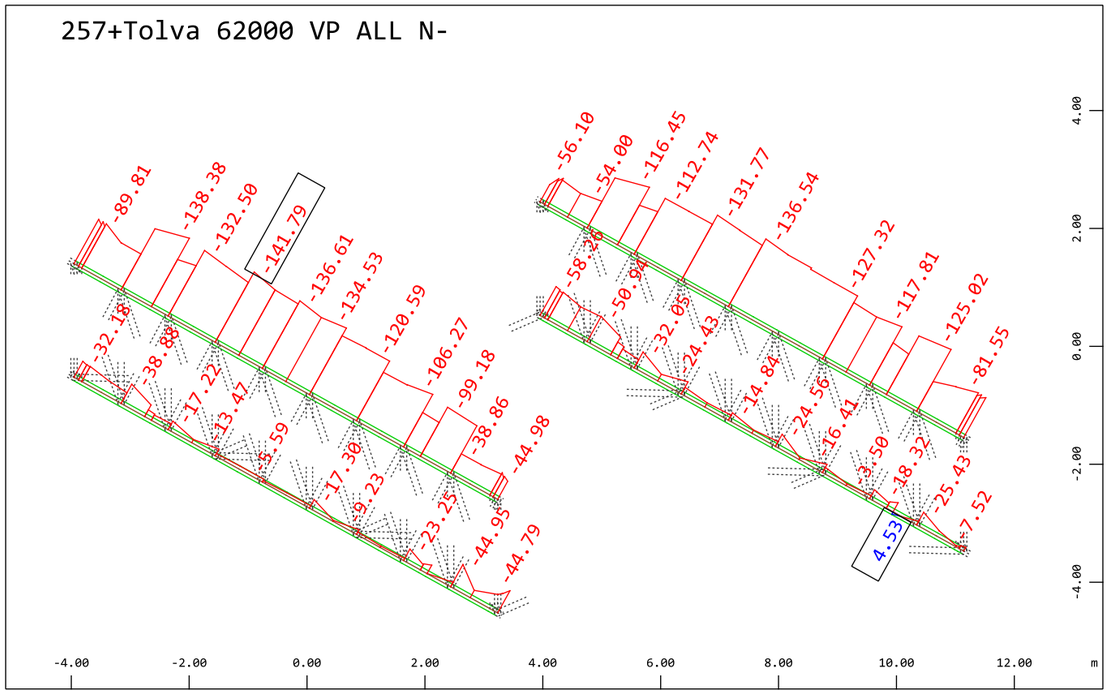

Z
Y
X

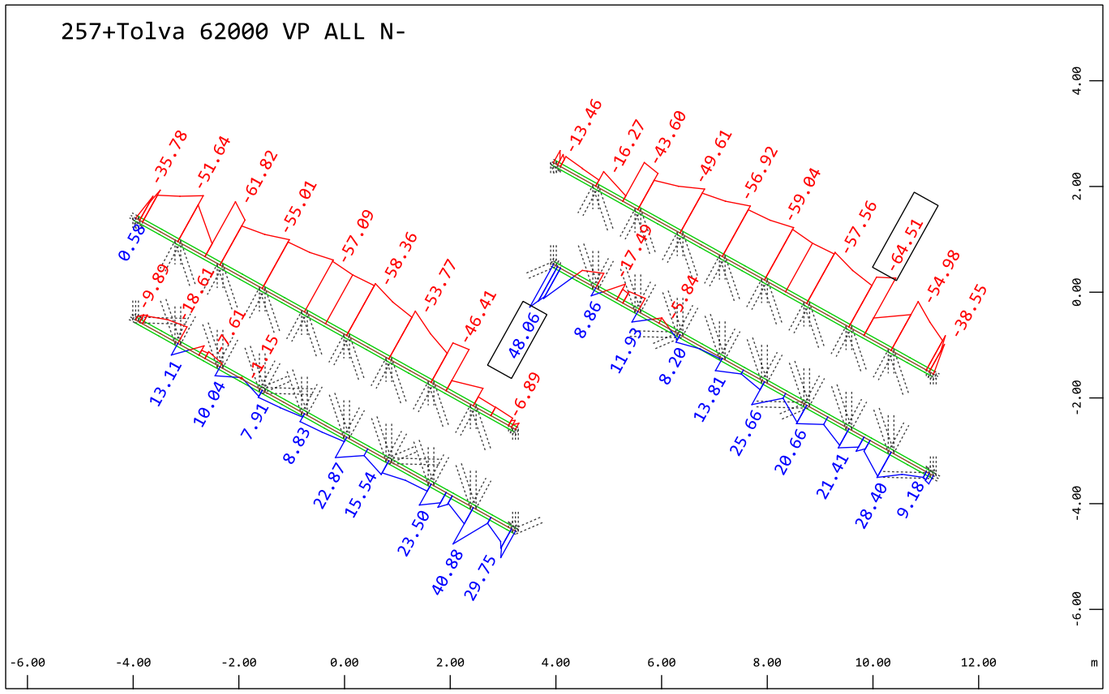
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1342 LL-2xSerie 257 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-68.53) (Max=47.08)

M 1 : 116
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones

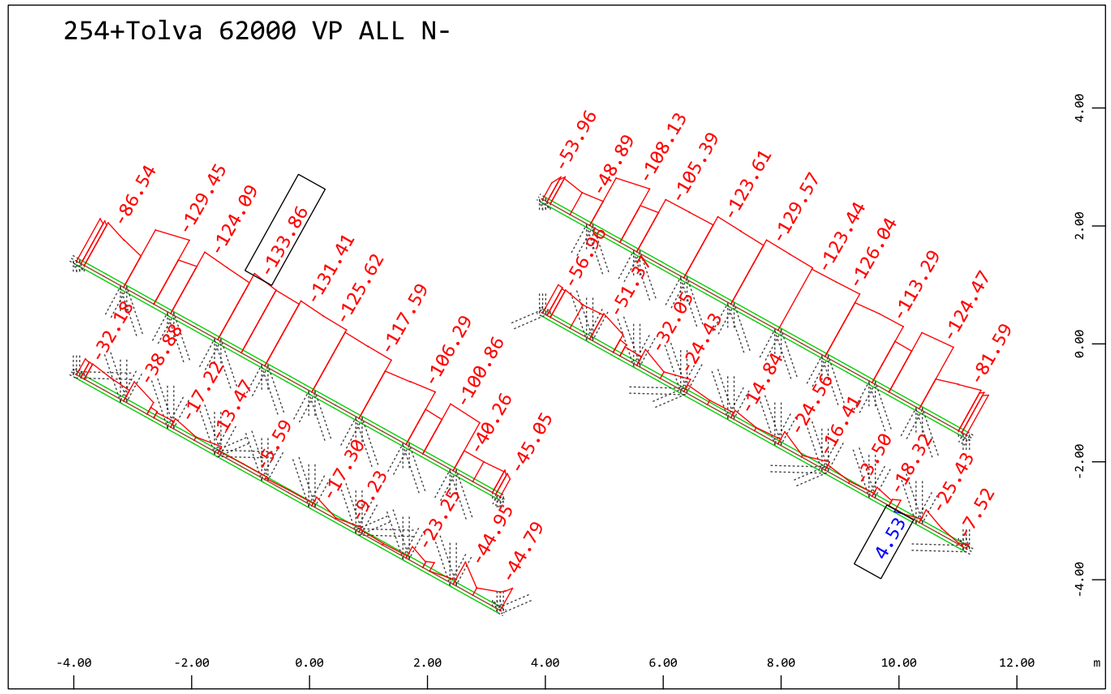


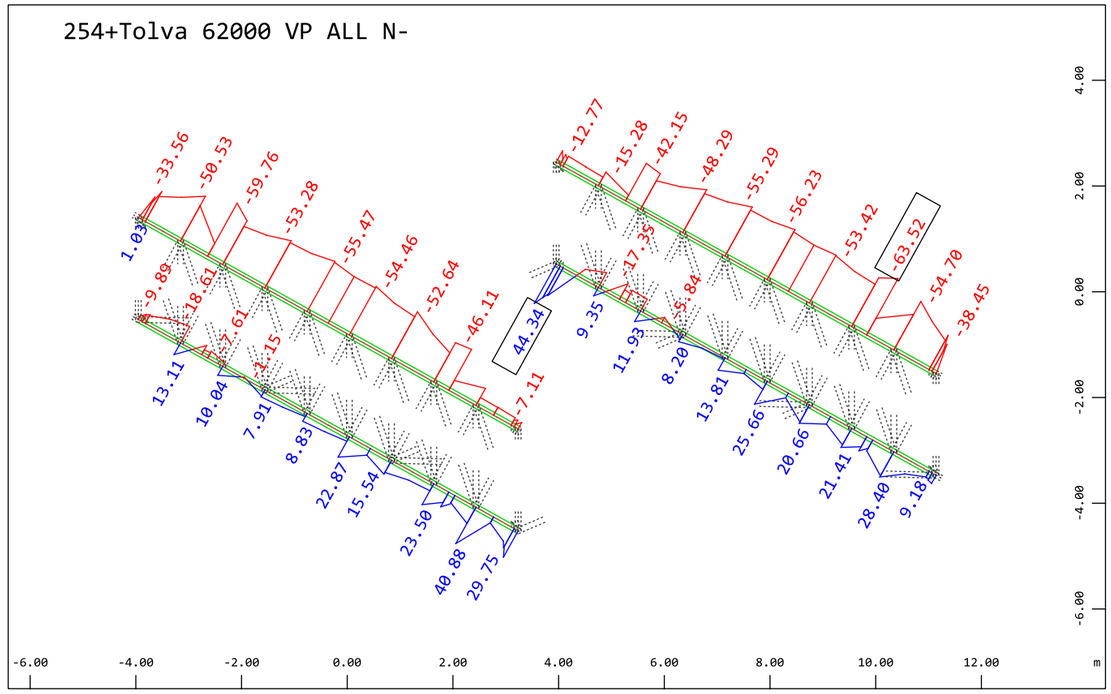




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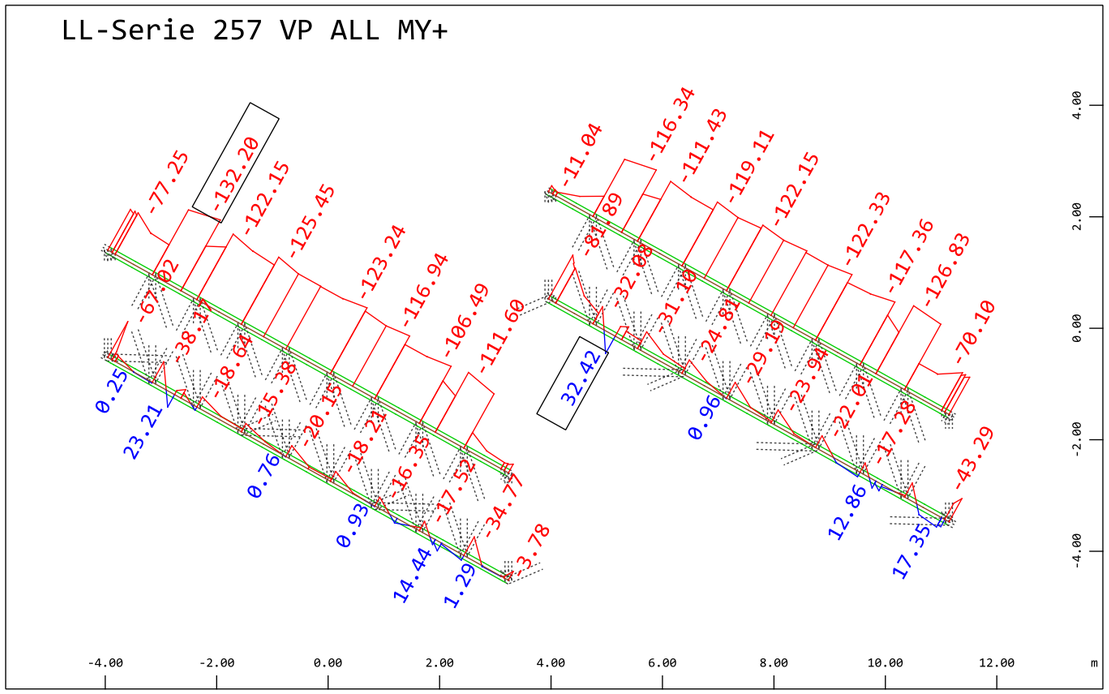
Pont Carretera Vic
Tensiones

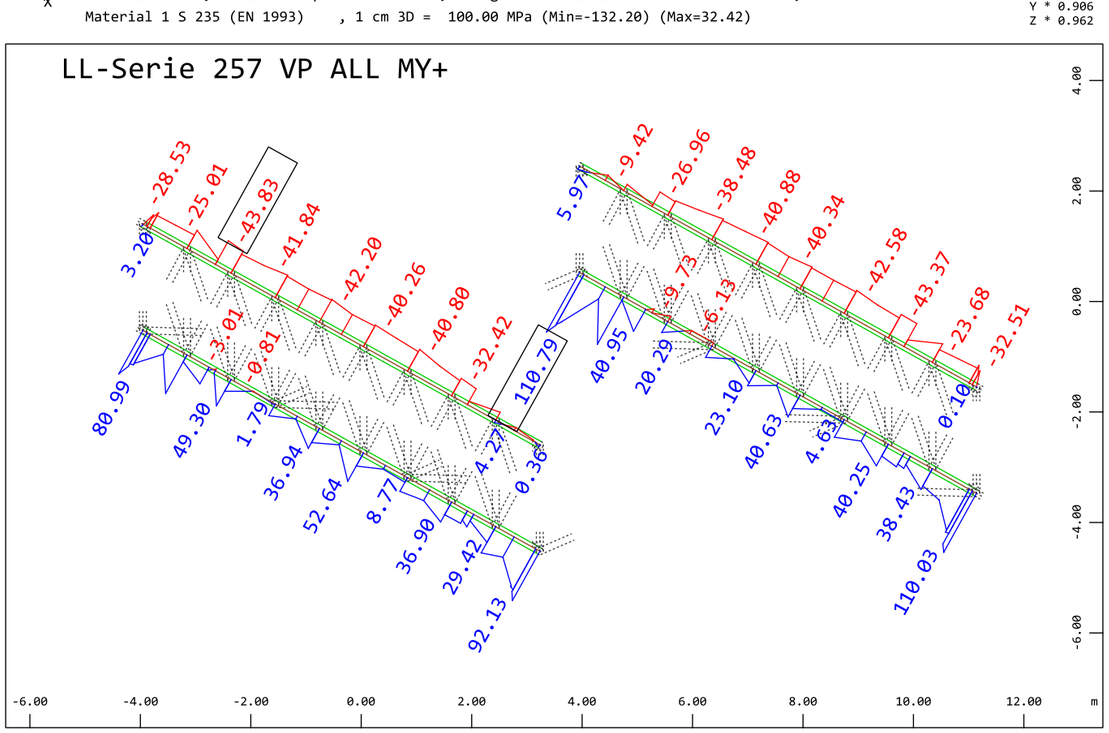



SOFiSTiK AG - www.sofistik.de

Pont Carretera Vic
Tensiones

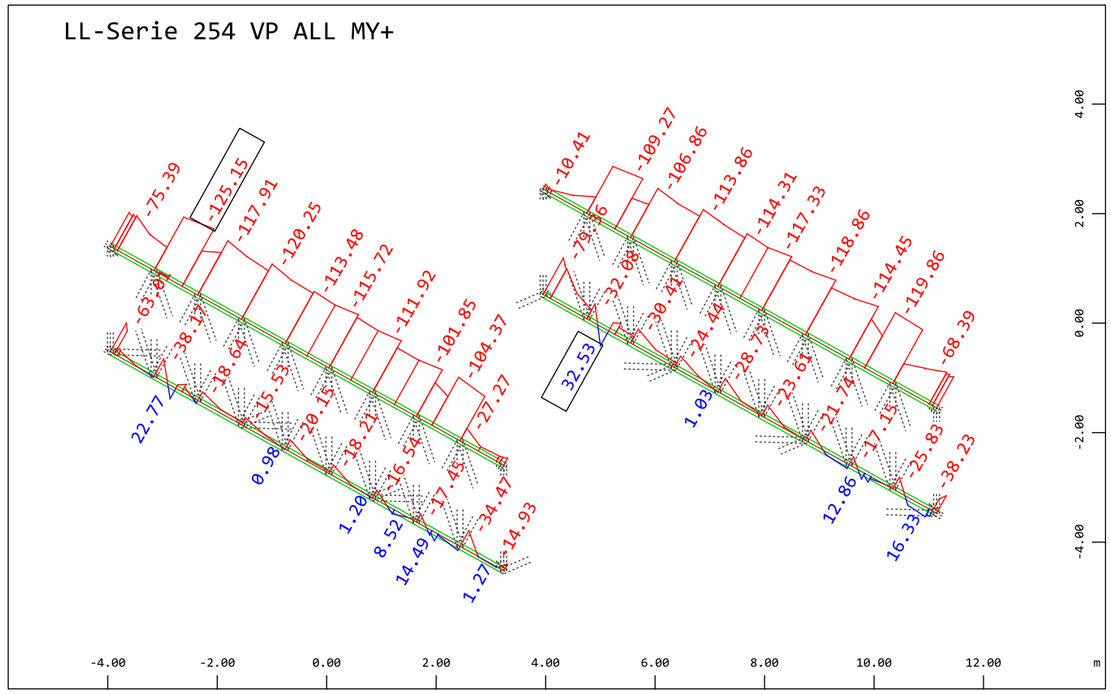


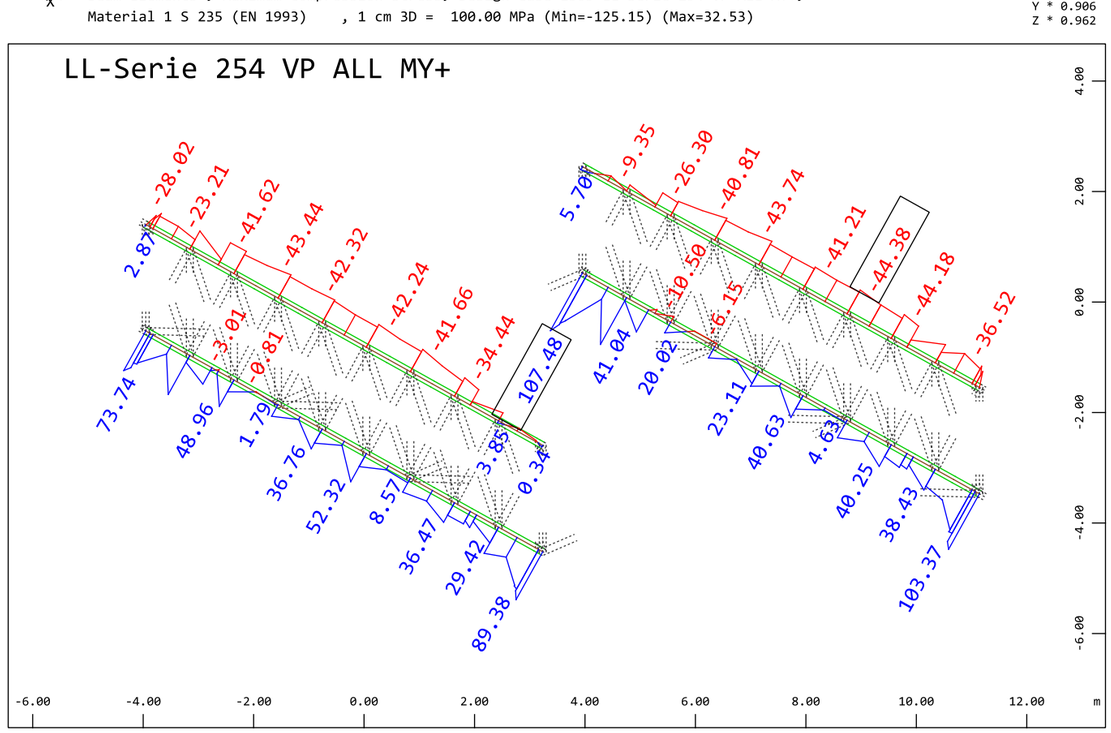




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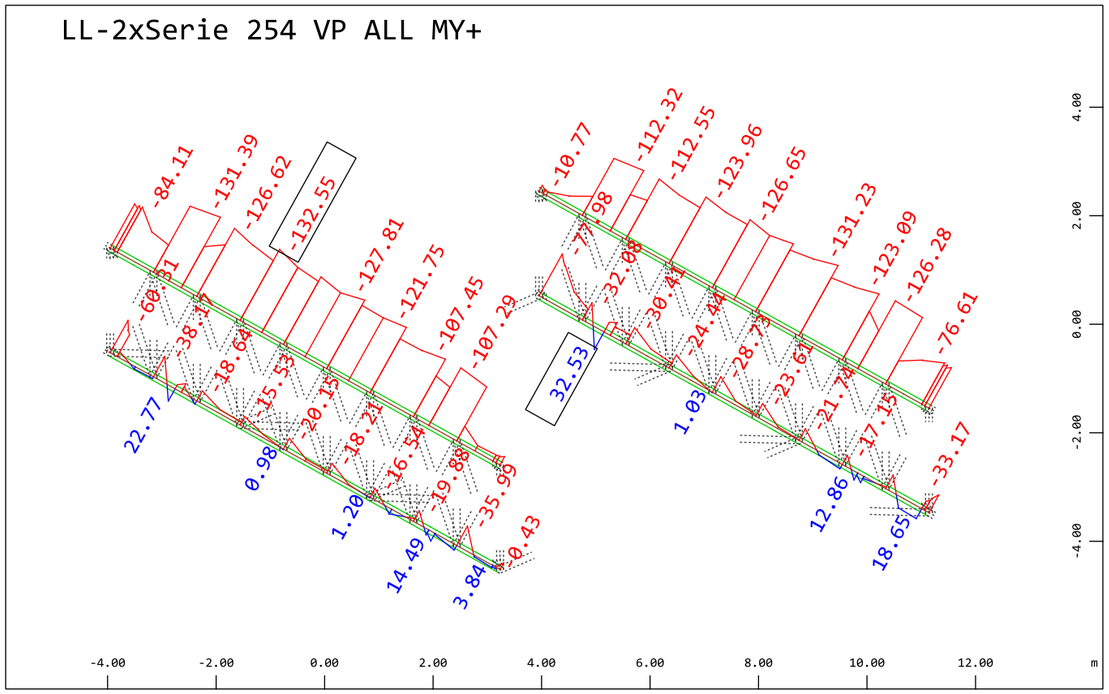
Pont Carretera Vic
Tensiones




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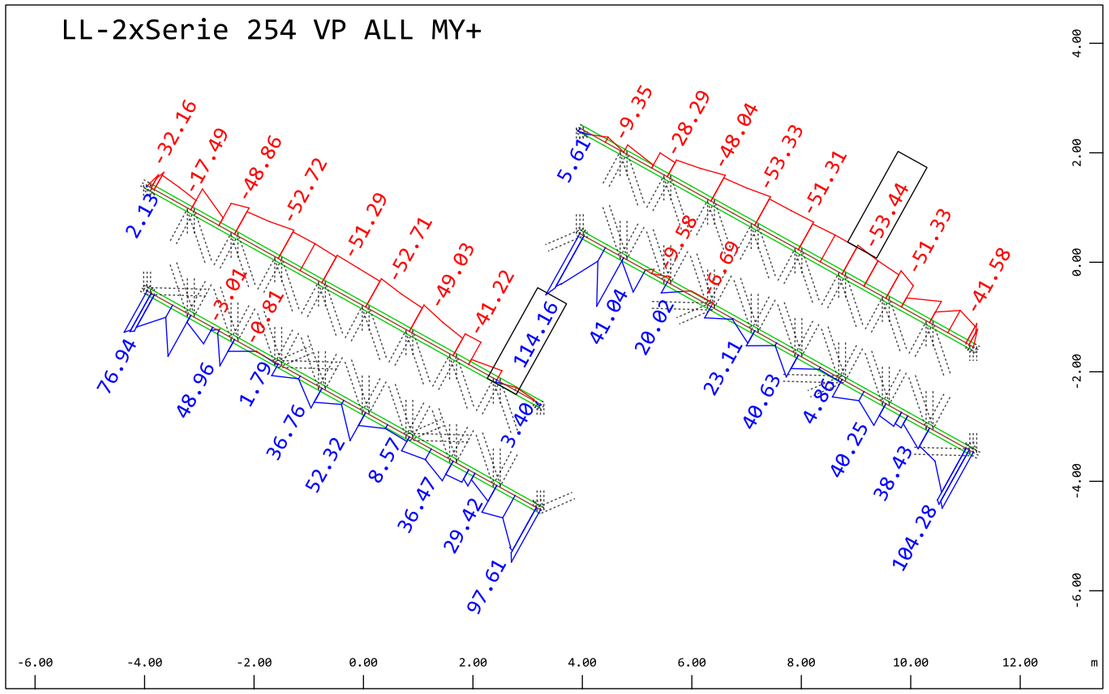
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1333 LL-2xSerie 254 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-132.55) (Max=32.53)

M 1 : 113
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

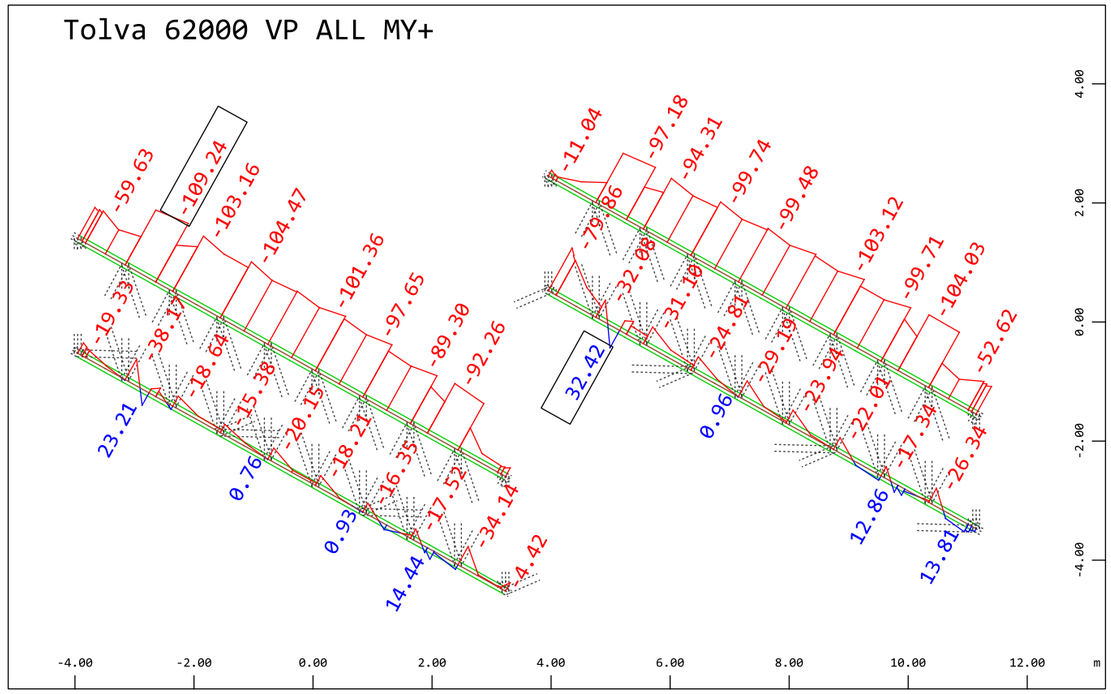
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1333 LL-2xSerie 254 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-53.44) (Max=114.16)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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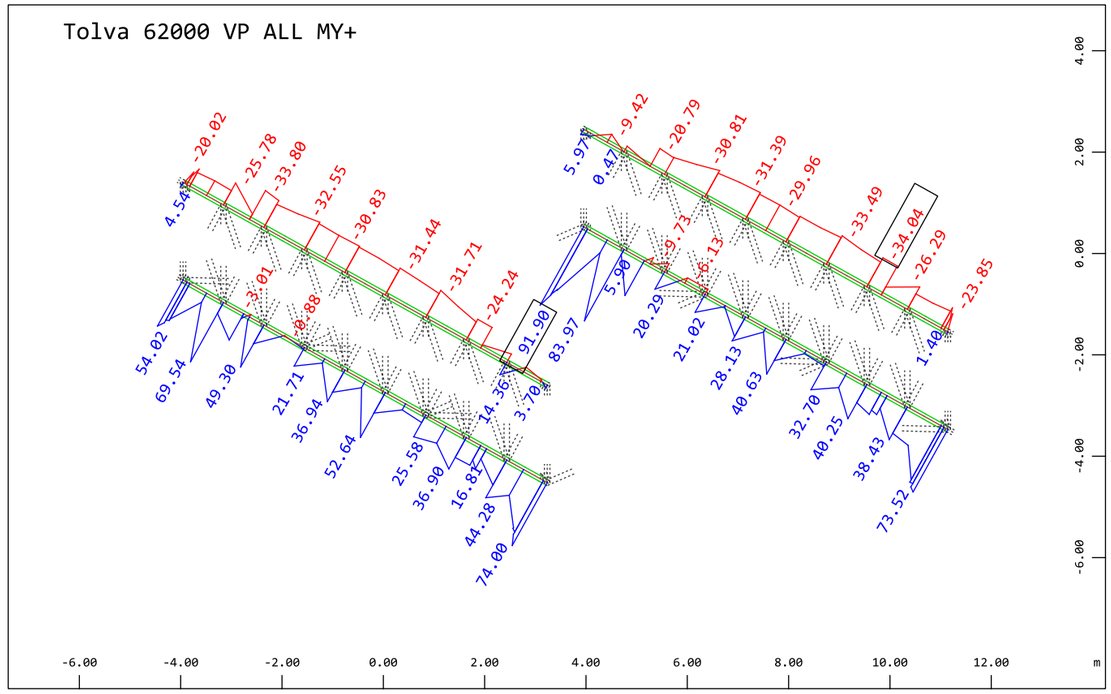
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1323 Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-109.24) (Max=32.42)

M 1 : 103
X * 0.502
Y * 0.906
Z * 0.962



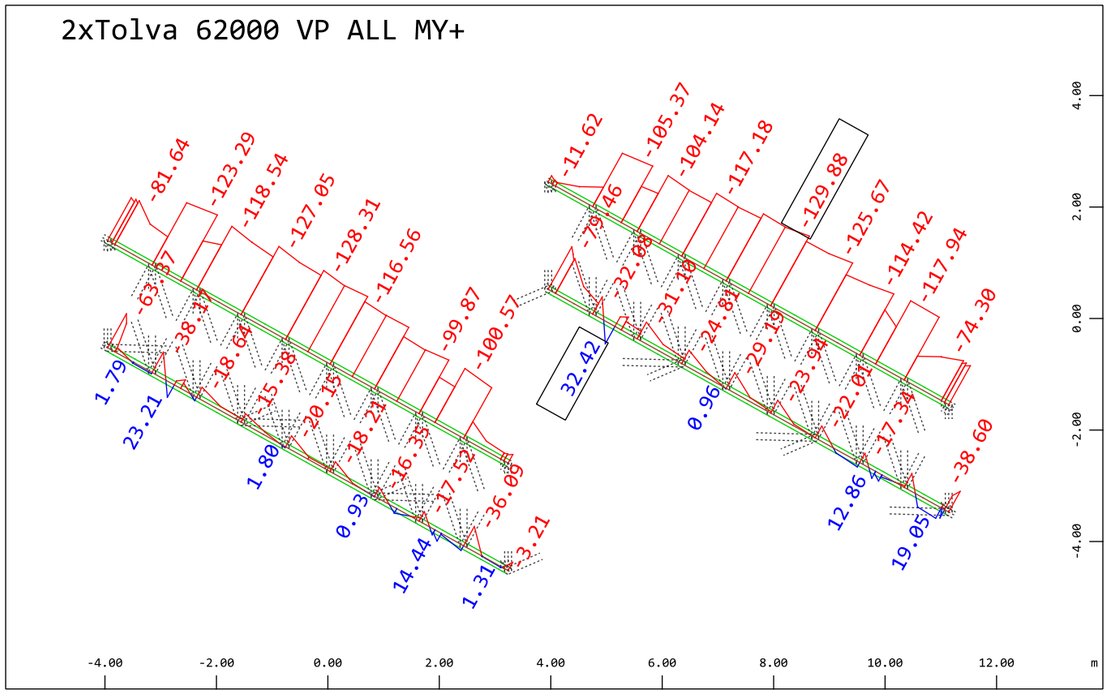

Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1323 Tolva 62000 VP ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-34.04) (Max=91.90)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962

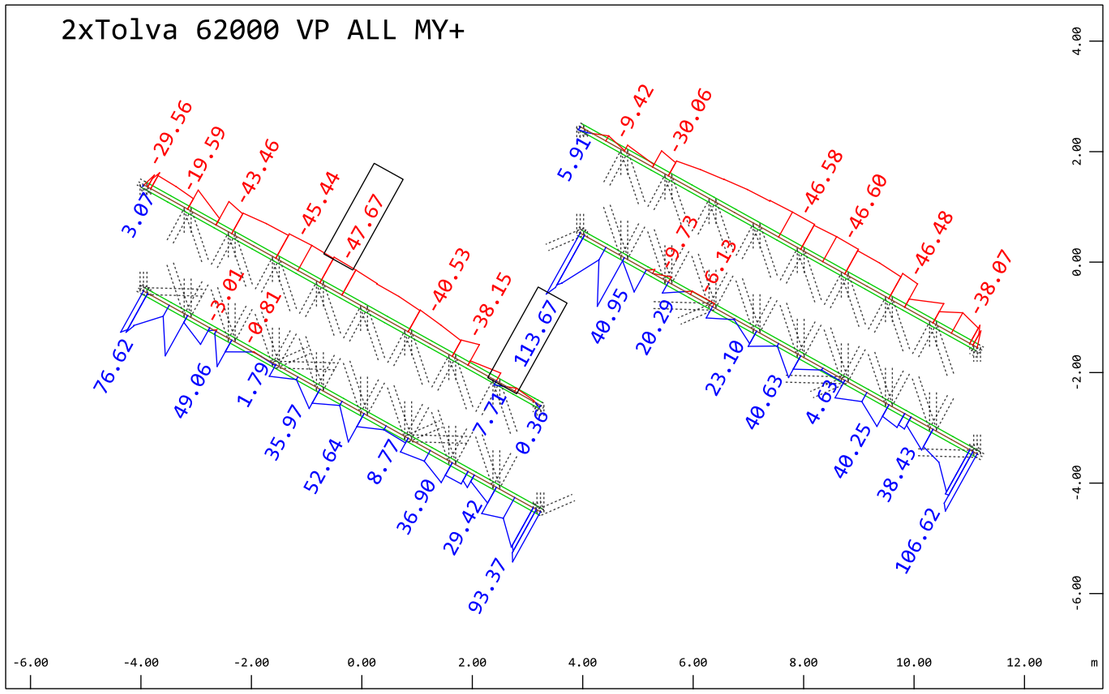
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1353 2xTolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-129.88) (Max=32.42)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962



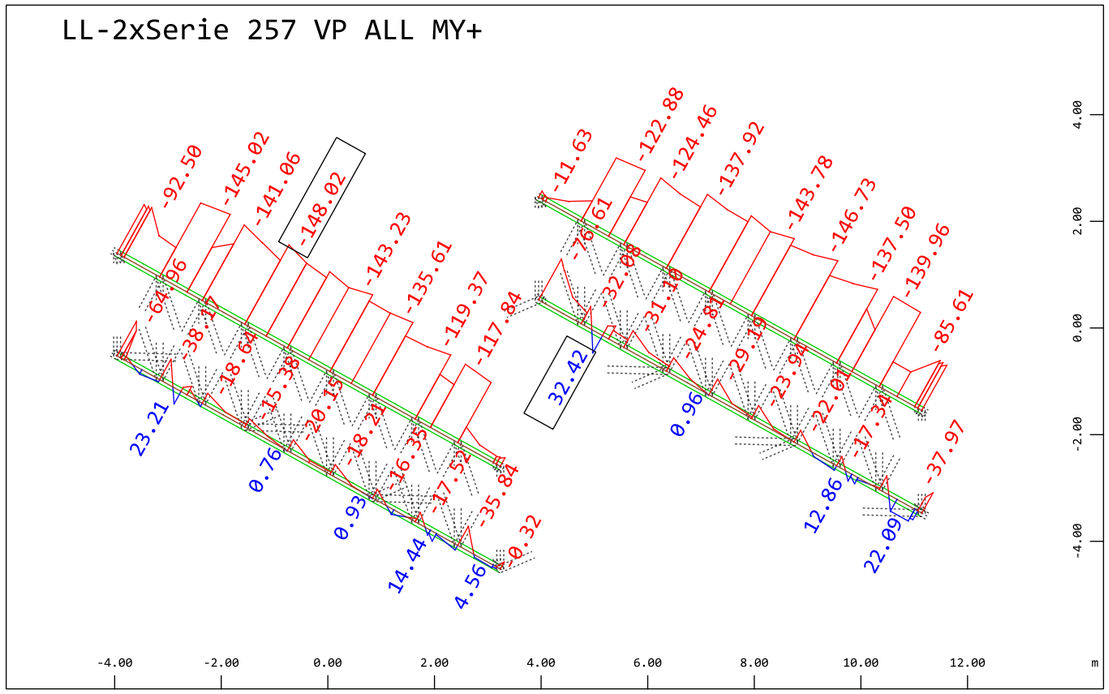

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1353 2xTolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-47.67) (Max=113.67)

M 1 : 111
X * 0.502
Y * 0.906
Z * 0.962

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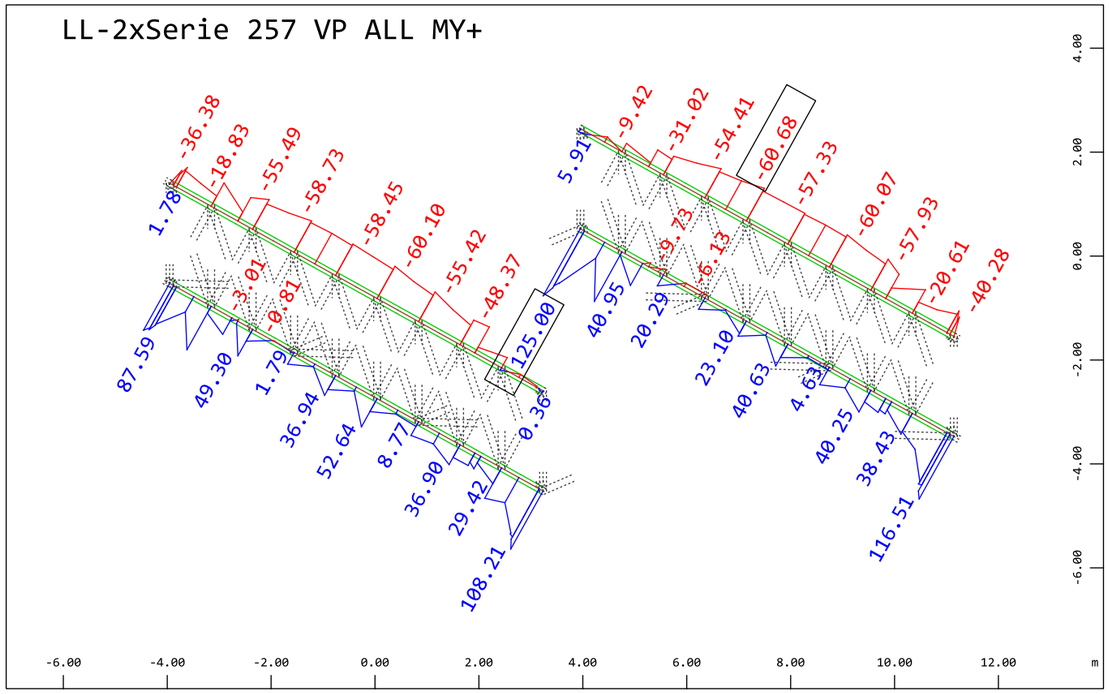


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1343 LL-2xSerie 257 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-148.02) (Max=32.42)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

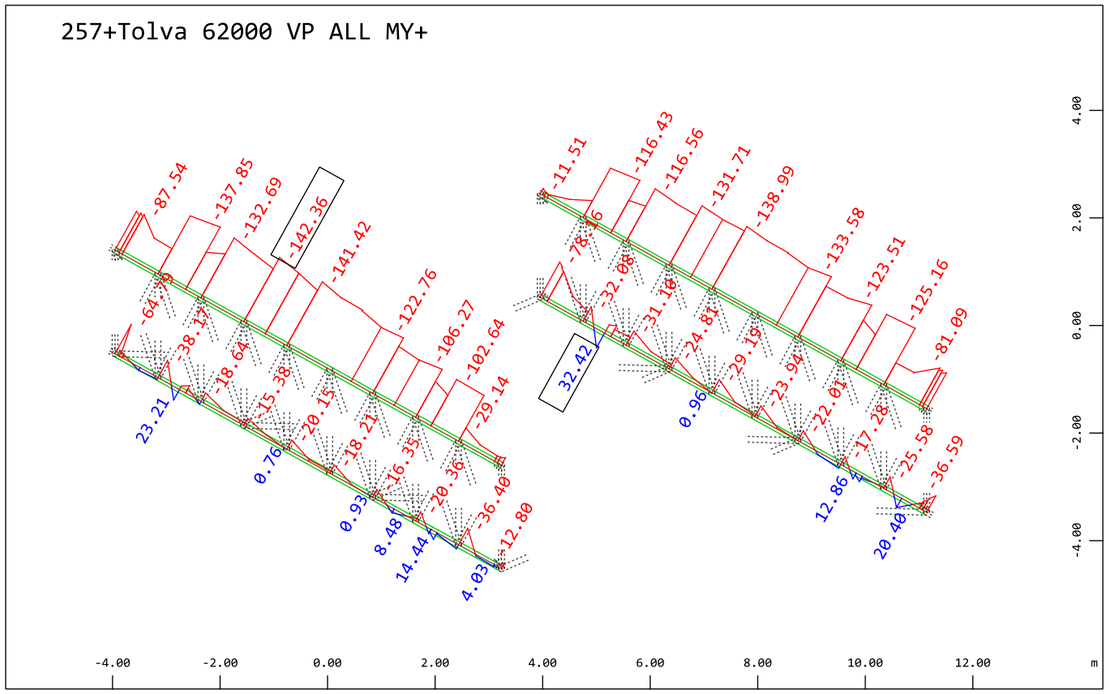


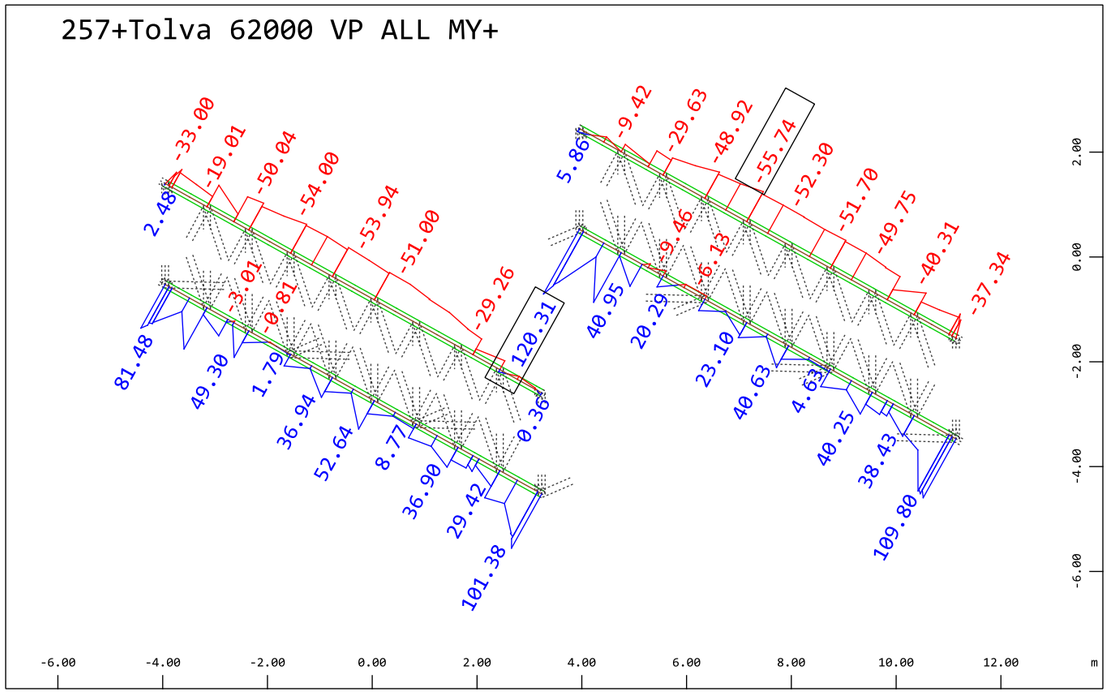

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1343 LL-2xSerie 257 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-60.68) (Max=125.00)

M 1 : 118
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones

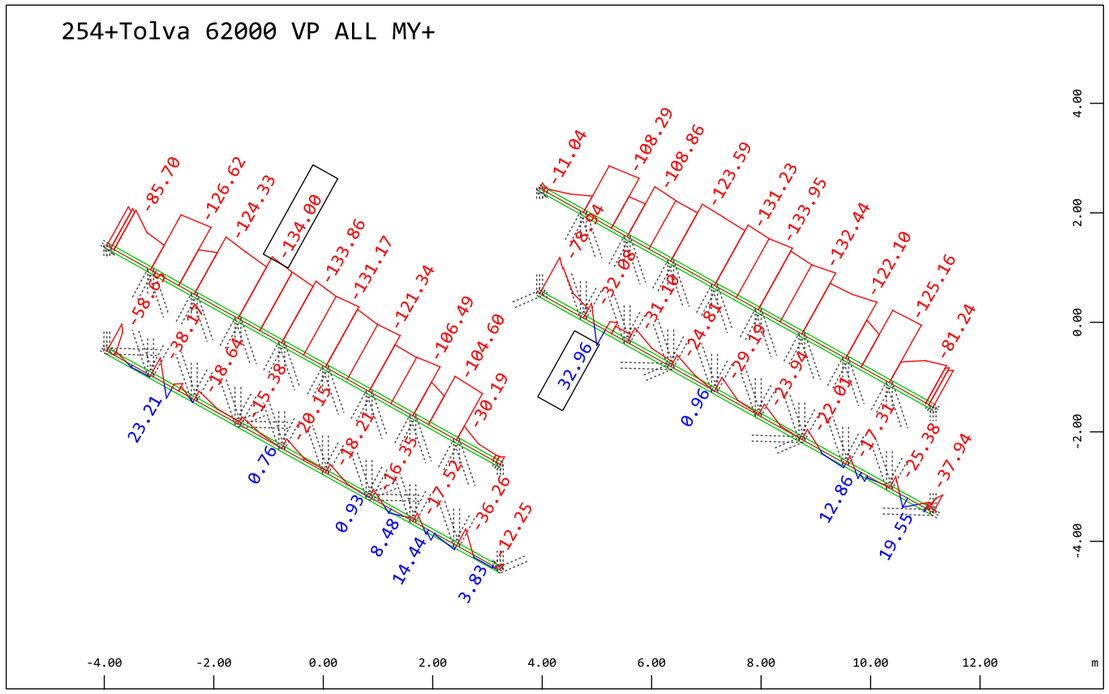


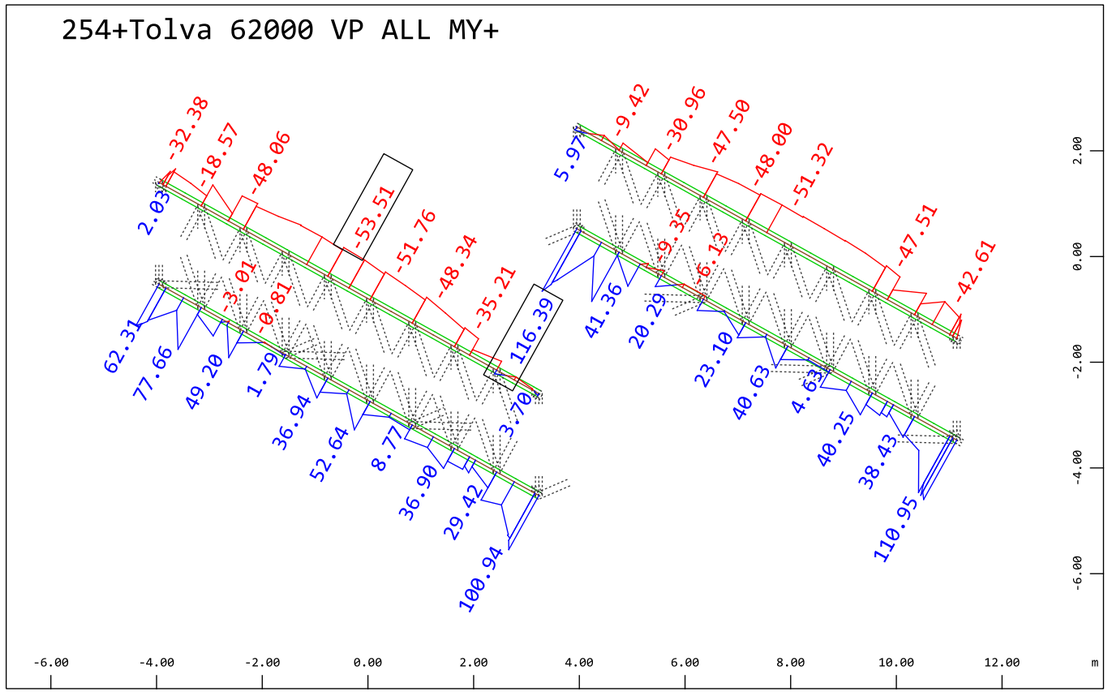




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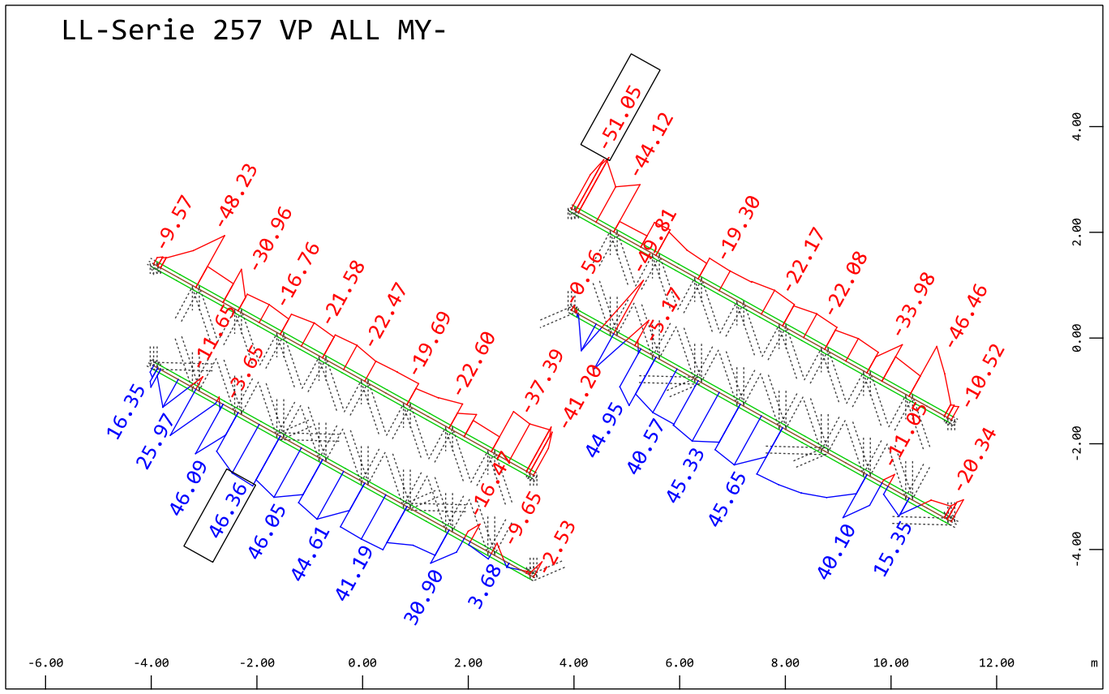
Pont Carretera Vic
Tensiones




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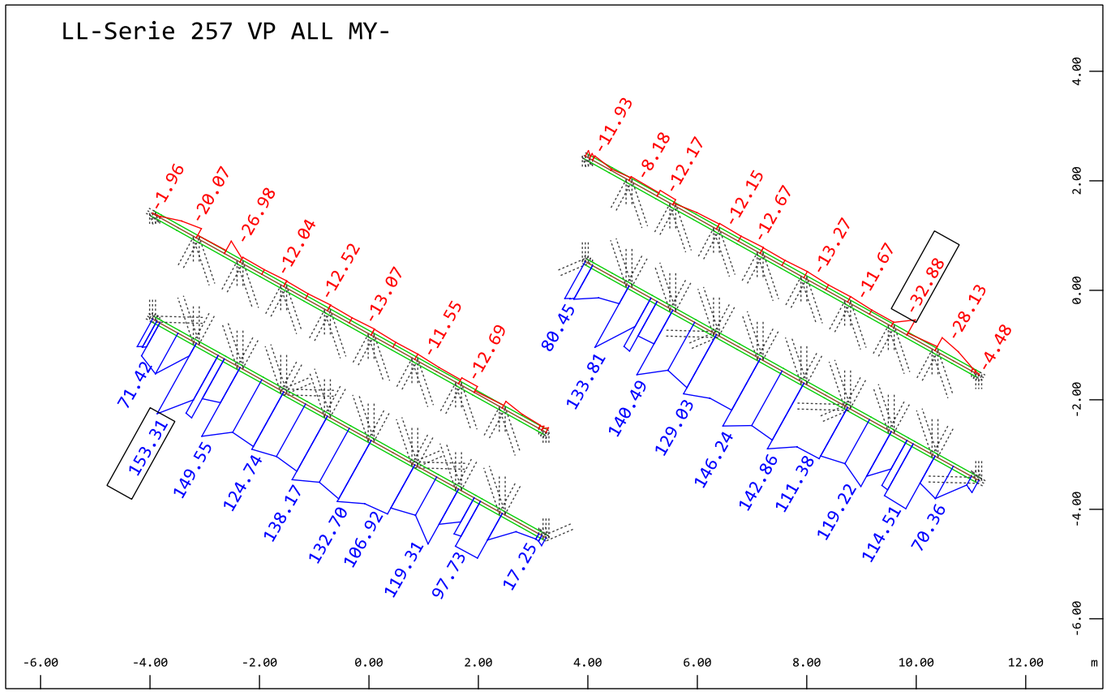
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1314 LL-Serie 257 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-51.05) (Max=46.36)

M 1 : 116
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

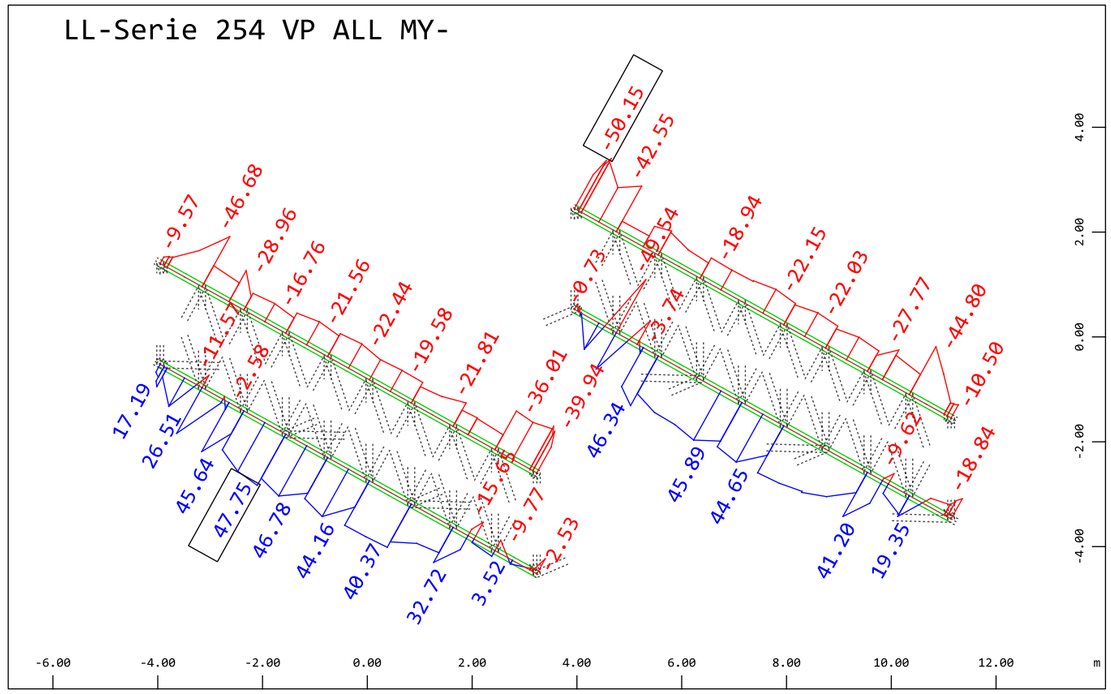
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1314 LL-Serie 257 VP ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-32.88) (Max=153.31)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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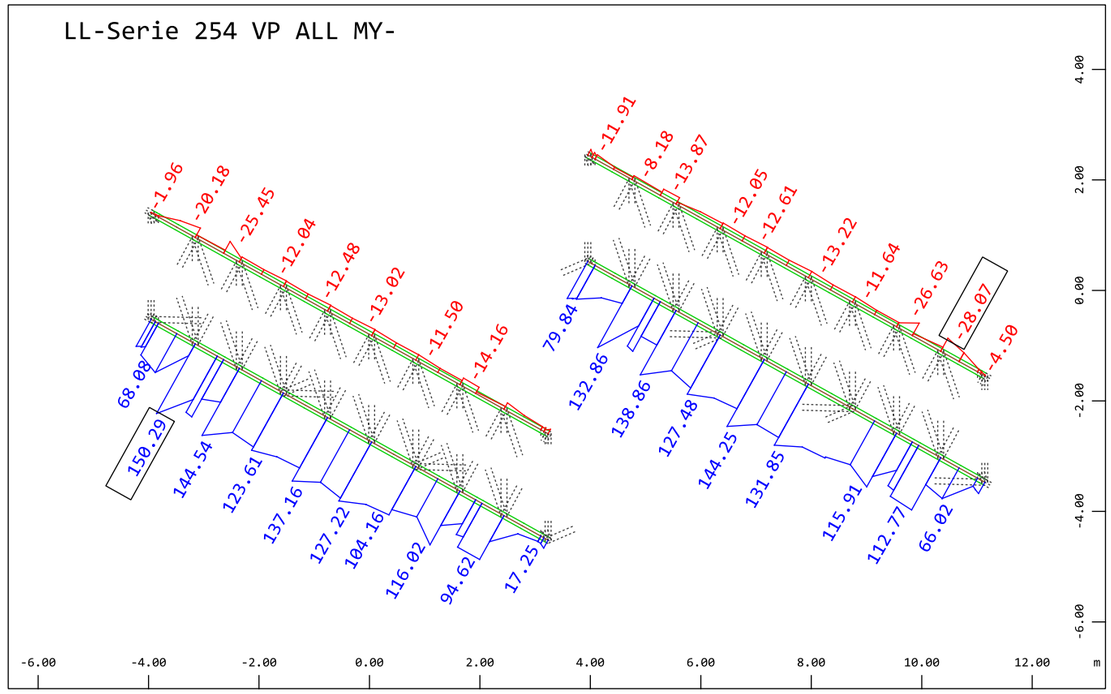
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1304 LL-Serie 254 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-50.15) (Max=47.75)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962



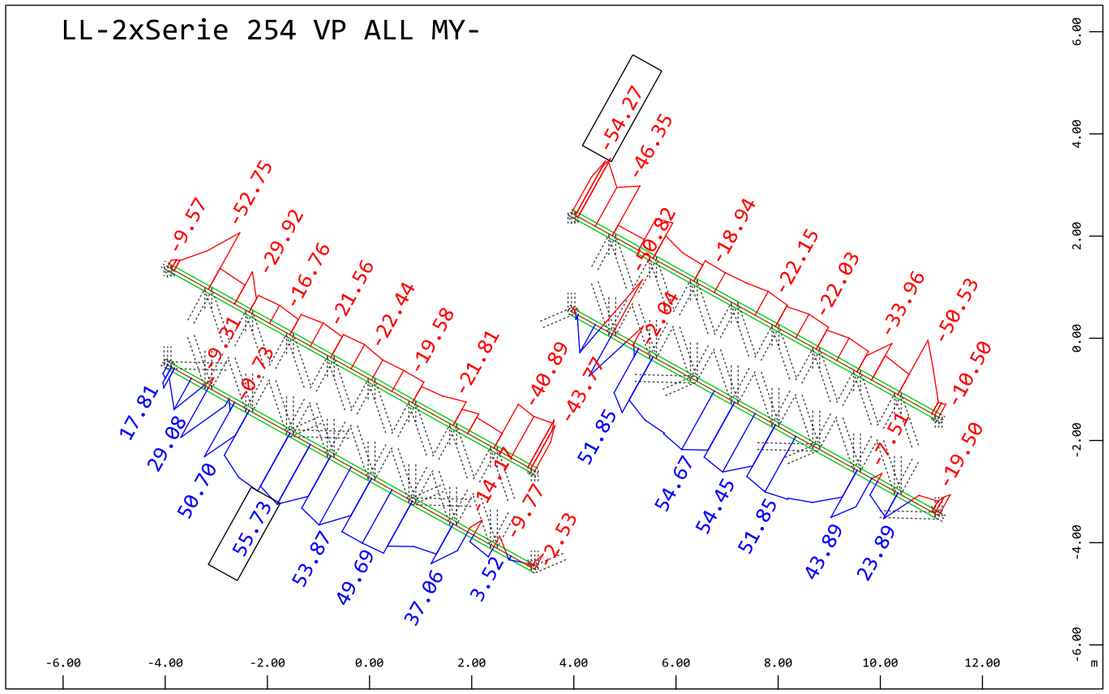

Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1304 LL-Serie 254 VP ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-28.07) (Max=150.29)

M 1 : 111
X * 0.502
Y * 0.906
Z * 0.962

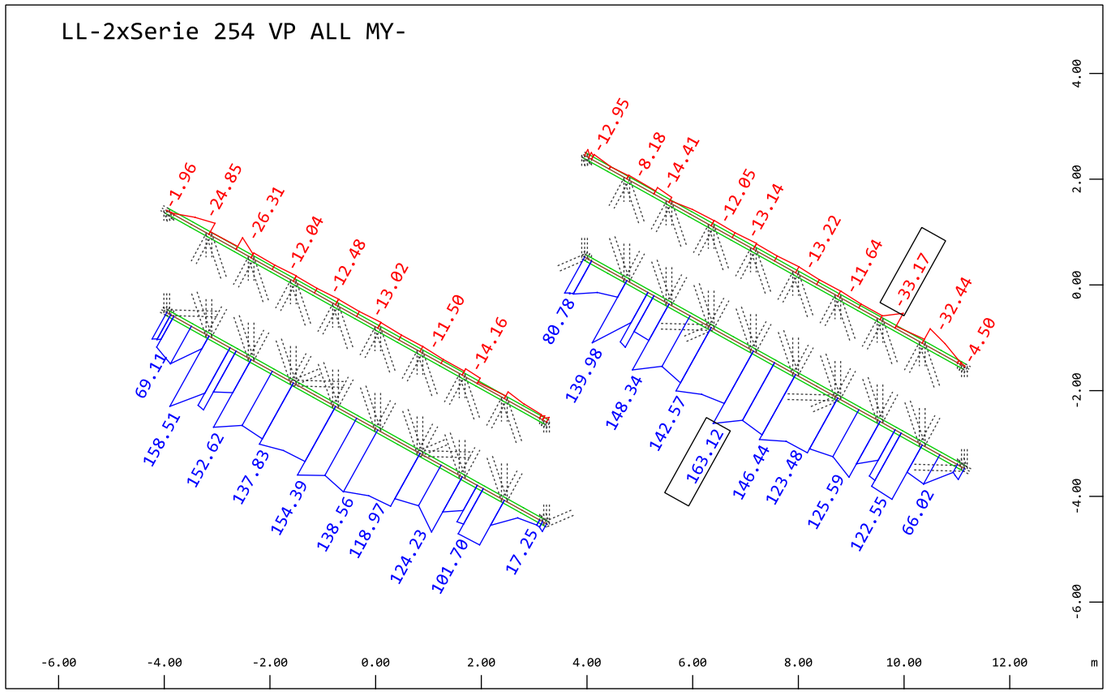
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1334 LL-2xSerie 254 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-54.27) (Max=55.73)

M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



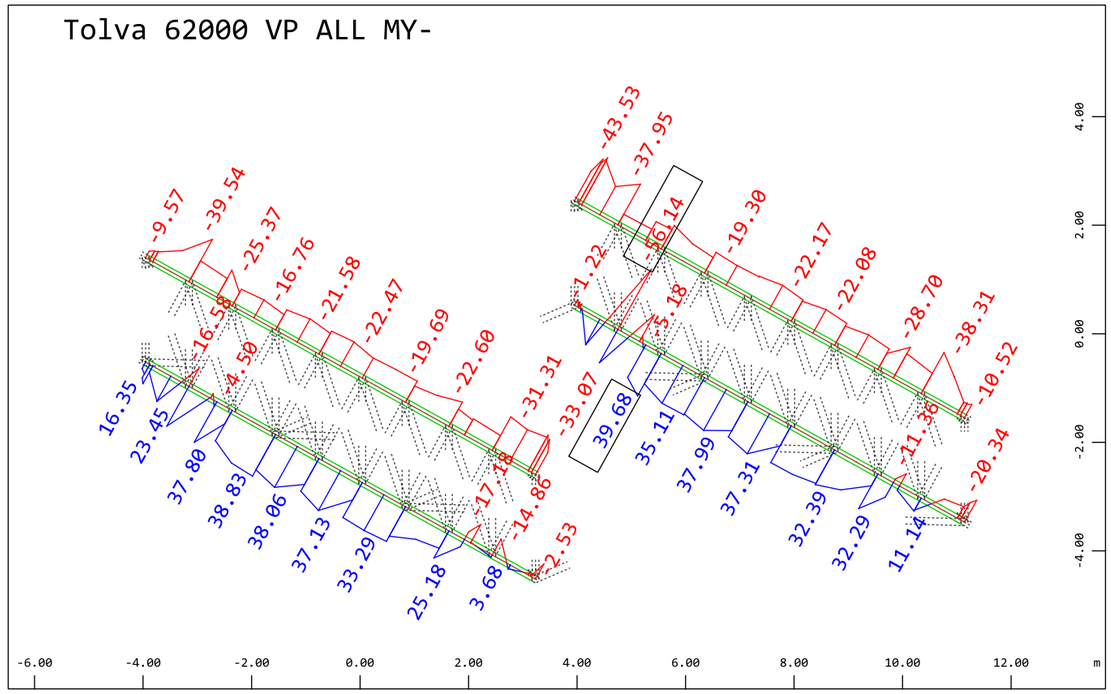

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1334 LL-2xSerie 254 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-33.17) (Max=163.12)

M 1 : 116
X * 0.502
Y * 0.906
Z * 0.962

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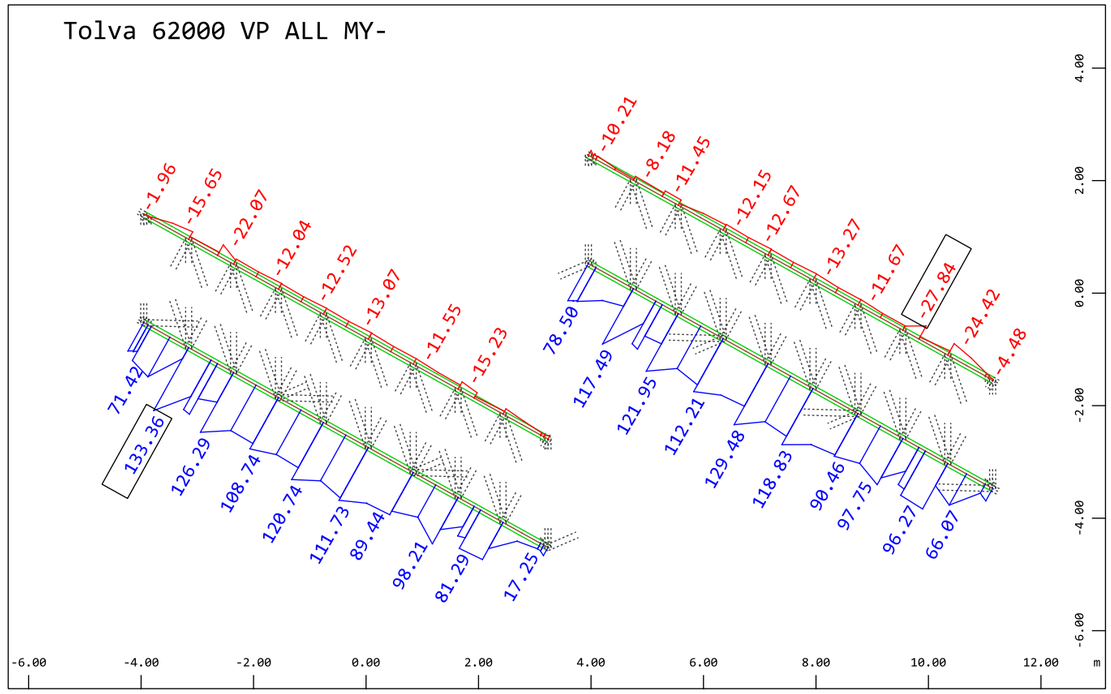


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1324 Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-56.14) (Max=39.68)

M 1 : 113
X * 0.502
Y * 0.906
Z * 0.962

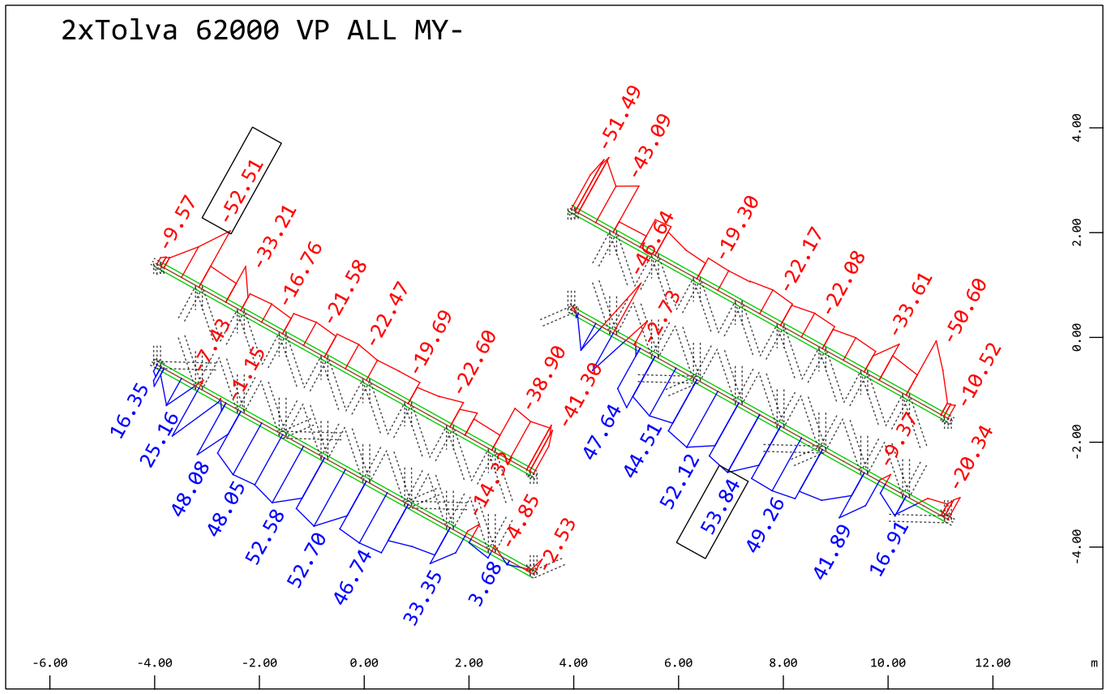



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1324 Tolva 62000 VP ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-27.84) (Max=133.36)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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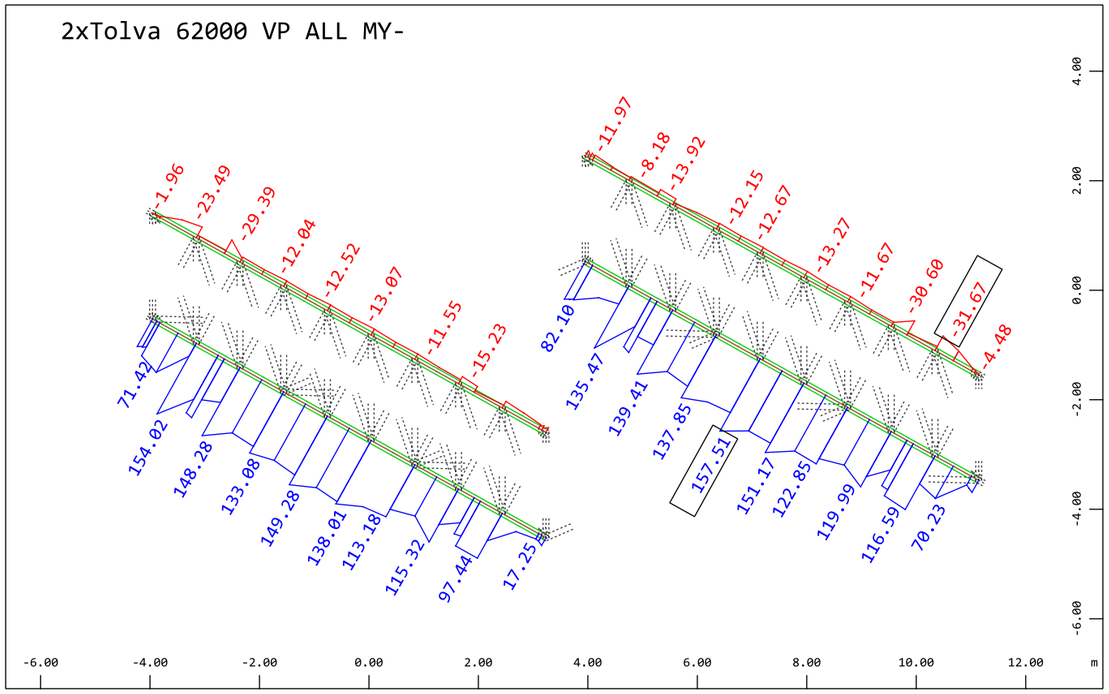
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1344 LL-2xSerie 257 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-59.50) (Max=61.47)

M 1 : 123
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1344 LL-2xSerie 257 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-35.88) (Max=177.96)

M 1 : 119
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1354 2xTolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-52.51) (Max=53.84)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962



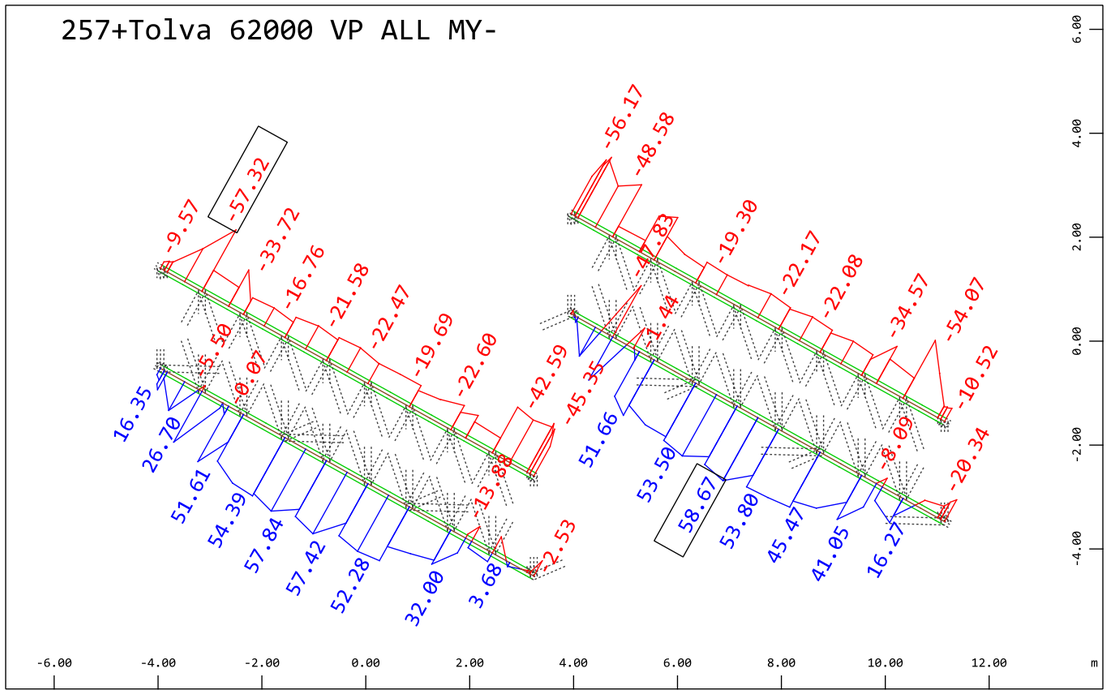

Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1354 2xTolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-31.67) (Max=157.51)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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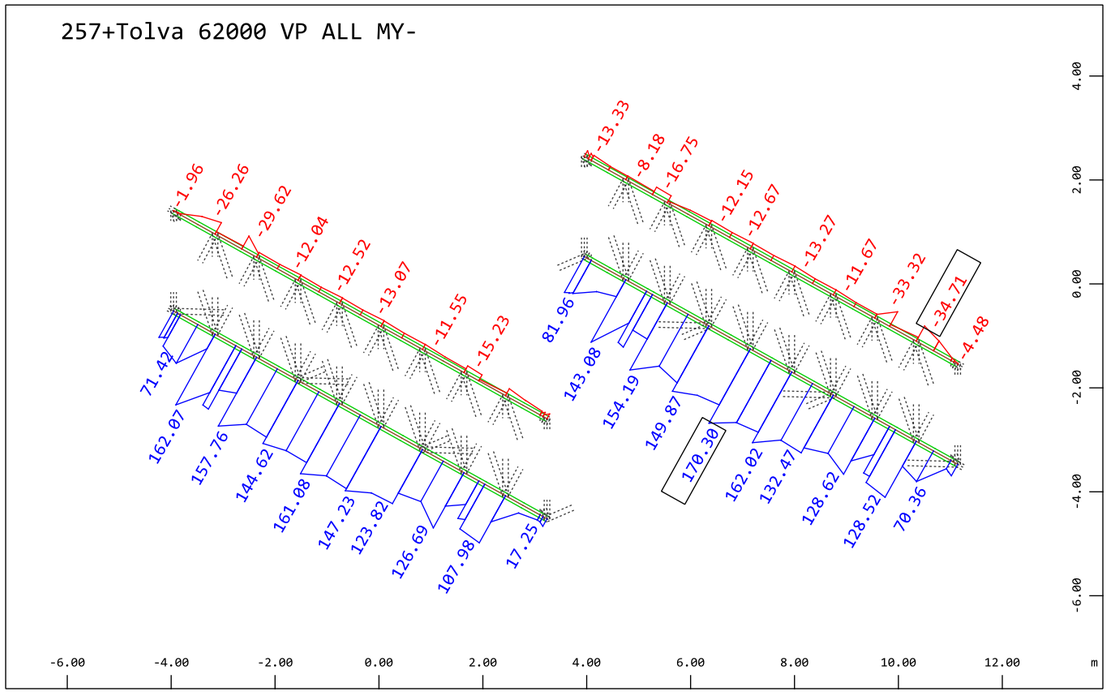
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1374 257+Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-57.32) (Max=58.67)

M 1 : 118
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

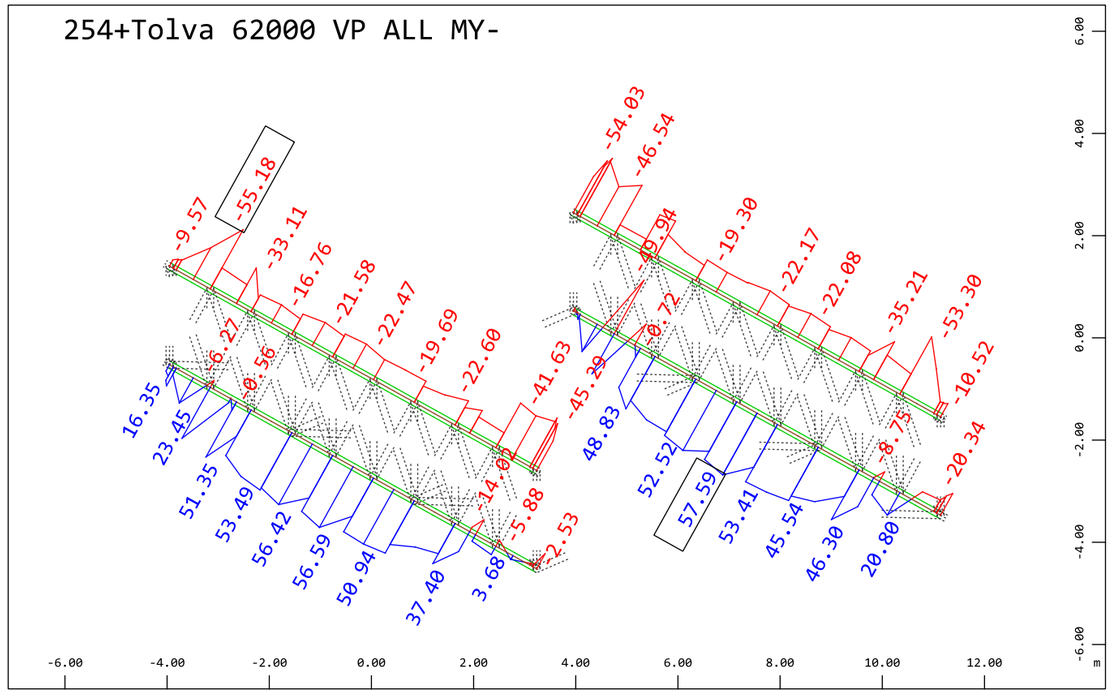
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1374 257+Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-34.71) (Max=170.30)

M 1 : 118
X * 0.502
Y * 0.906
Z * 0.962

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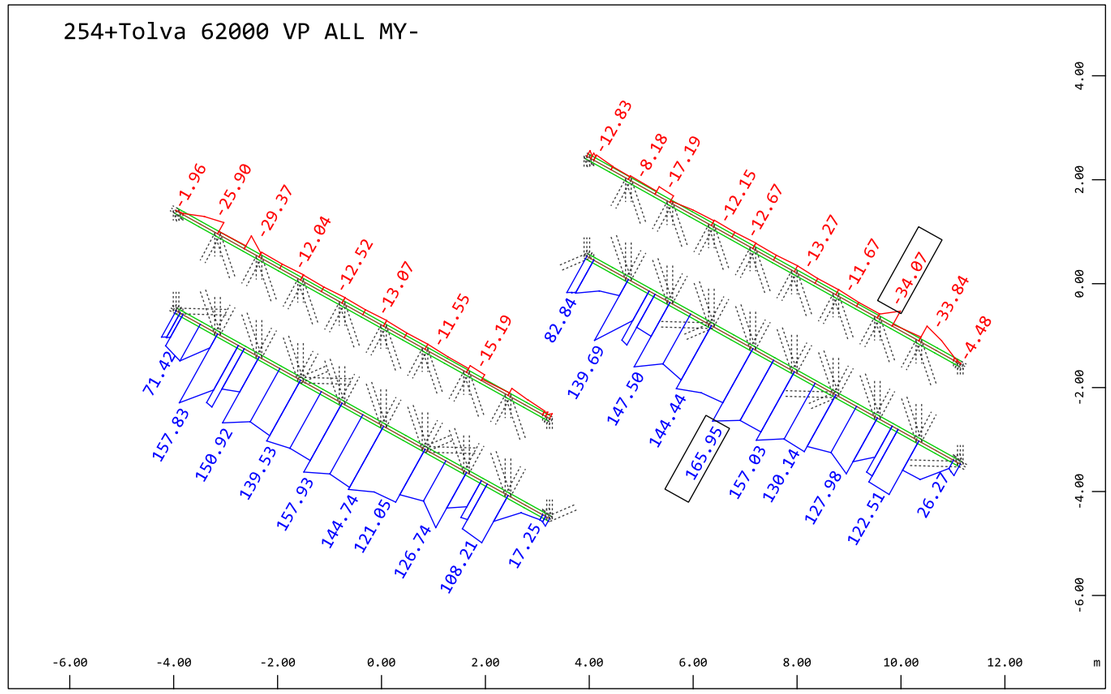
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1364 254+Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-55.18) (Max=57.59)

M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



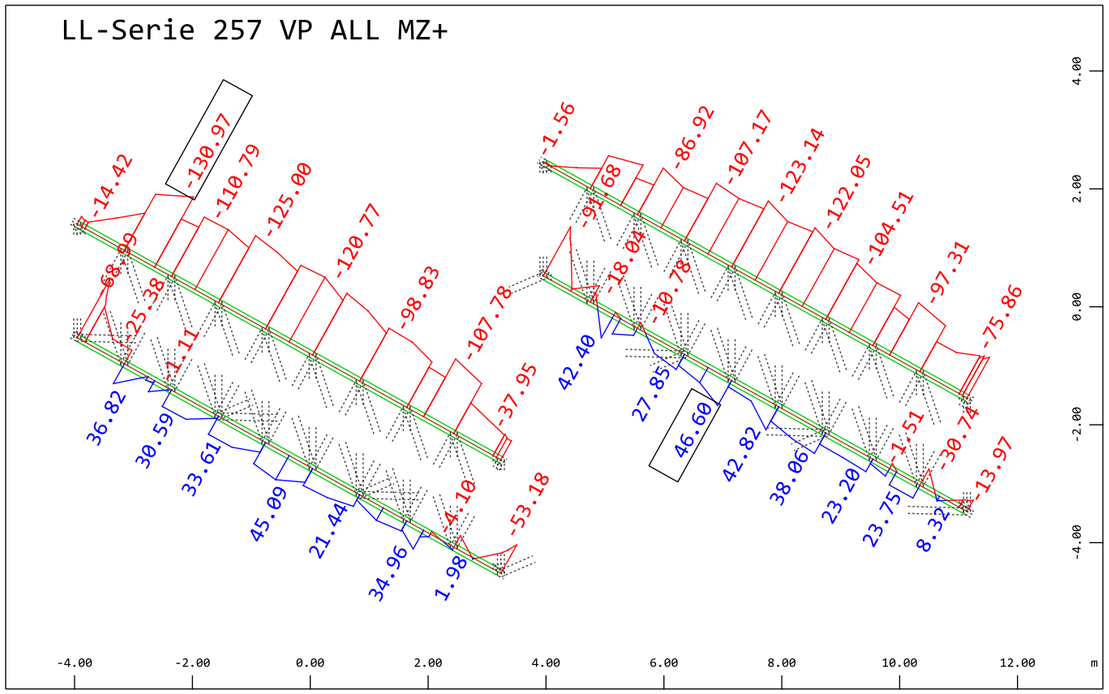

Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1364 254+Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-34.07) (Max=165.95)

M 1 : 118
X * 0.502
Y * 0.906
Z * 0.962

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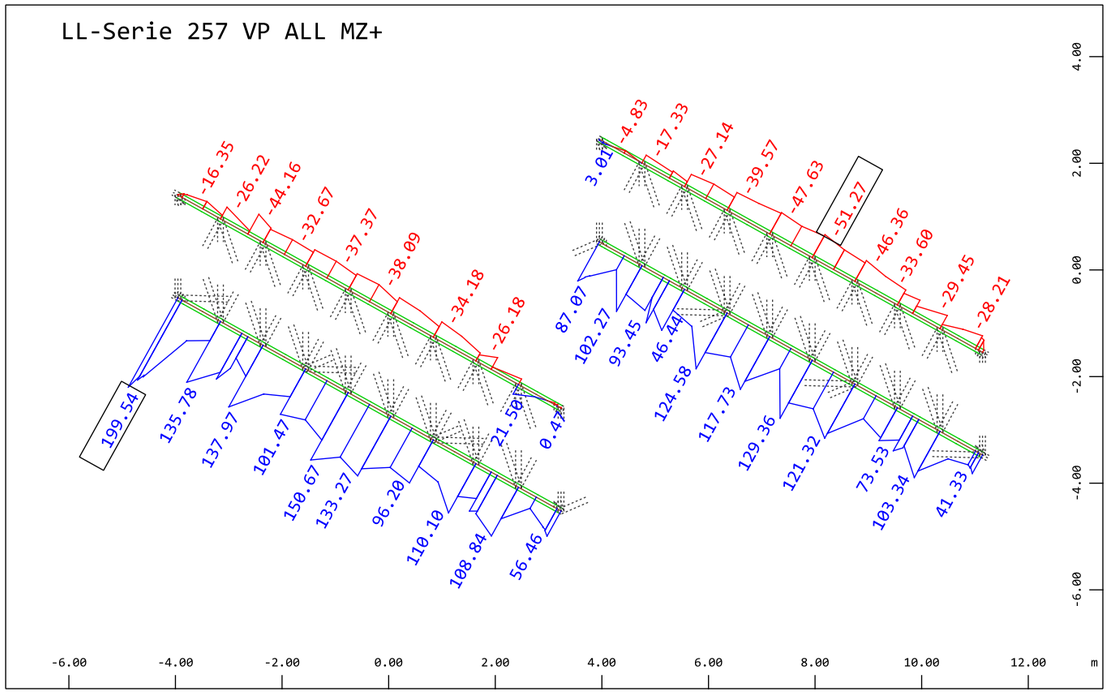
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1315 LL-Serie 257 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-130.97) (Max=46.60)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

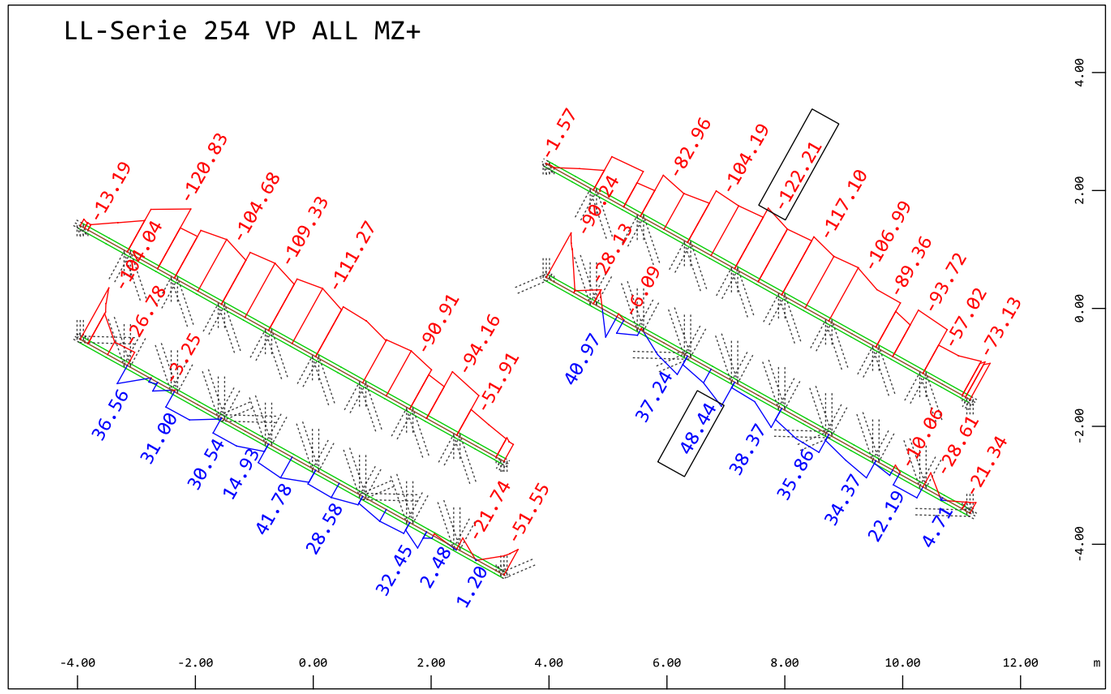
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1315 LL-Serie 257 VP ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-51.27) (Max=199.54)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

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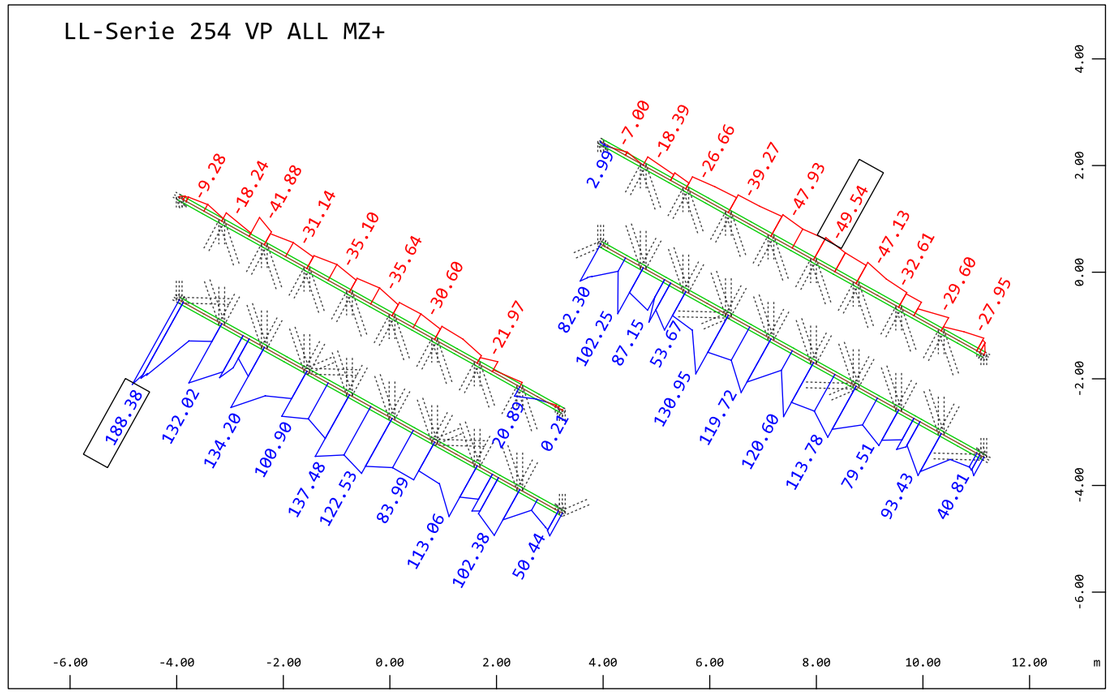
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1305 LL-Serie 254 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-122.21) (Max=48.44)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962



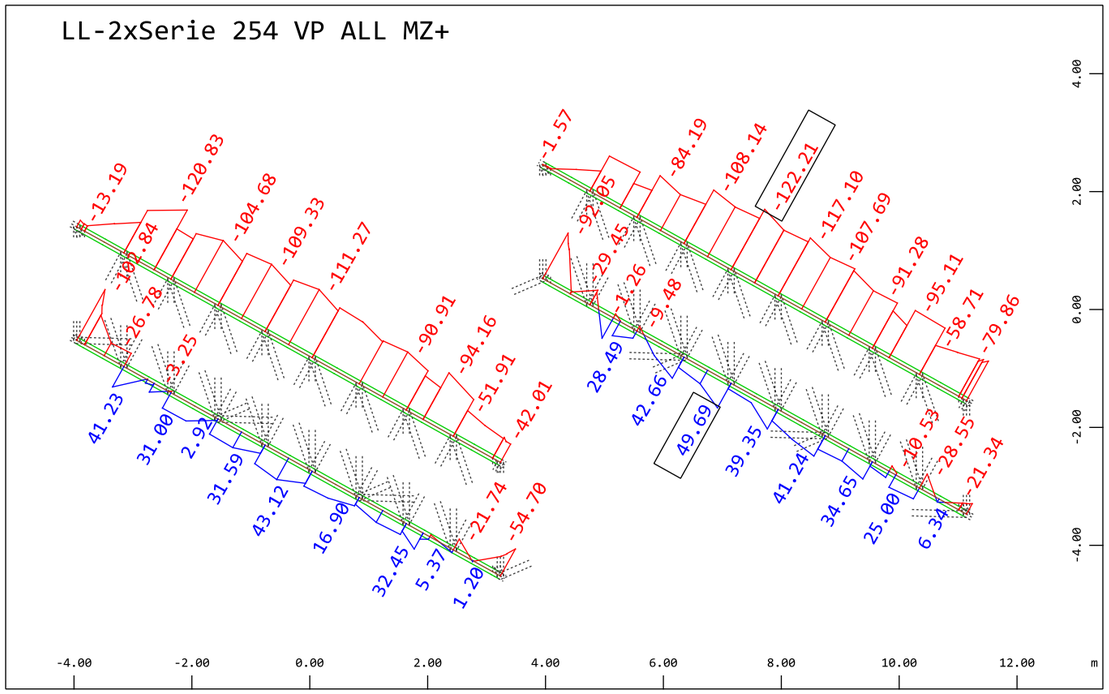

Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1305 LL-Serie 254 VP ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-49.54) (Max=188.38)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

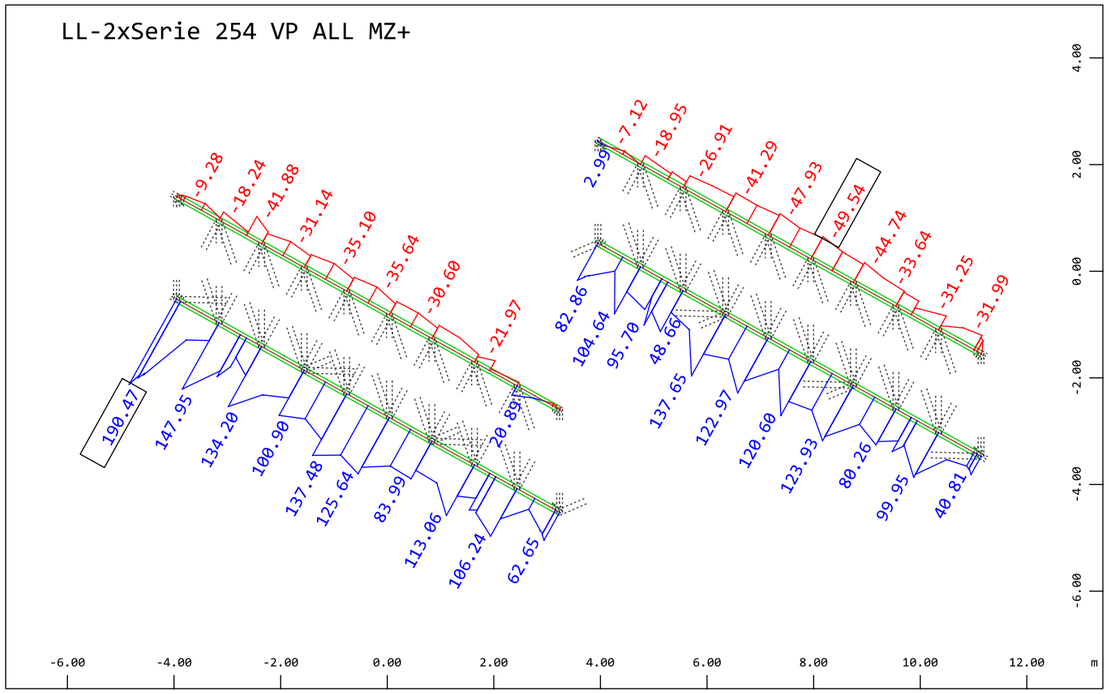
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1335 LL-2xSerie 254 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-122.21) (Max=49.69)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962



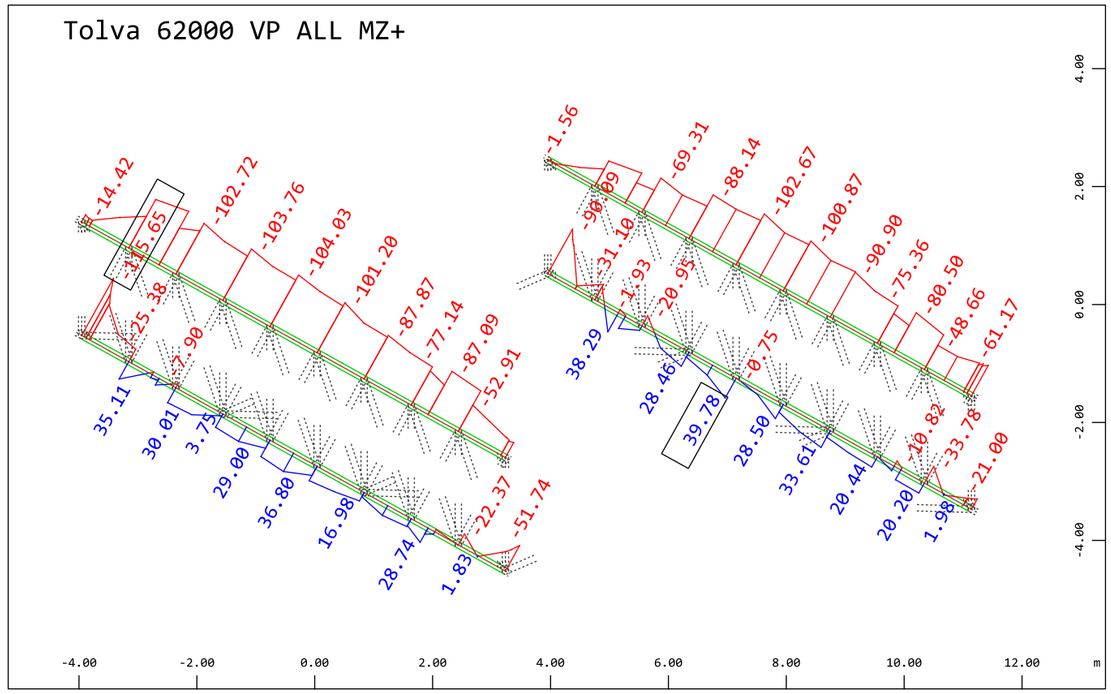

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1335 LL-2xSerie 254 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-49.54) (Max=190.47)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

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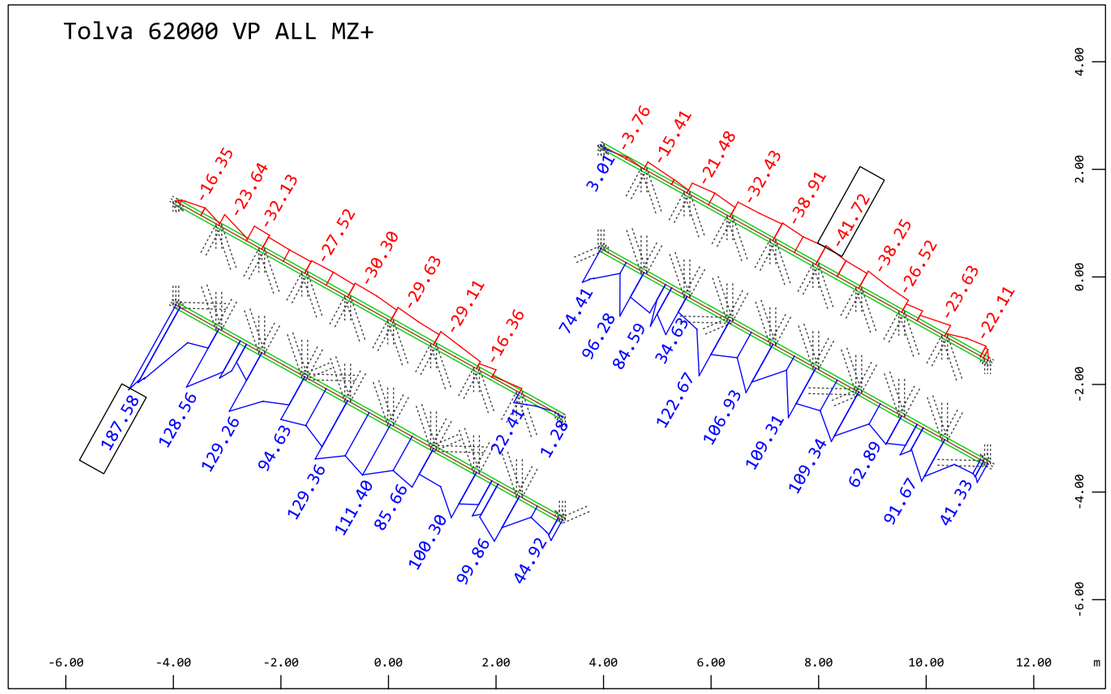


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1325 Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-115.65) (Max=39.78)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962

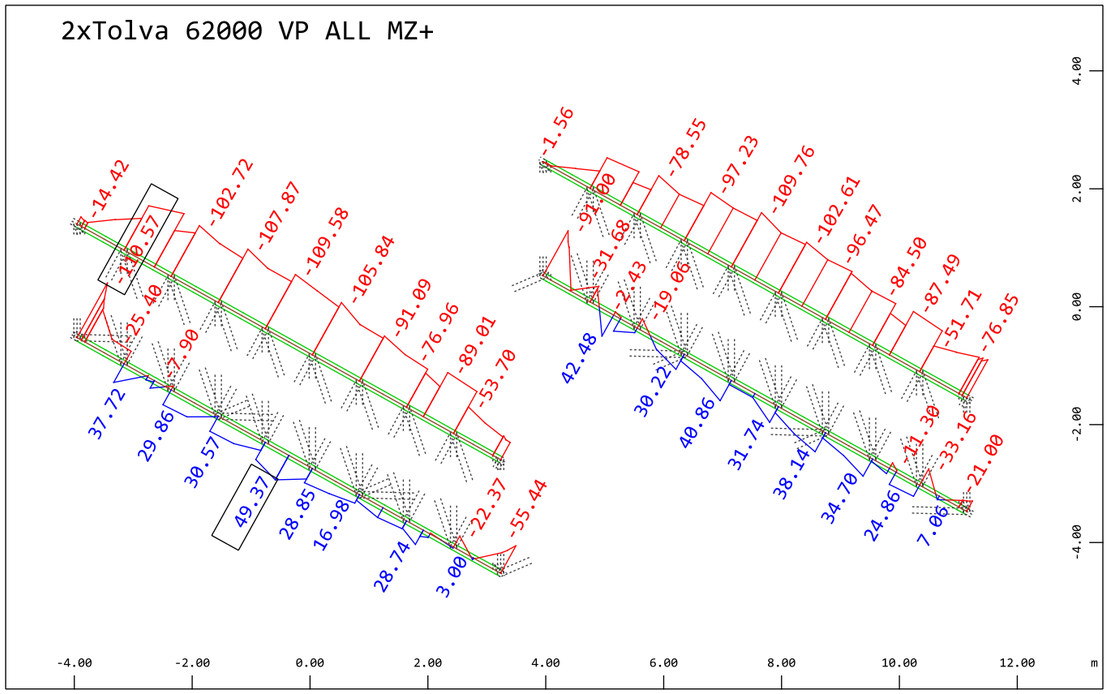



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1325 Tolva 62000 VP ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-41.72) (Max=187.58)

M 1 : 114
X * 0.502
Y * 0.906
Z * 0.962

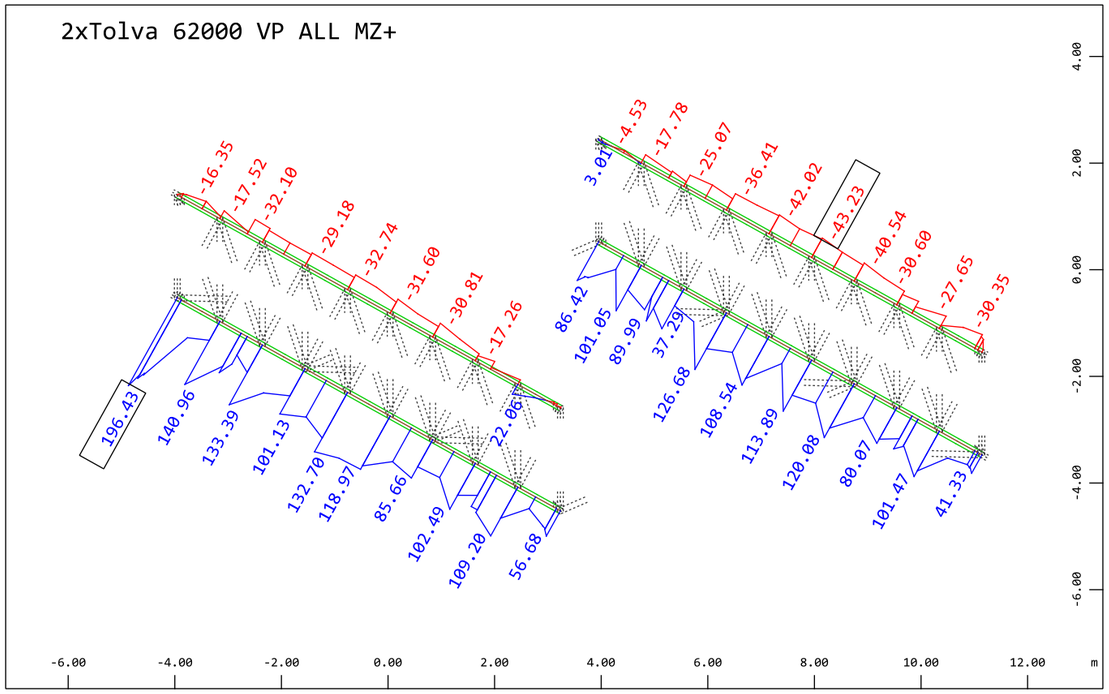
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1355 2xTolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-110.57) (Max=49.37)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962



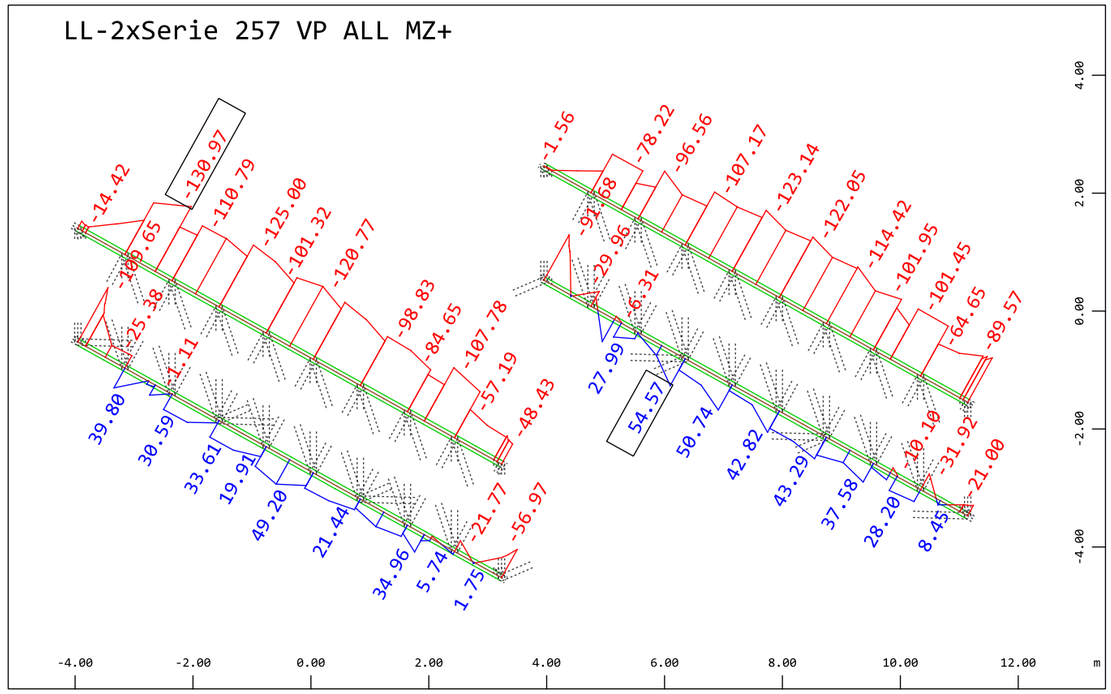

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1355 2xTolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-43.23) (Max=196.43)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

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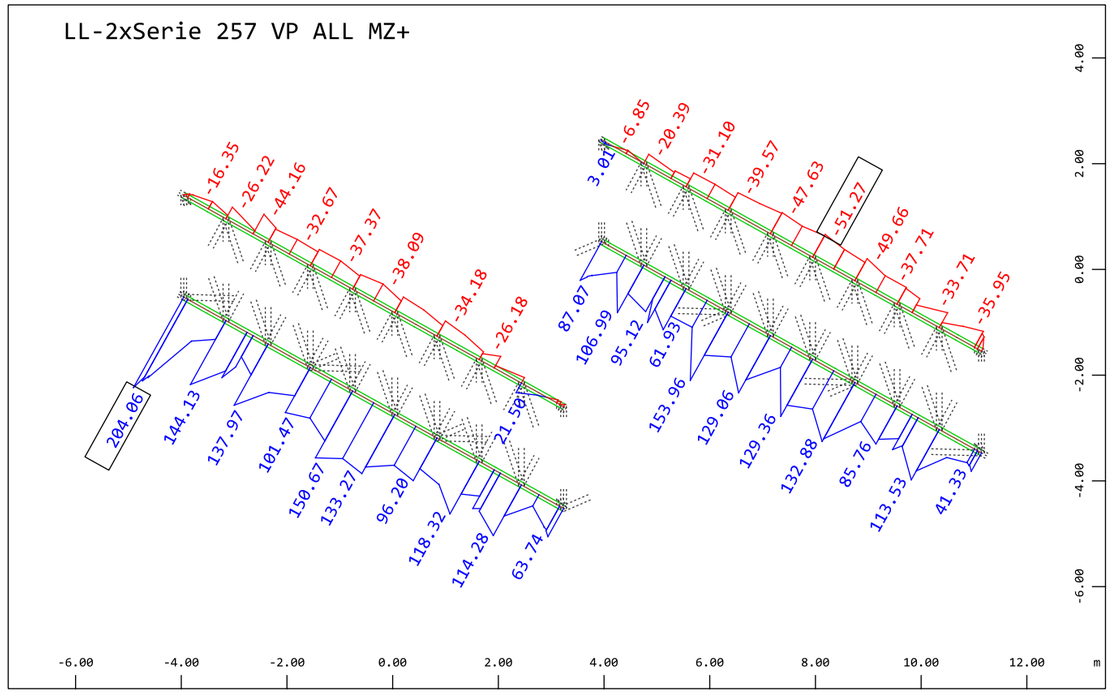


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1345 LL-2xSerie 257 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-130.97) (Max=54.57)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962

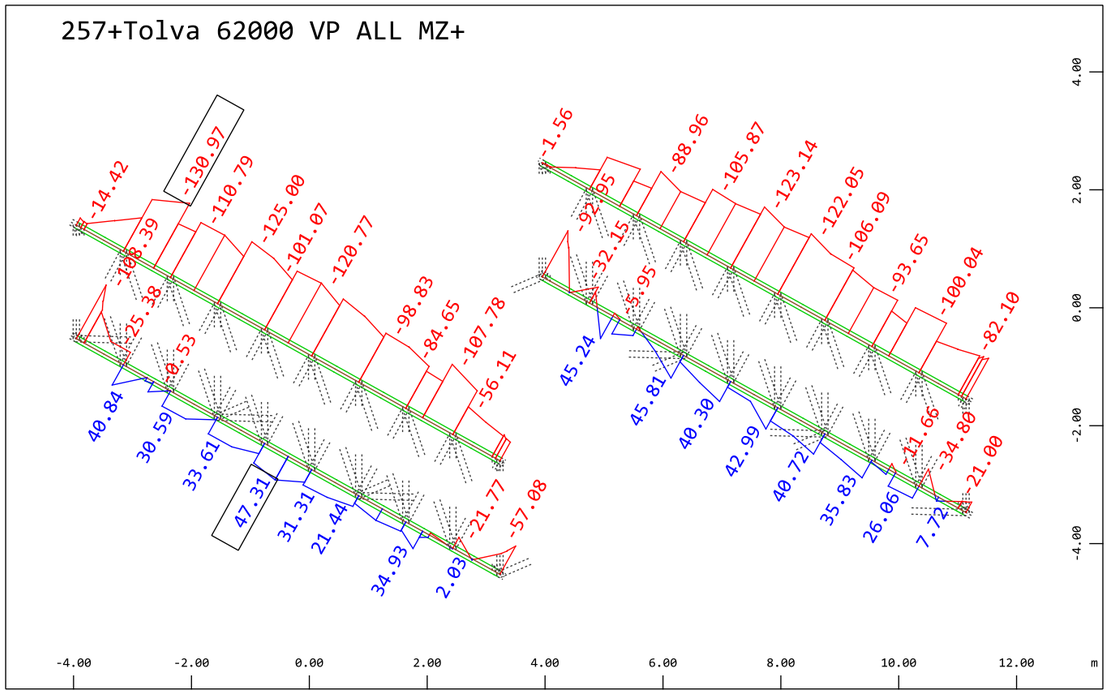



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1345 LL-2xSerie 257 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-51.27) (Max=204.06)

M 1 : 116
X * 0.502
Y * 0.906
Z * 0.962

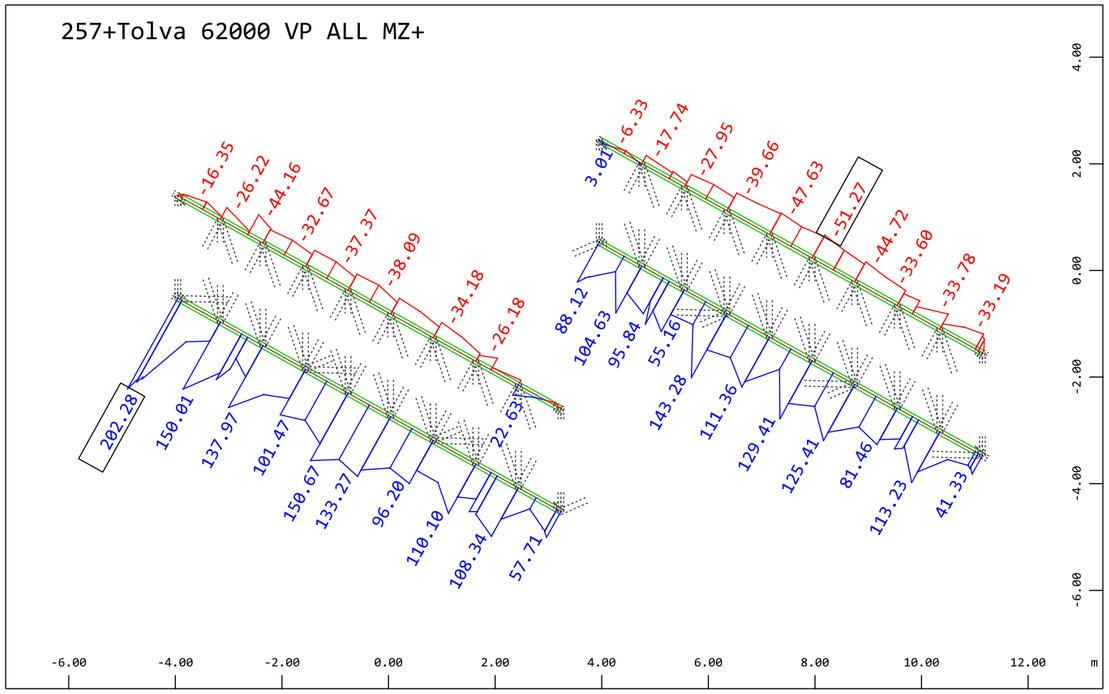
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1375 257+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-130.97) (Max=47.31)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962

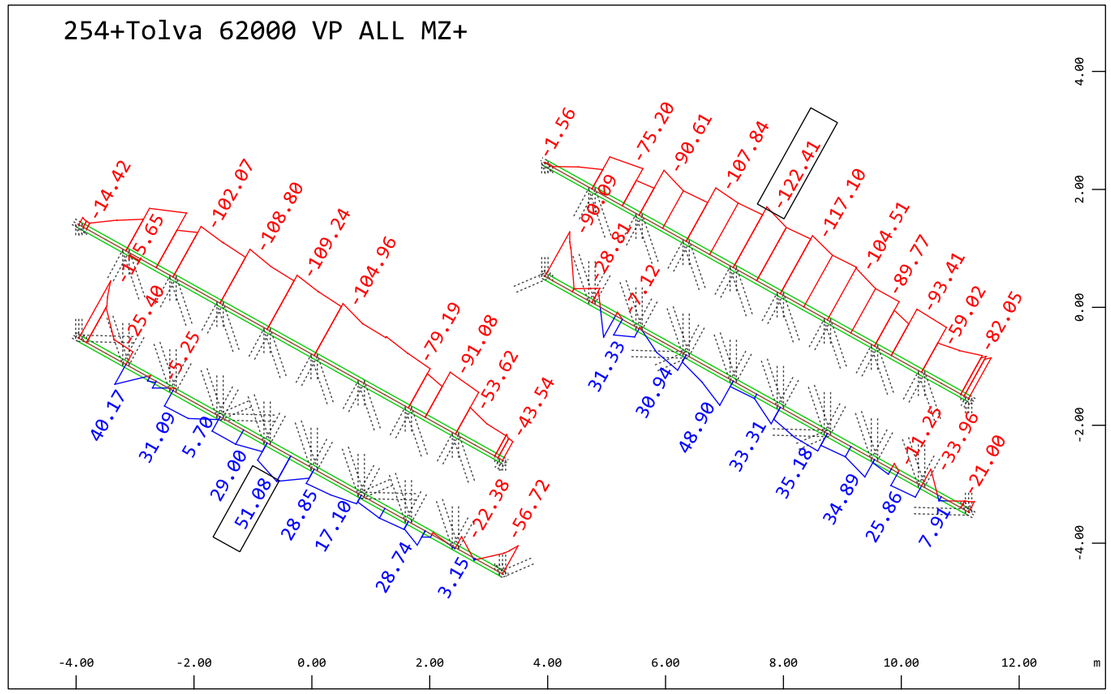



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1375 257+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-51.27) (Max=202.28)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

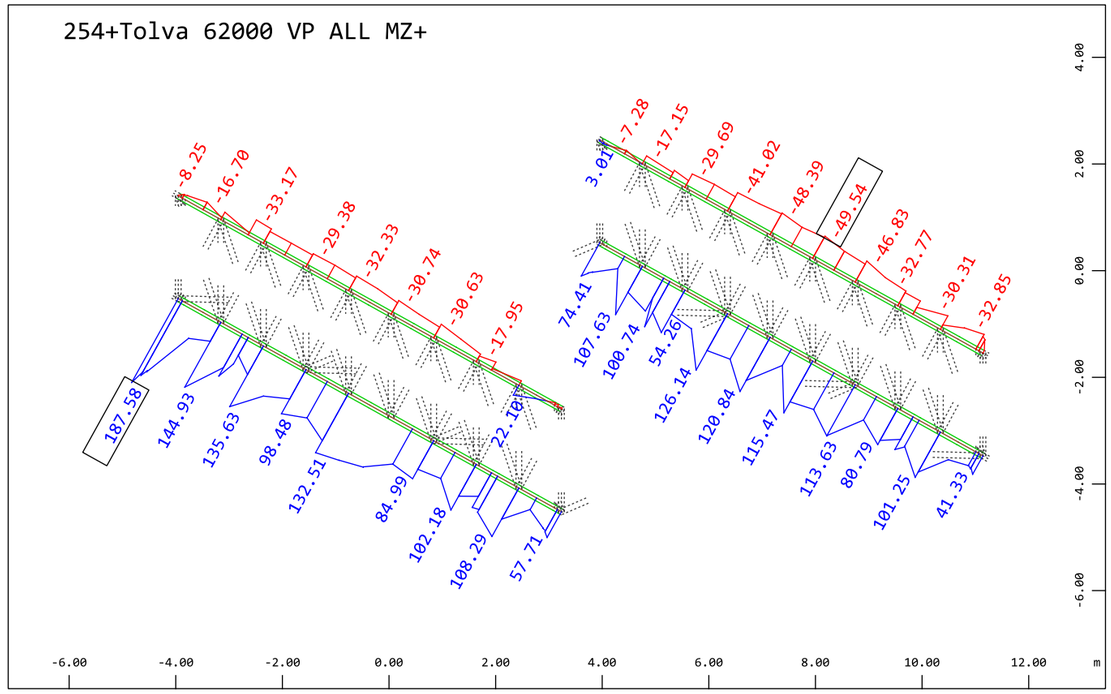


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1365 254+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-122.41) (Max=51.08)

M 1 : 104
X * 0.502
Y * 0.906
Z * 0.962

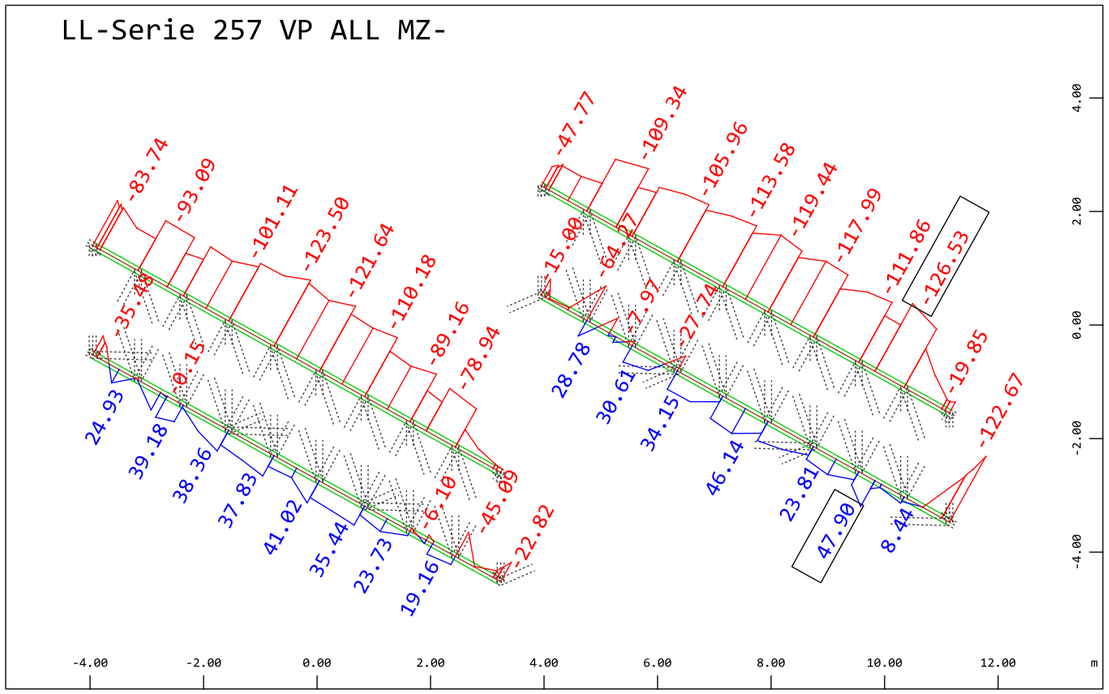



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1365 254+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-49.54) (Max=187.58)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

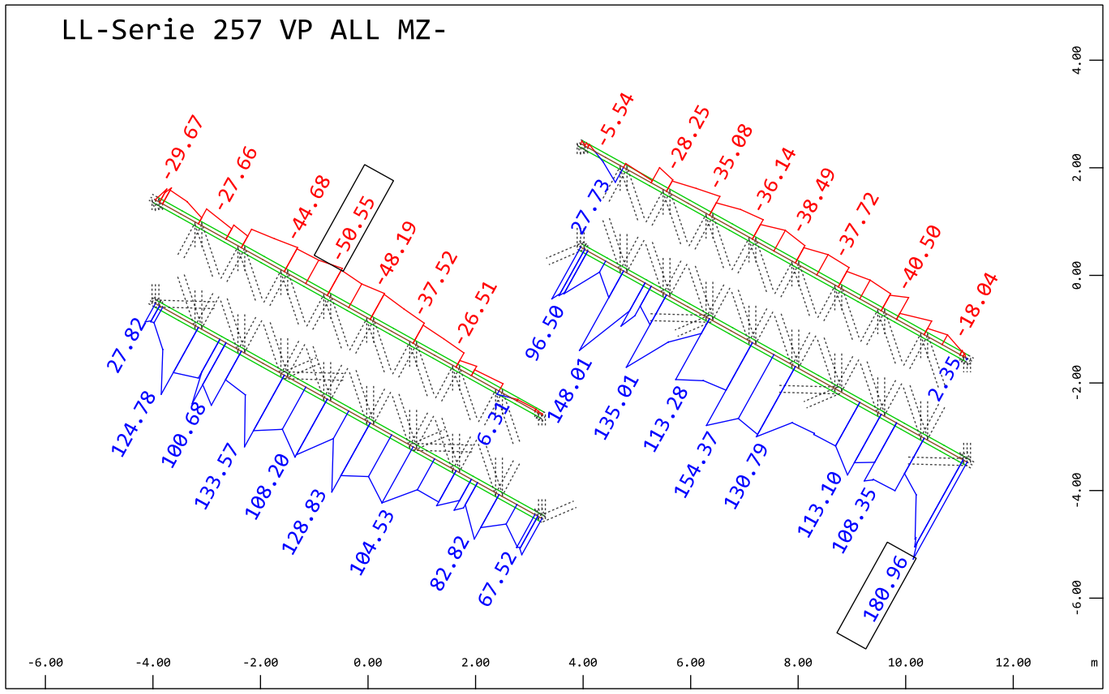
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1316 LL-Serie 257 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-126.53) (Max=47.90)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962



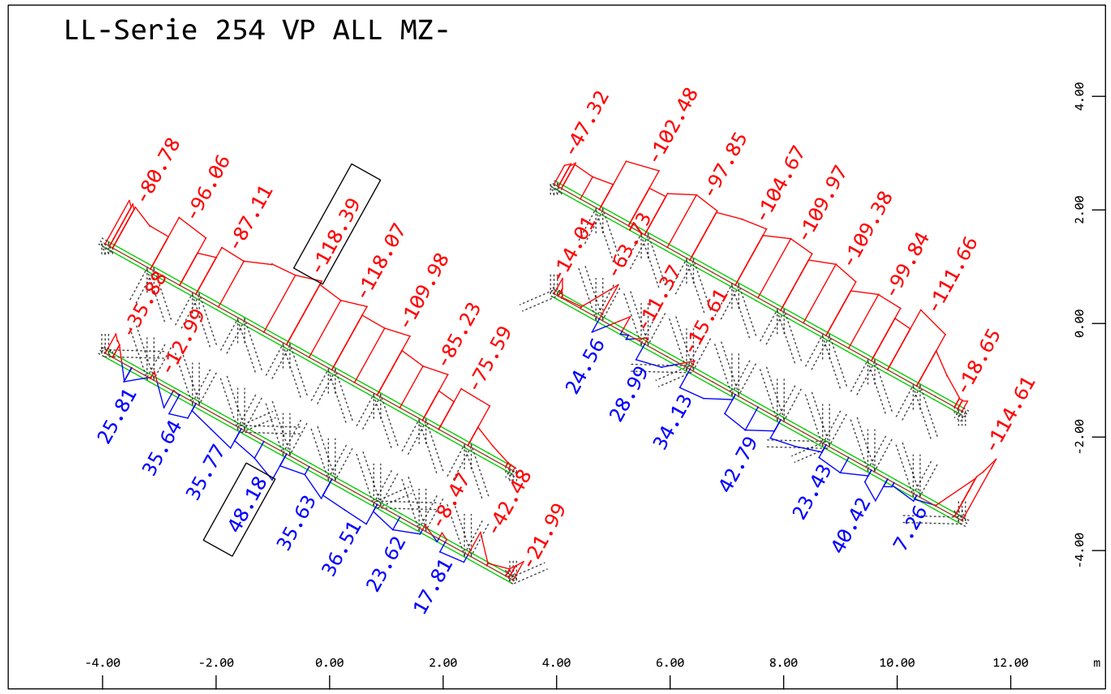

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1316 LL-Serie 257 VP ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-50.55) (Max=180.96)

M 1 : 114
X * 0.502
Y * 0.906
Z * 0.962

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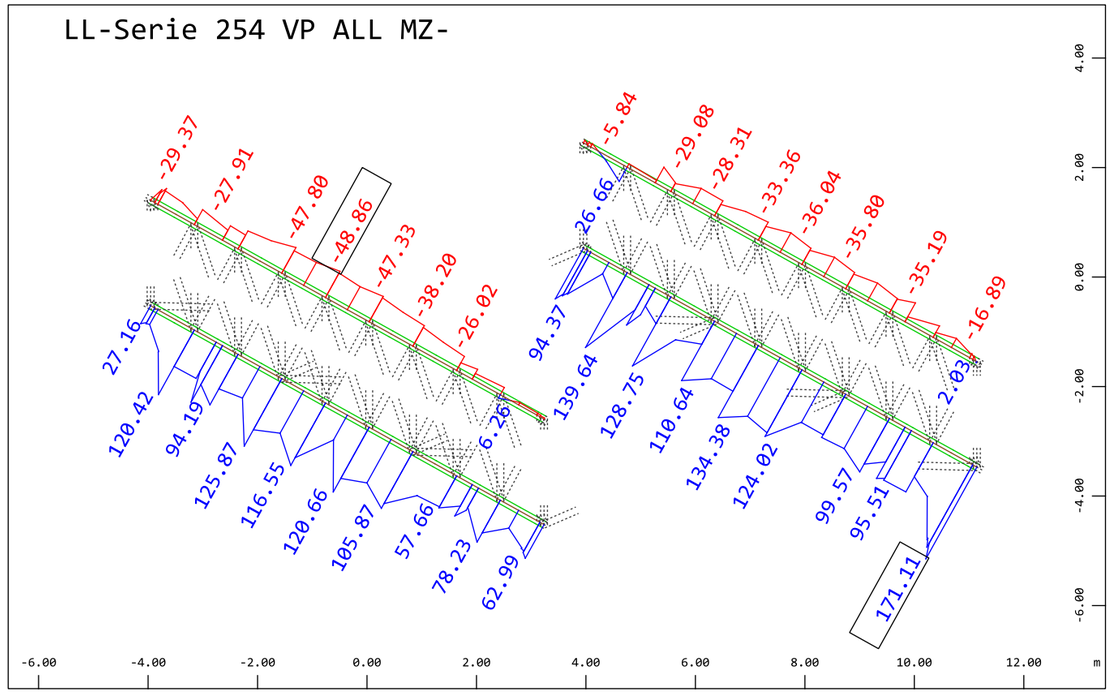


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1306 LL-Serie 254 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-118.39) (Max=48.18)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962

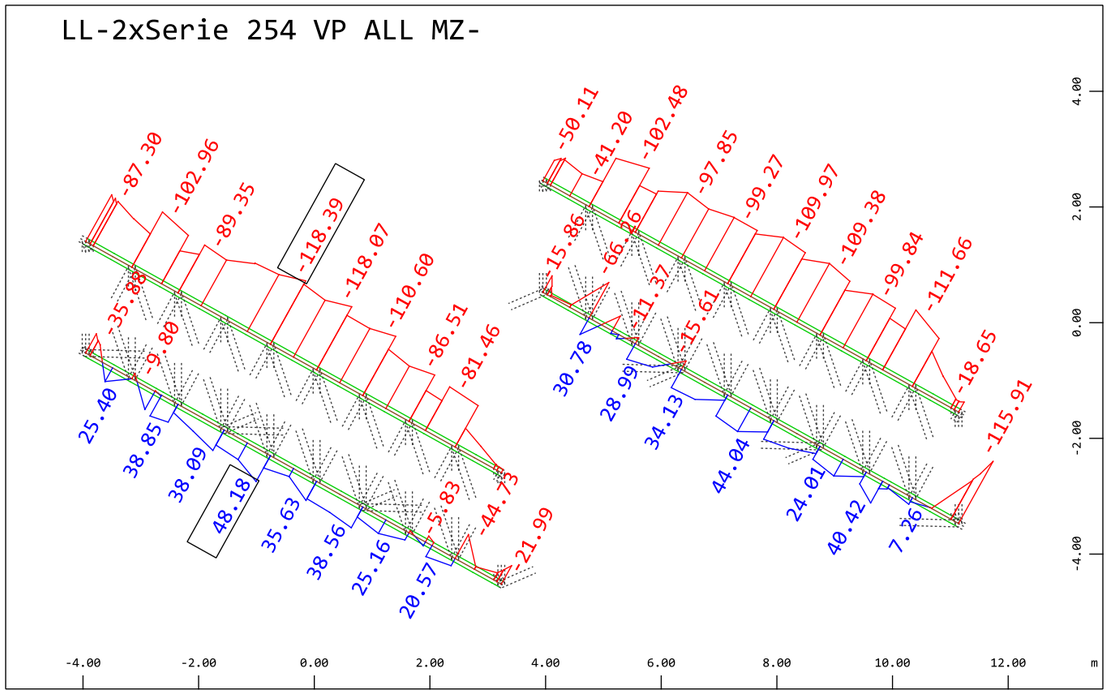



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1306 LL-Serie 254 VP ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-48.86) (Max=171.11)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

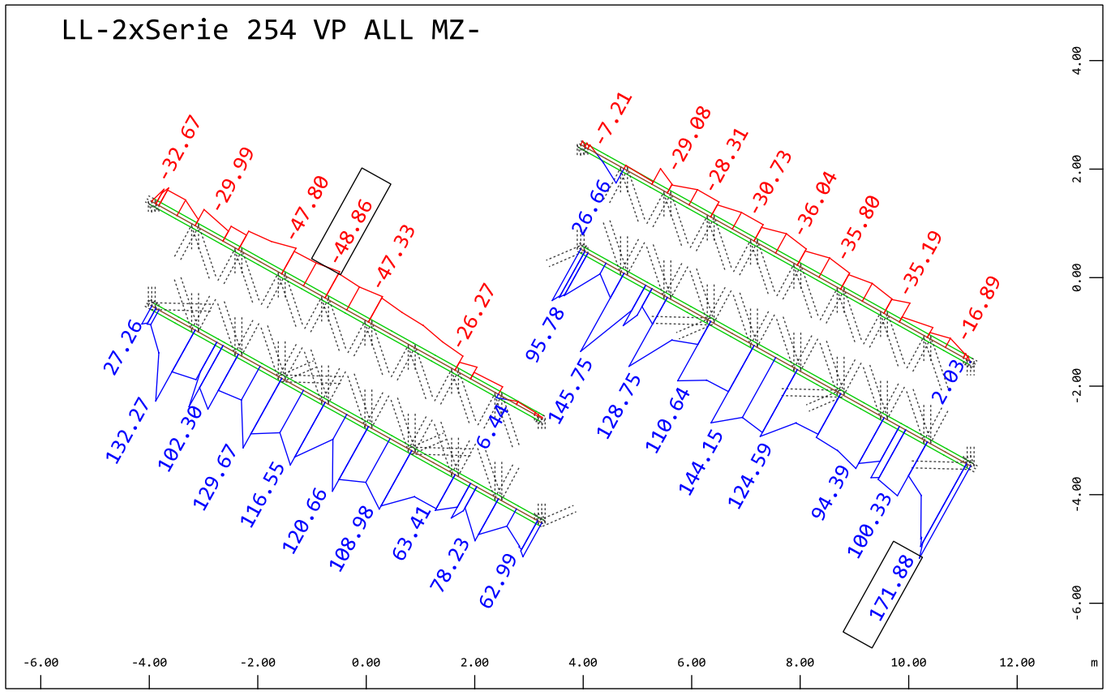
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1336 LL-2xSerie 254 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-118.39) (Max=48.18)

M 1 : 106
X * 0.502
Y * 0.906
Z * 0.962



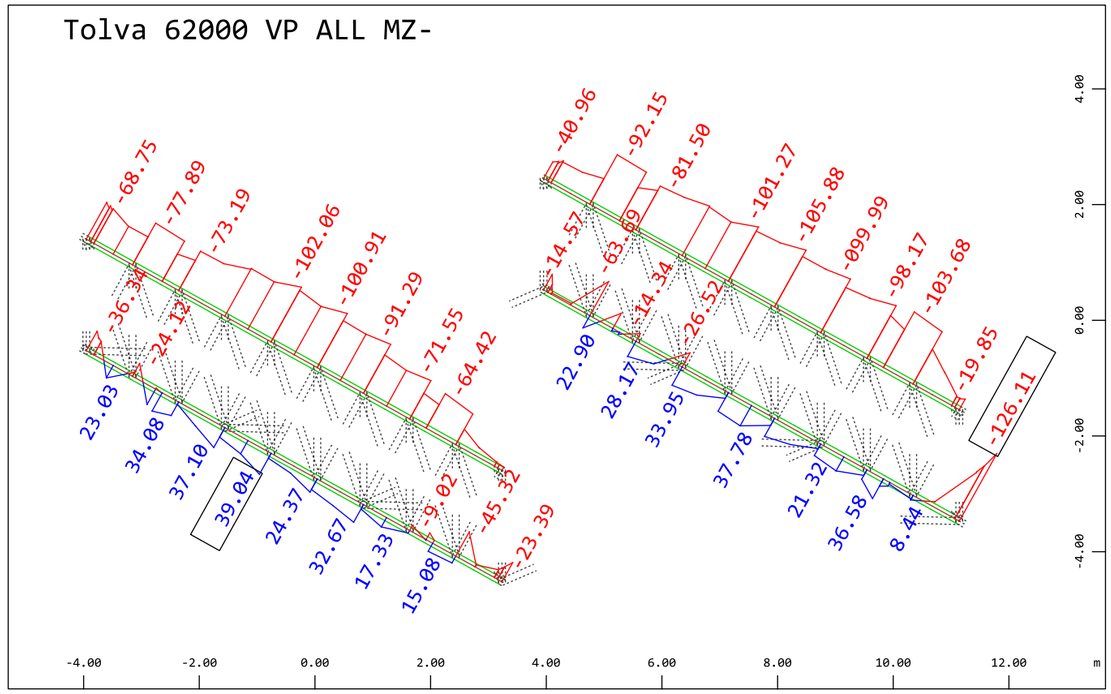

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1336 LL-2xSerie 254 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-48.86) (Max=171.88)

M 1 : 113
X * 0.502
Y * 0.906
Z * 0.962

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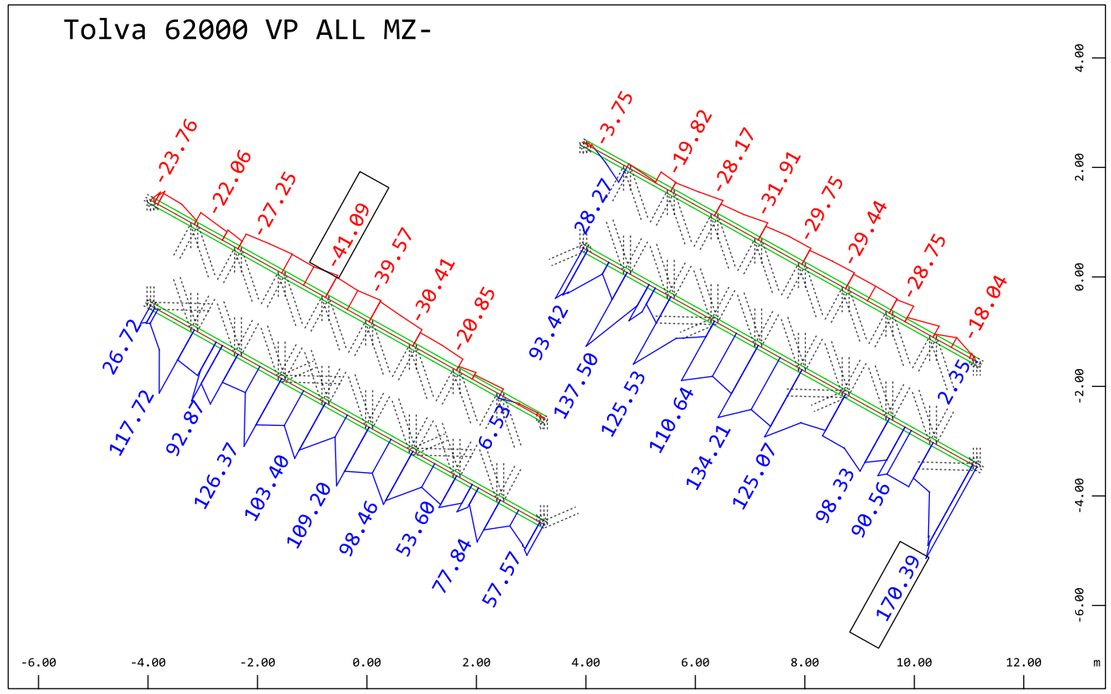


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1326 Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-126.11) (Max=39.04)

M 1 : 106
X * 0.502
Y * 0.906
Z * 0.962

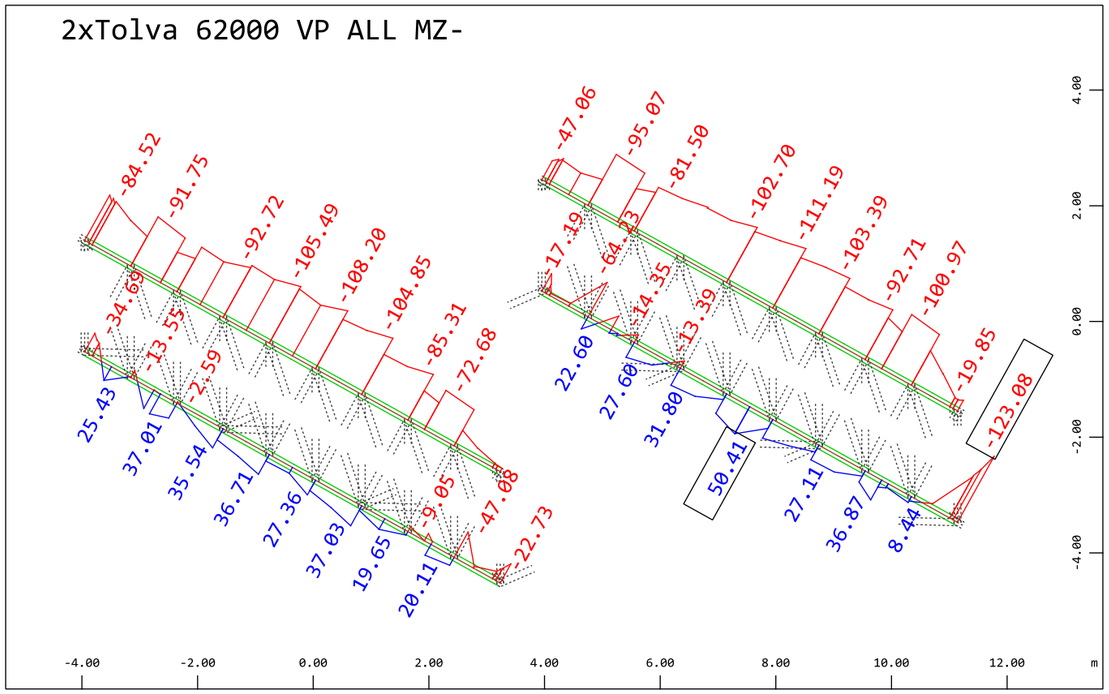



Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1326 Tolva 62000 VP ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-41.09) (Max=170.39)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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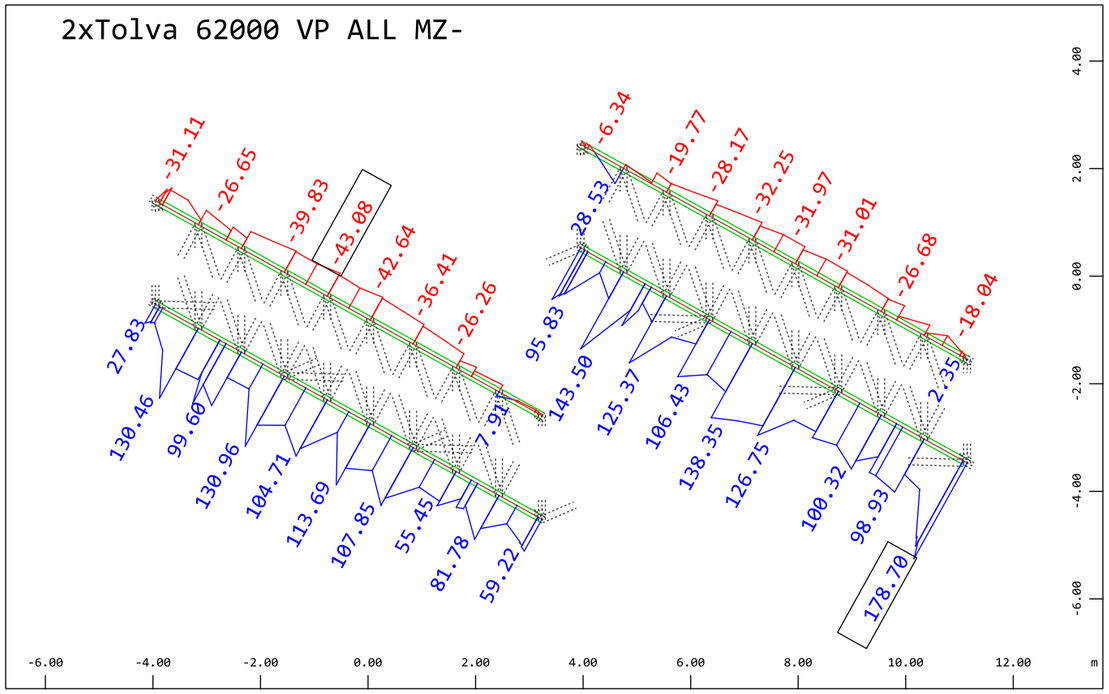
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1356 2xTolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-123.08) (Max=50.41)

M 1 : 106
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

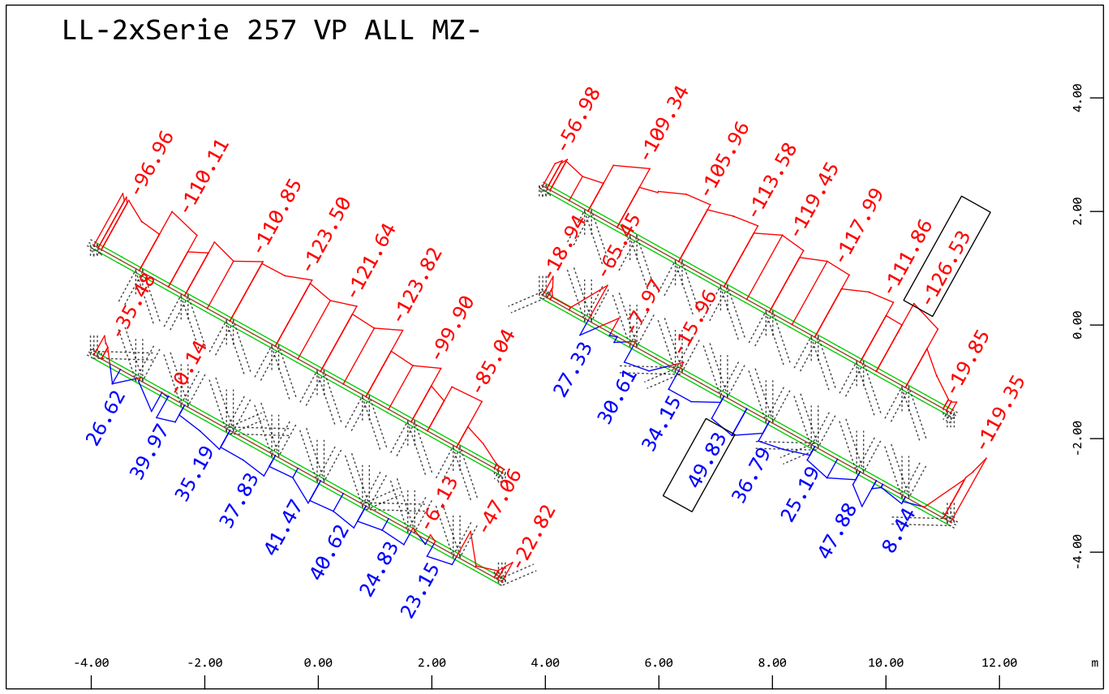
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1356 2xTolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-43.08) (Max=178.70)

M 1 : 114
X * 0.502
Y * 0.906
Z * 0.962

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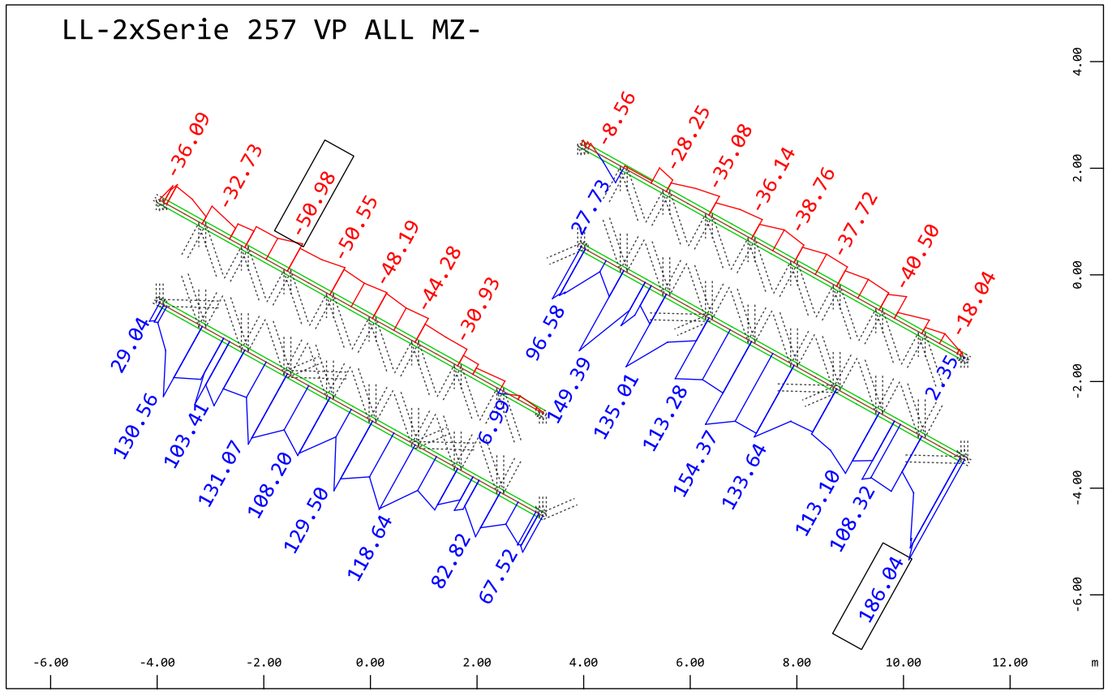
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1346 LL-2xSerie 257 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-126.53) (Max=49.83)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962



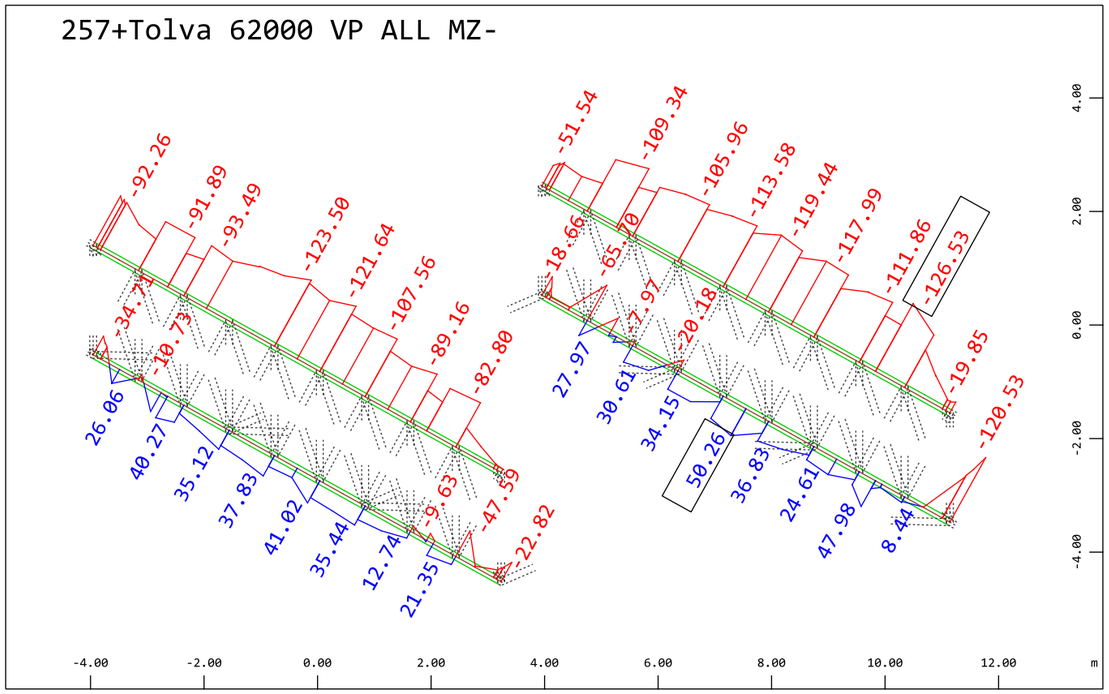

Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1346 LL-2xSerie 257 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-50.98) (Max=186.04)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

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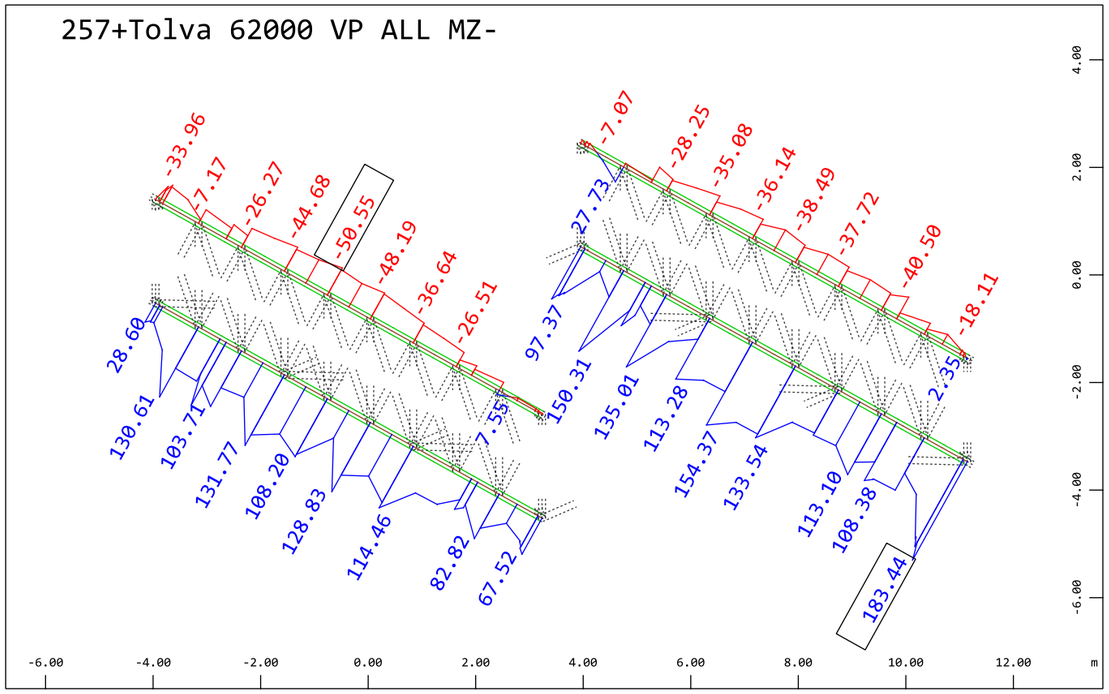
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1376 257+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-126.53) (Max=50.26)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

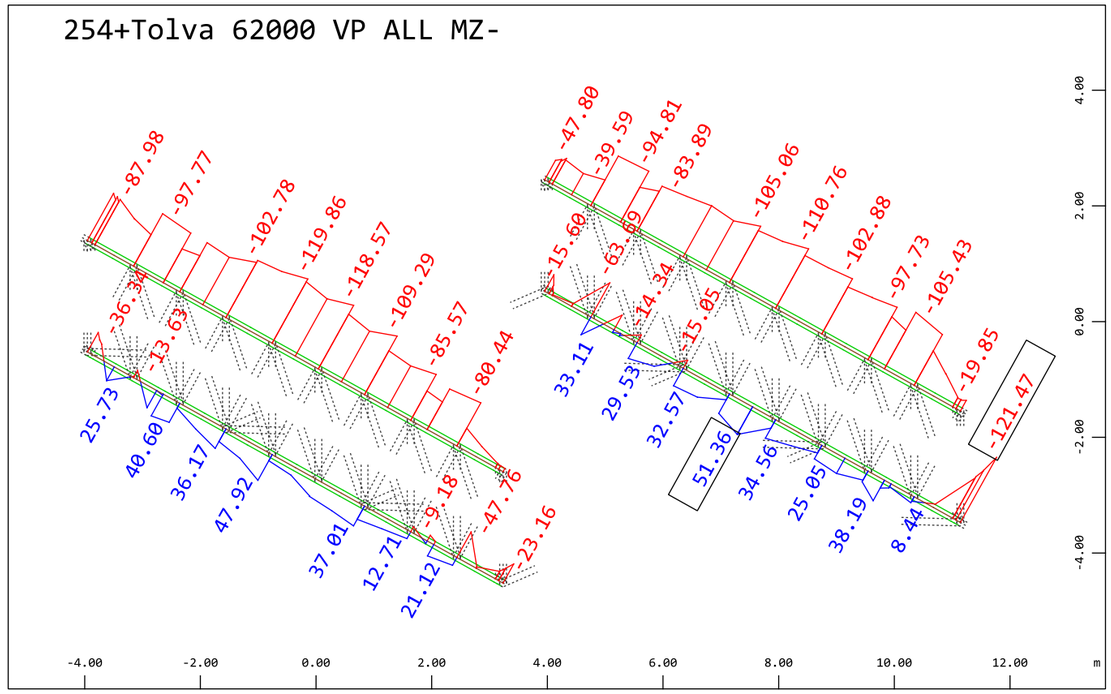
Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1376 257+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-50.55) (Max=183.44)

M 1 : 114
X * 0.502
Y * 0.906
Z * 0.962

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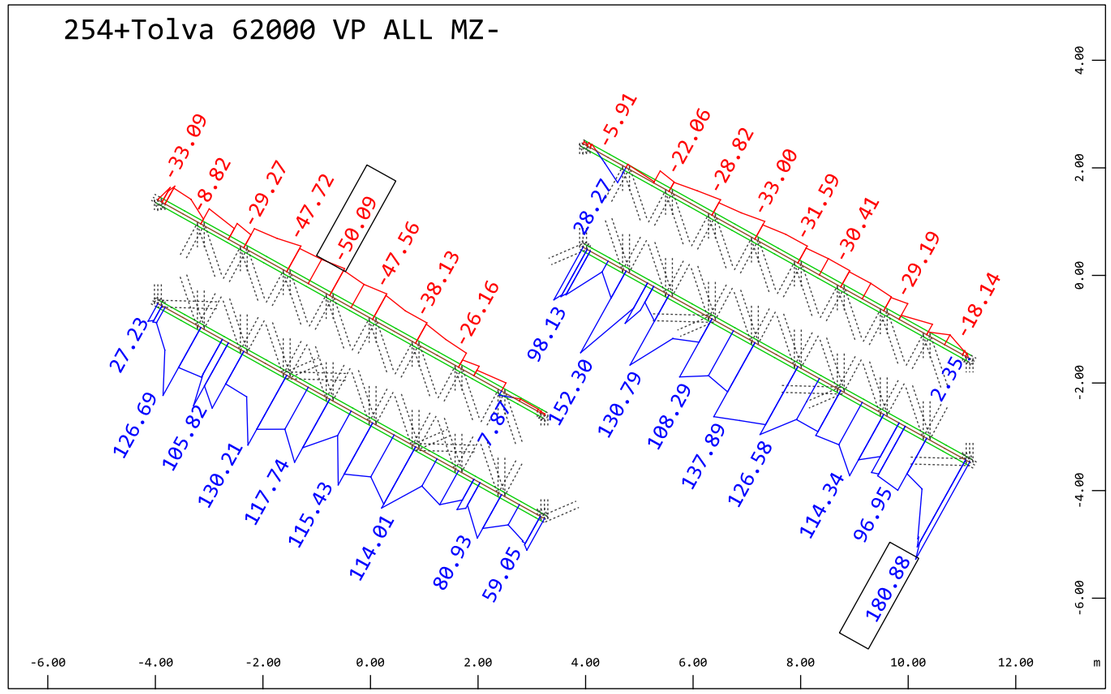
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum compression stress, Design Case 1366 254+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-121.47) (Max=51.36)

M 1 : 106
X * 0.502
Y * 0.906
Z * 0.962



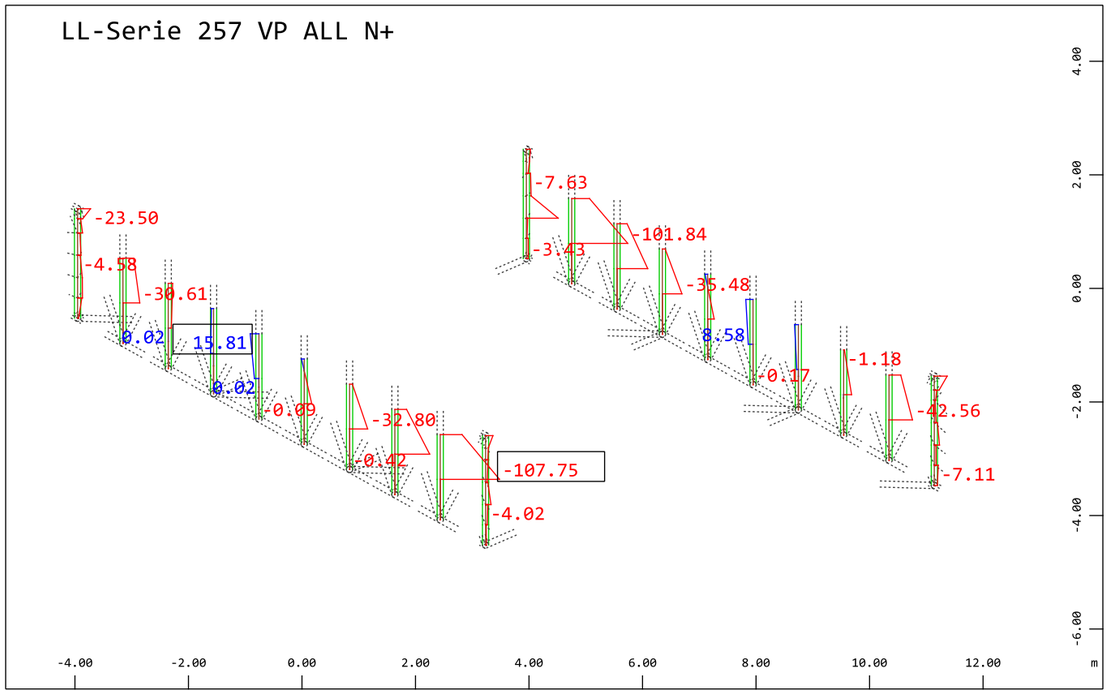

Z
Y
X

Sector of system Beam Elements Group 1 2 4 5
Beam Elements , Maximum tensile stress, Design Case 1366 254+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-50.09) (Max=180.88)

M 1 : 114
X * 0.502
Y * 0.906
Z * 0.962

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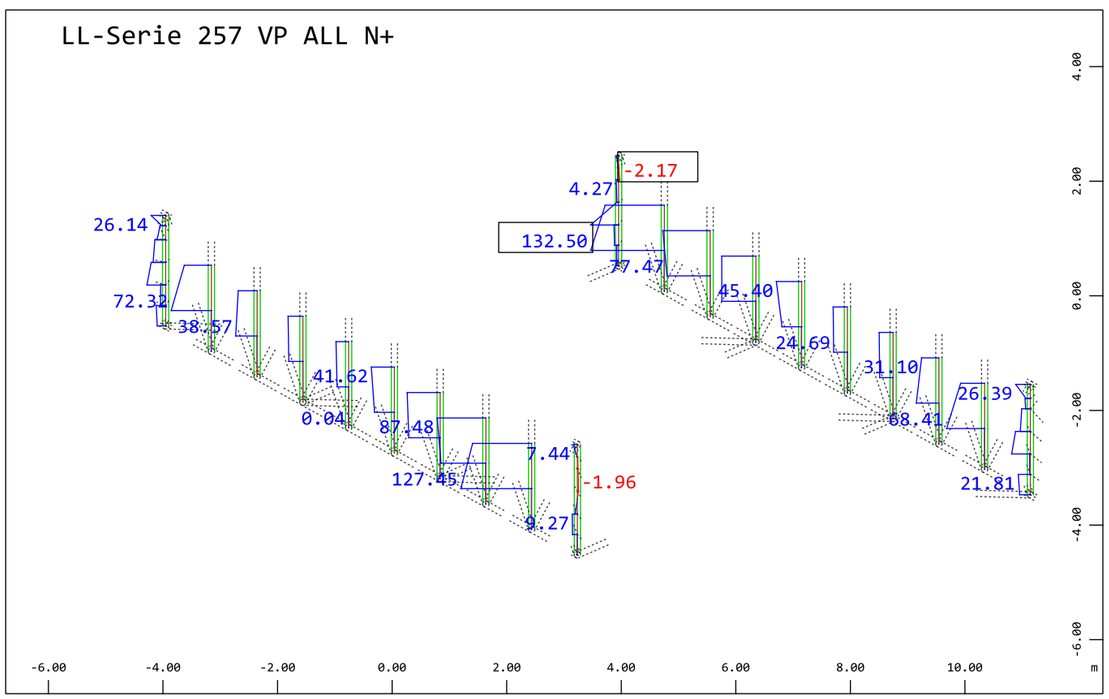
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1311 LL-Serie 257 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-107.75) (Max=15.81)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

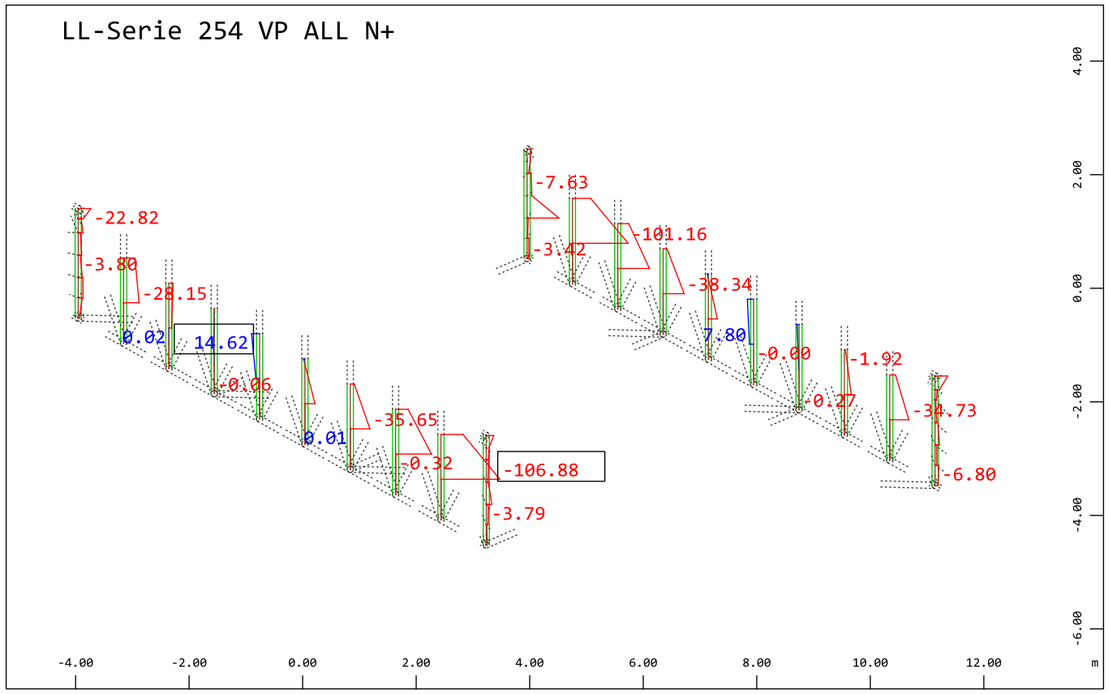
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1311 LL-Serie 257 VP ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-2.17) (Max=132.50)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

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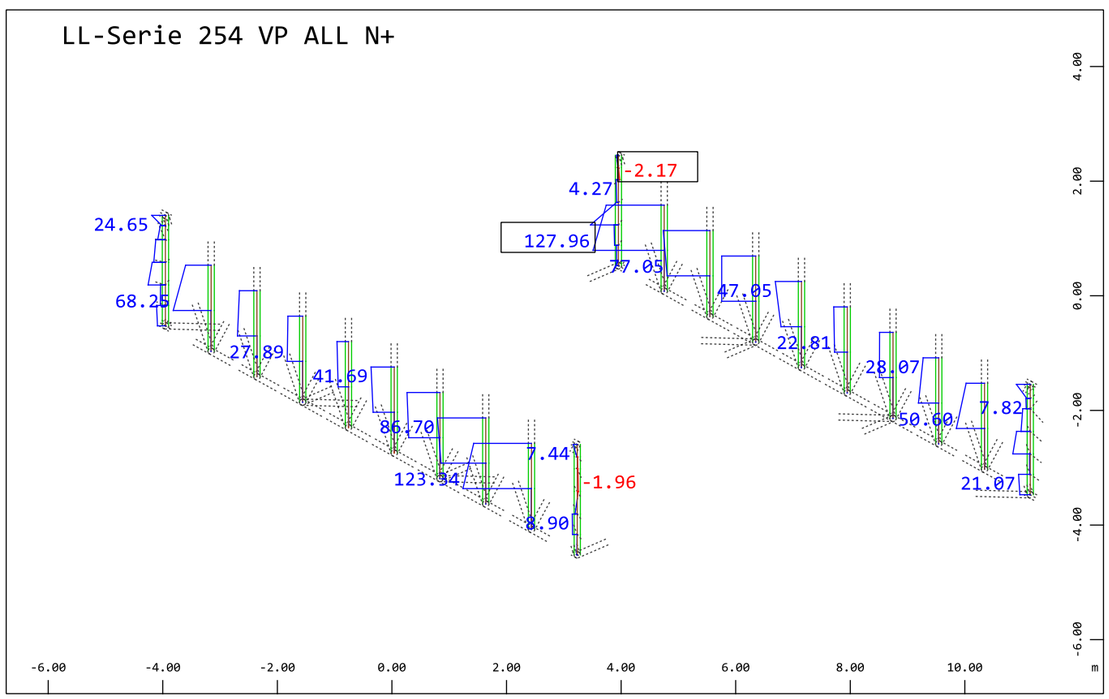
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1301 LL-Serie 254 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-106.88) (Max=14.62)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962



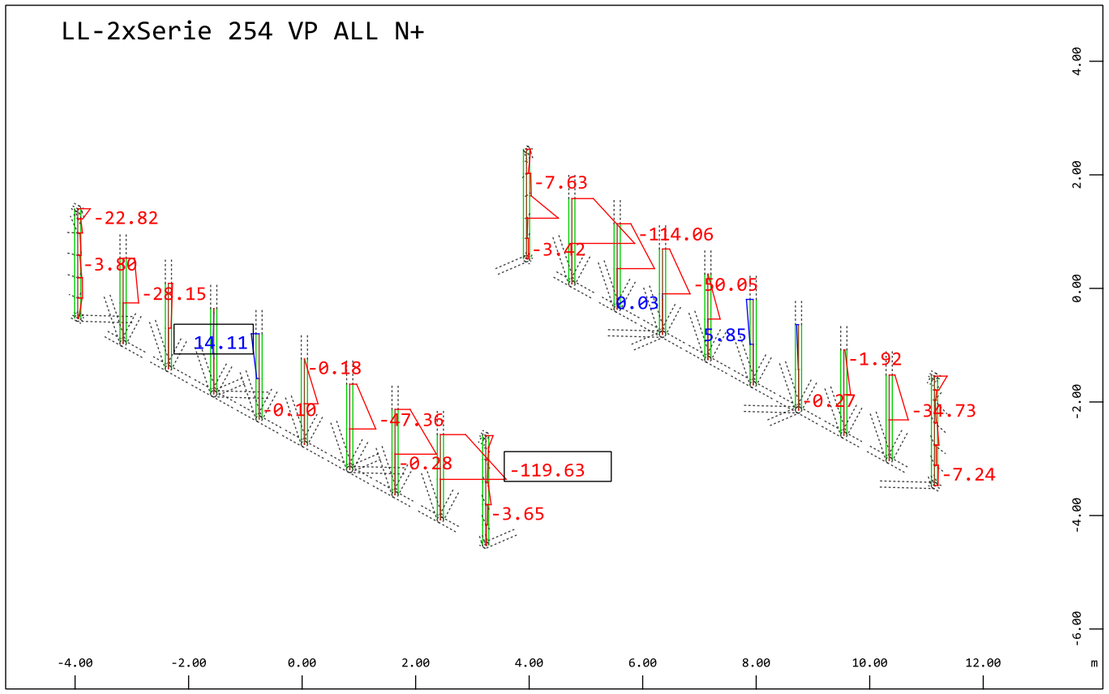

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1301 LL-Serie 254 VP ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-2.17) (Max=127.96)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

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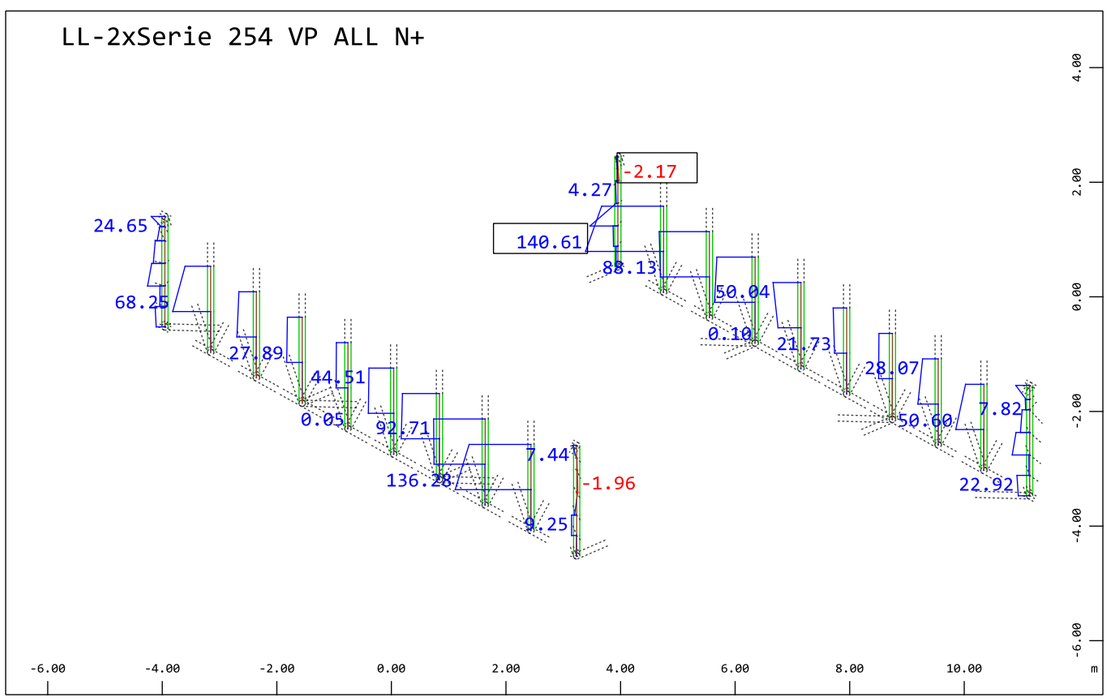
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1331 LL-2xSerie 254 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-119.63) (Max=14.11)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

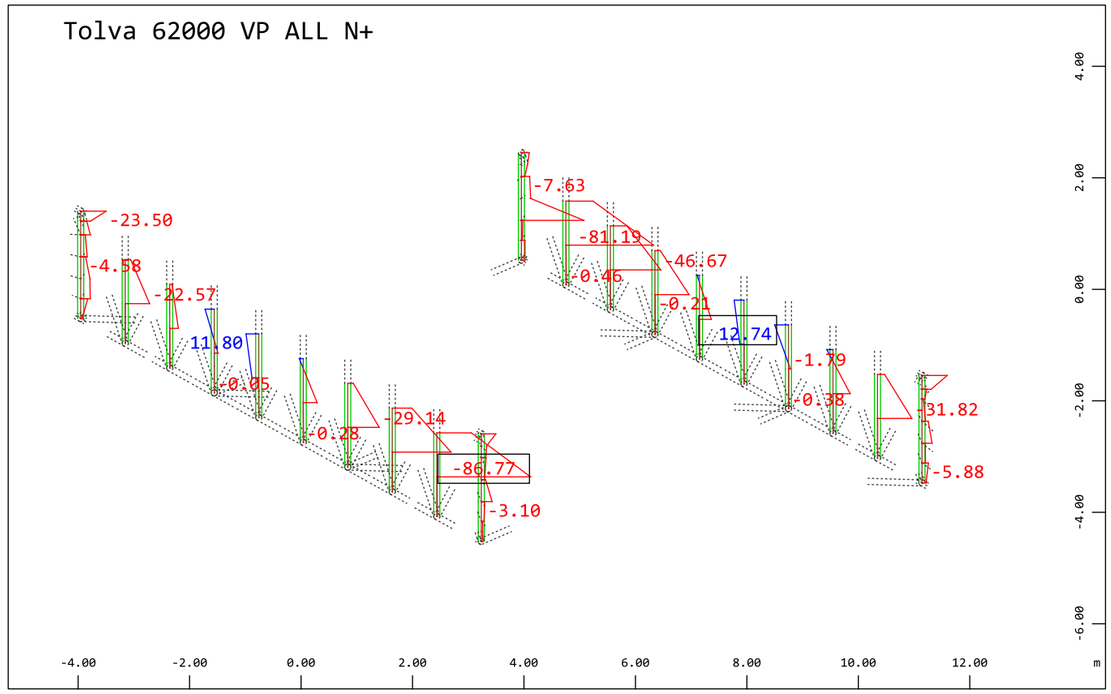
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1331 LL-2xSerie 254 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-2.17) (Max=140.61)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

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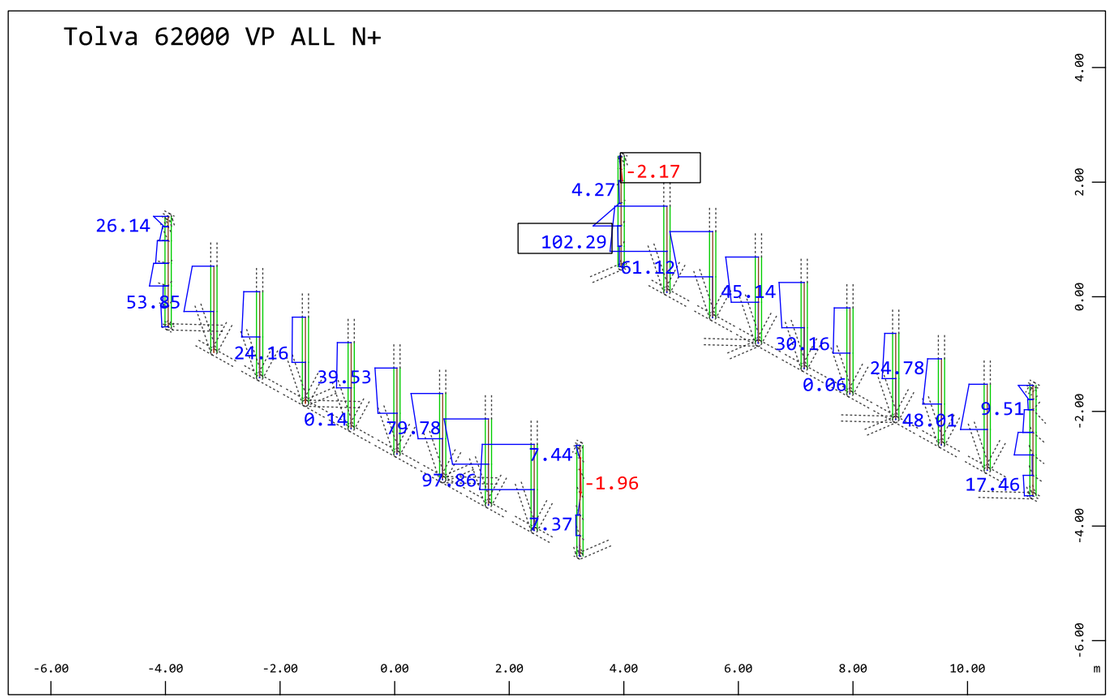
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1321 Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-86.77) (Max=12.74)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962



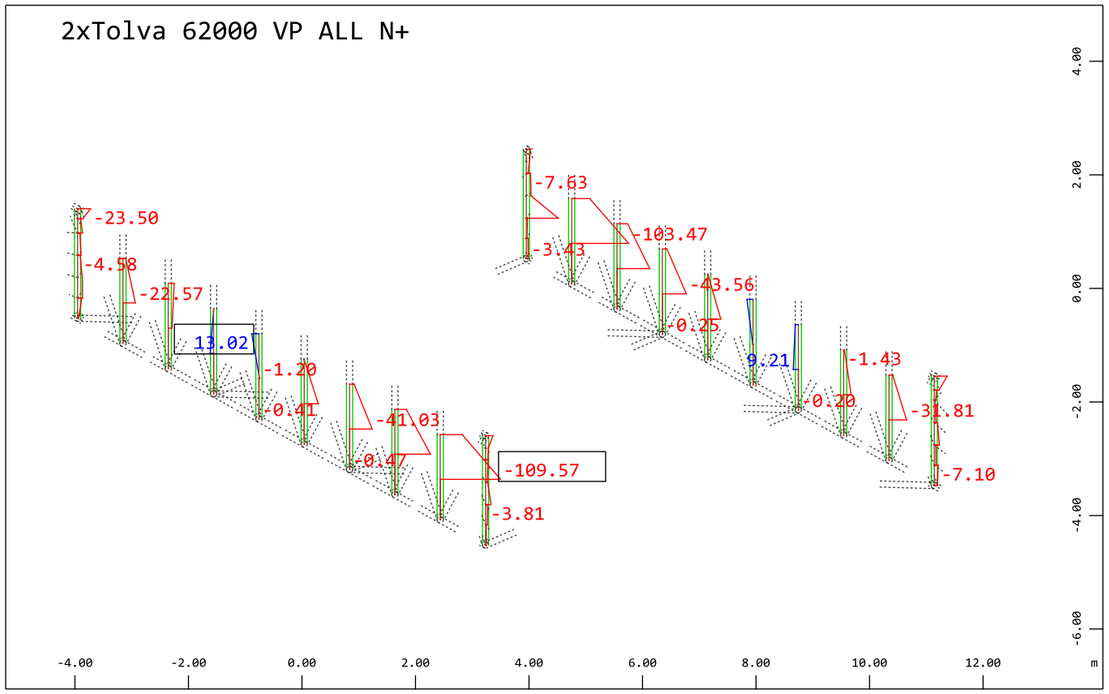

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1321 Tolva 62000 VP ALL N+, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-2.17) (Max=102.29)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

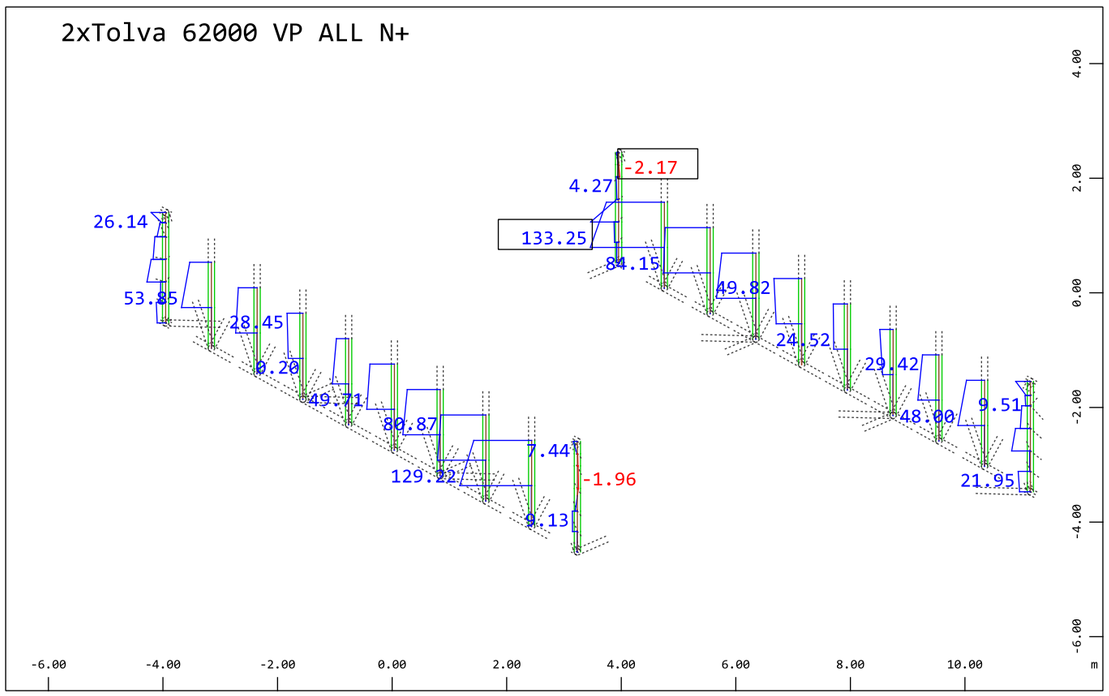
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Pont Carretera Vic
Tensiones




Z
Y
X
Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1351 2xTolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-109.57) (Max=13.02)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962



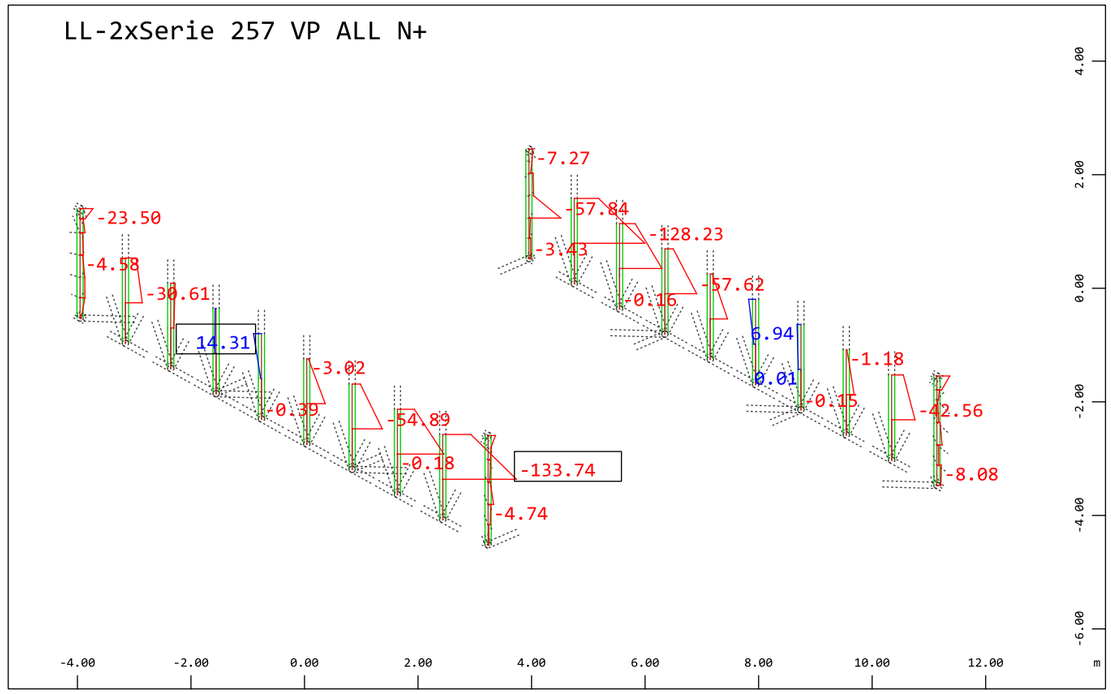

Z
Y
X
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1351 2xTolva 62000 VP ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-2.17) (Max=133.25)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

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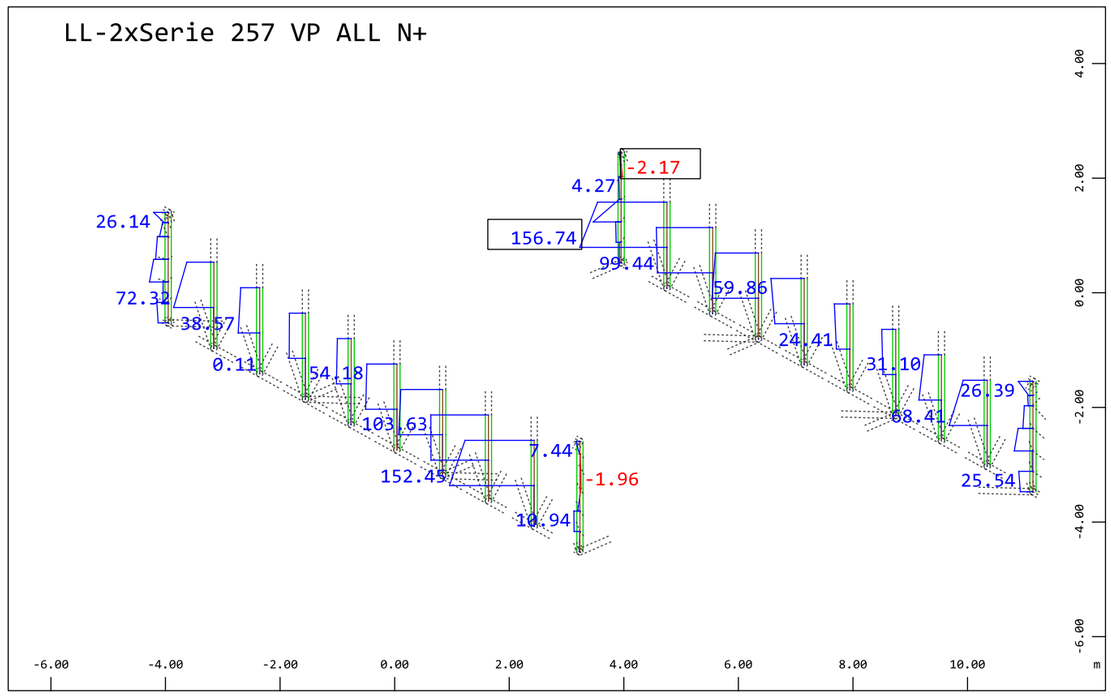


Pont Carretera Vic
Tensiones




Z
Y
X
Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1341 LL-2xSerie 257 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-133.74) (Max=14.31)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962

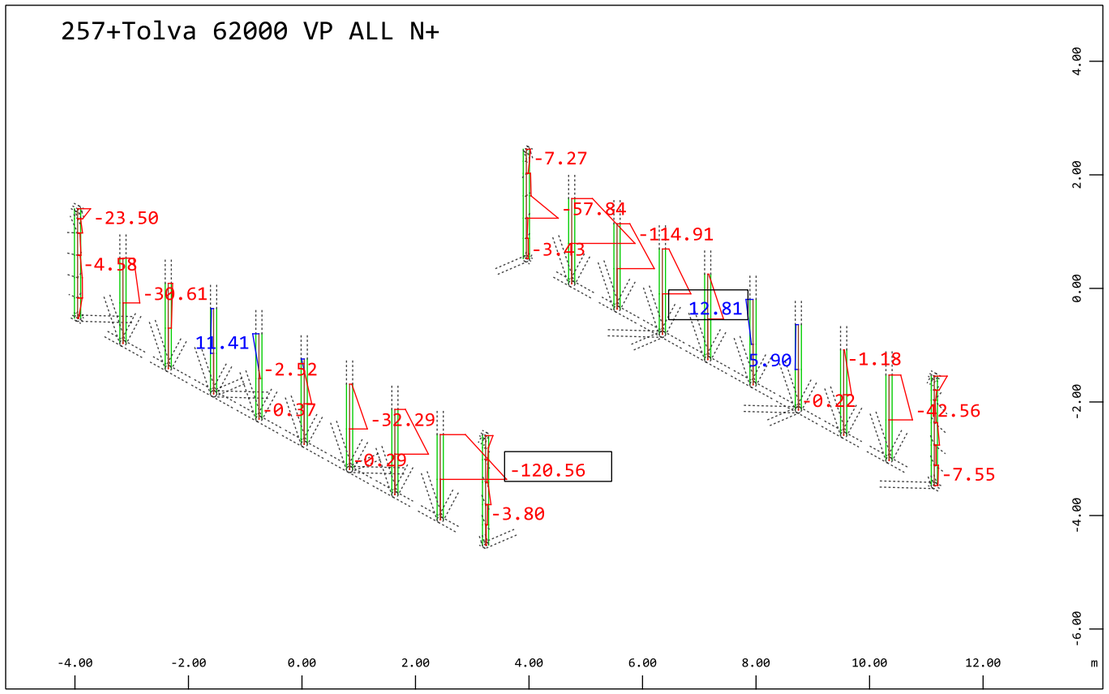



Z
Y
X
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1341 LL-2xSerie 257 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-2.17) (Max=156.74)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

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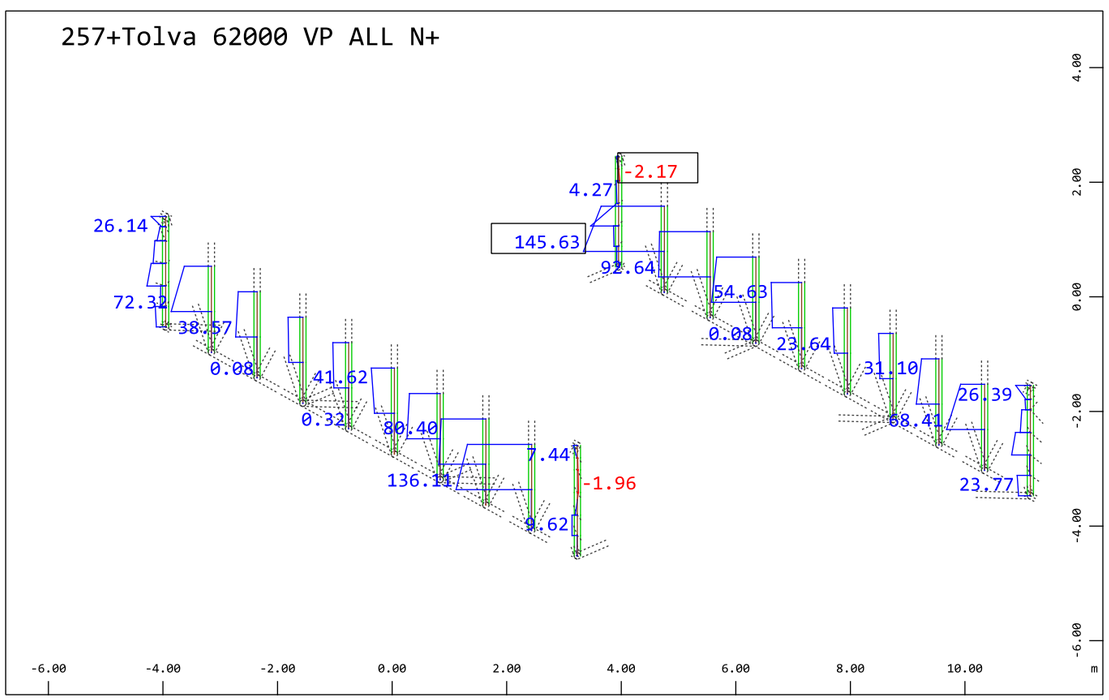
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1371 257+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-120.56) (Max=12.81)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

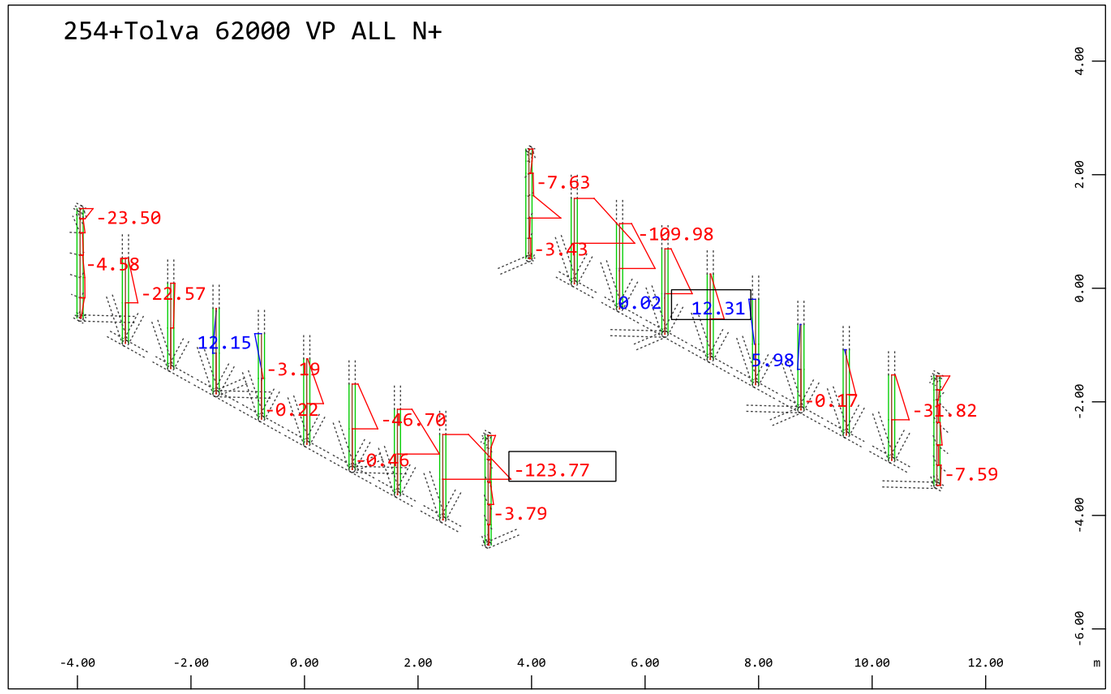
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1371 257+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-2.17) (Max=145.63)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

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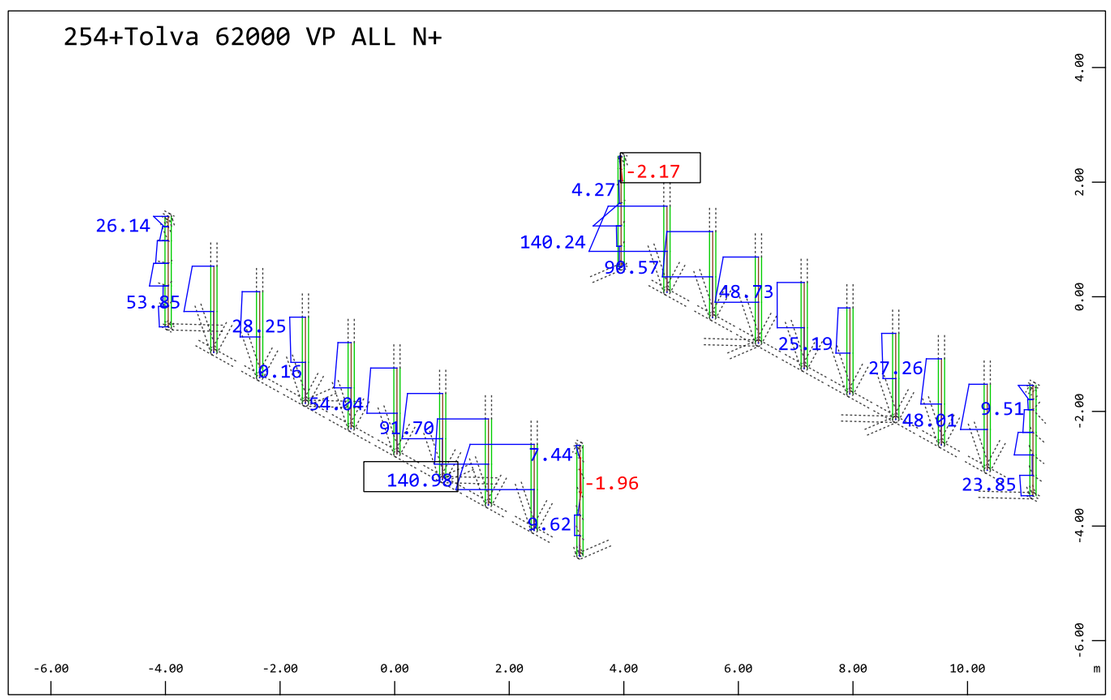
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1361 254+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-123.77) (Max=12.31)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962



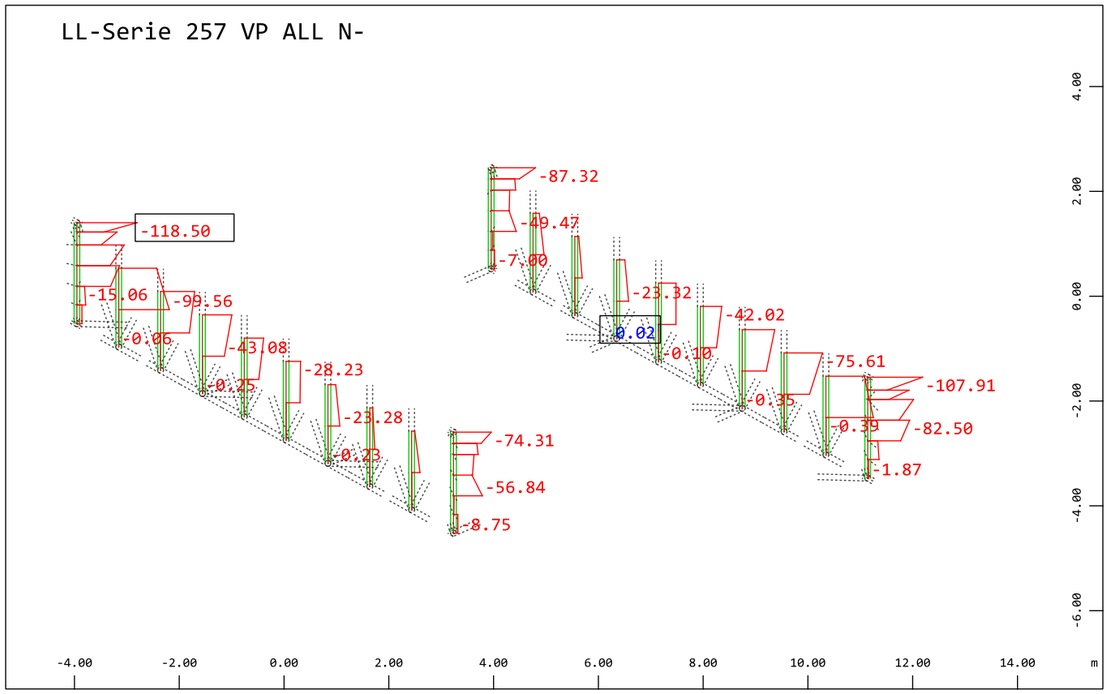

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1361 254+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-2.17) (Max=140.98)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

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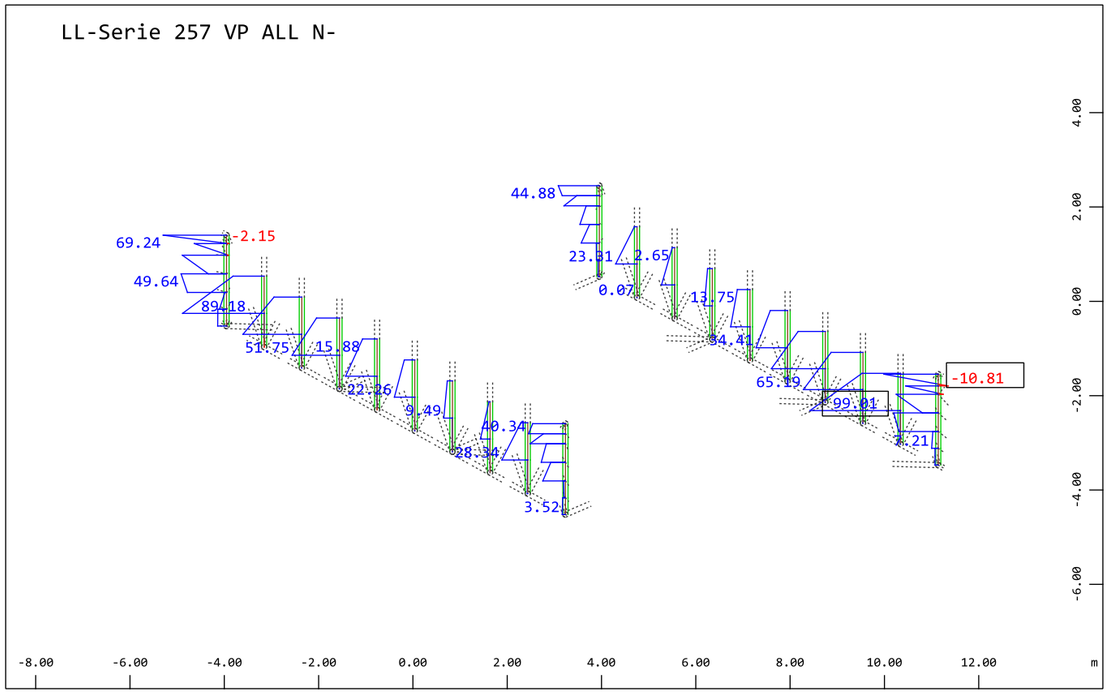
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1312 LL-Serie 257 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-118.50) (Max=0.02)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

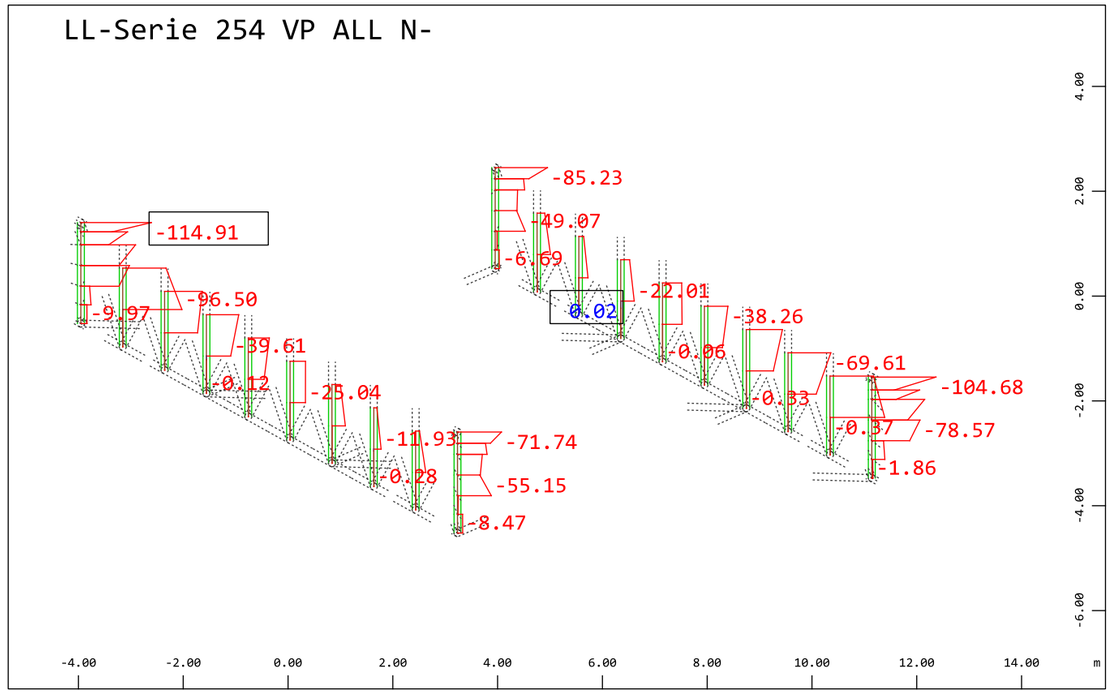
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1312 LL-Serie 257 VP ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-10.81) (Max=99.01)

M 1 : 130
X * 0.502
Y * 0.906
Z * 0.962

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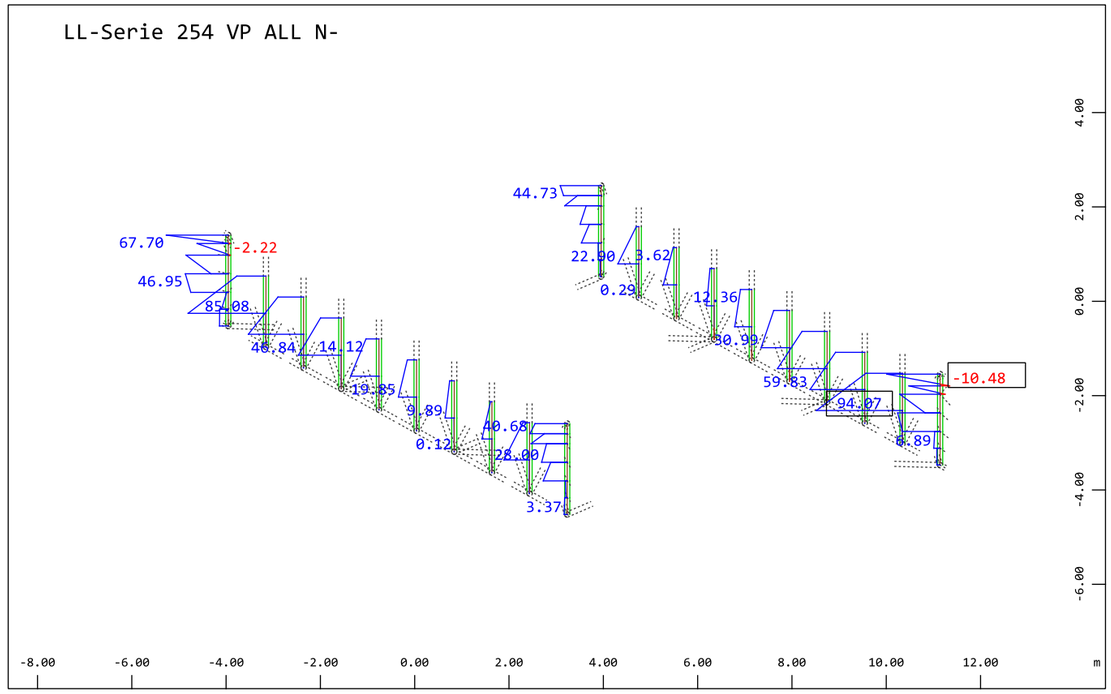
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1302 LL-Serie 254 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-114.91) (Max=0.02)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962



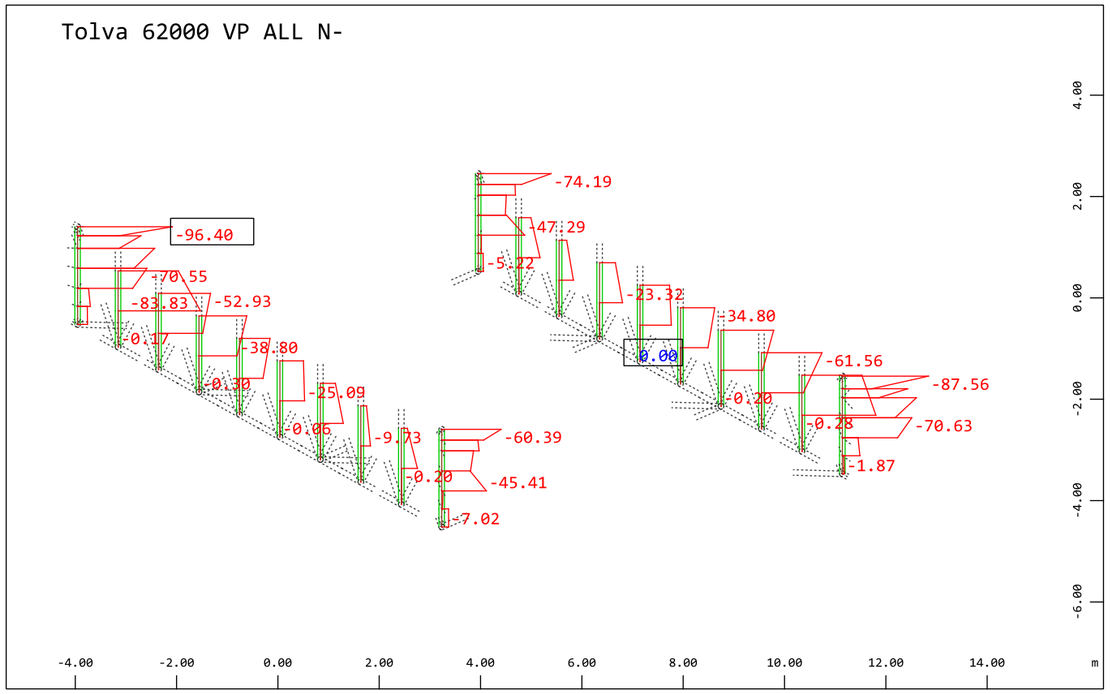

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1302 LL-Serie 254 VP ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-10.48) (Max=94.07)

M 1 : 130
X * 0.502
Y * 0.906
Z * 0.962

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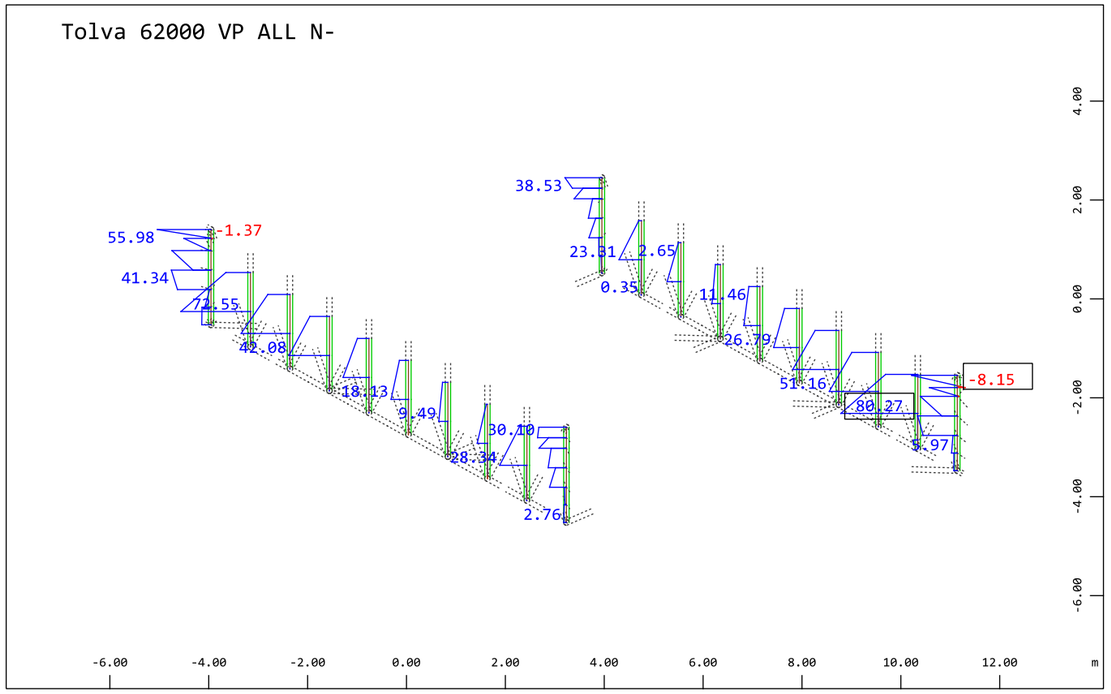
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1322 Tolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-96.40) (Max=0.00)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

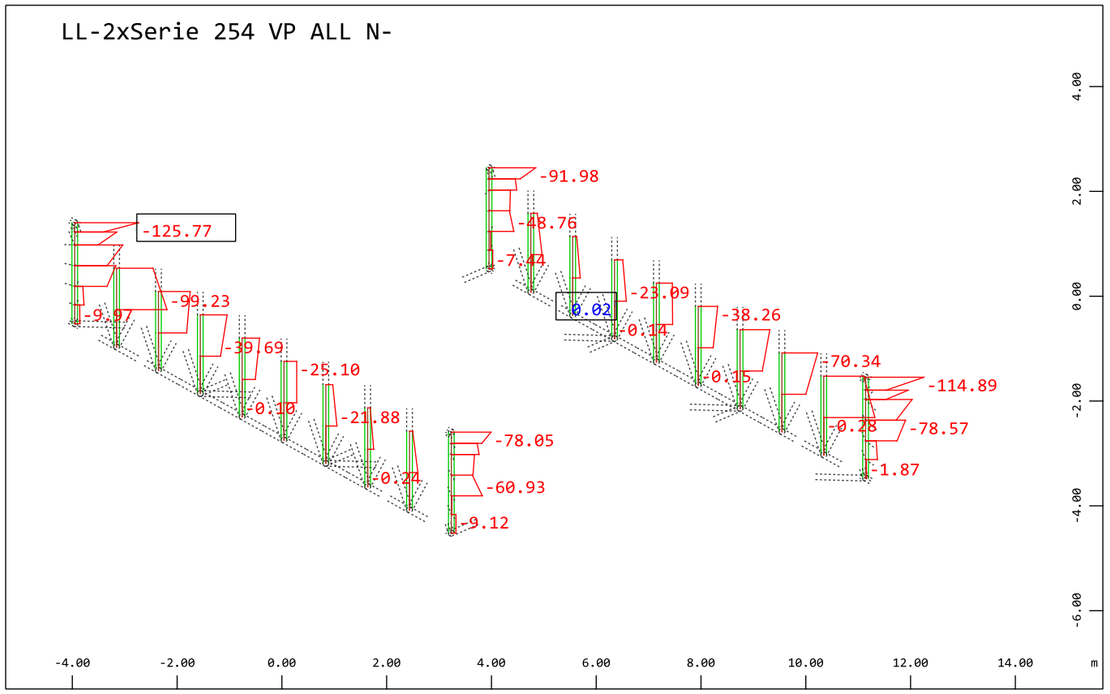
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1322 Tolva 62000 VP ALL N-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-8.15) (Max=80.27)

M 1 : 124
X * 0.502
Y * 0.906
Z * 0.962

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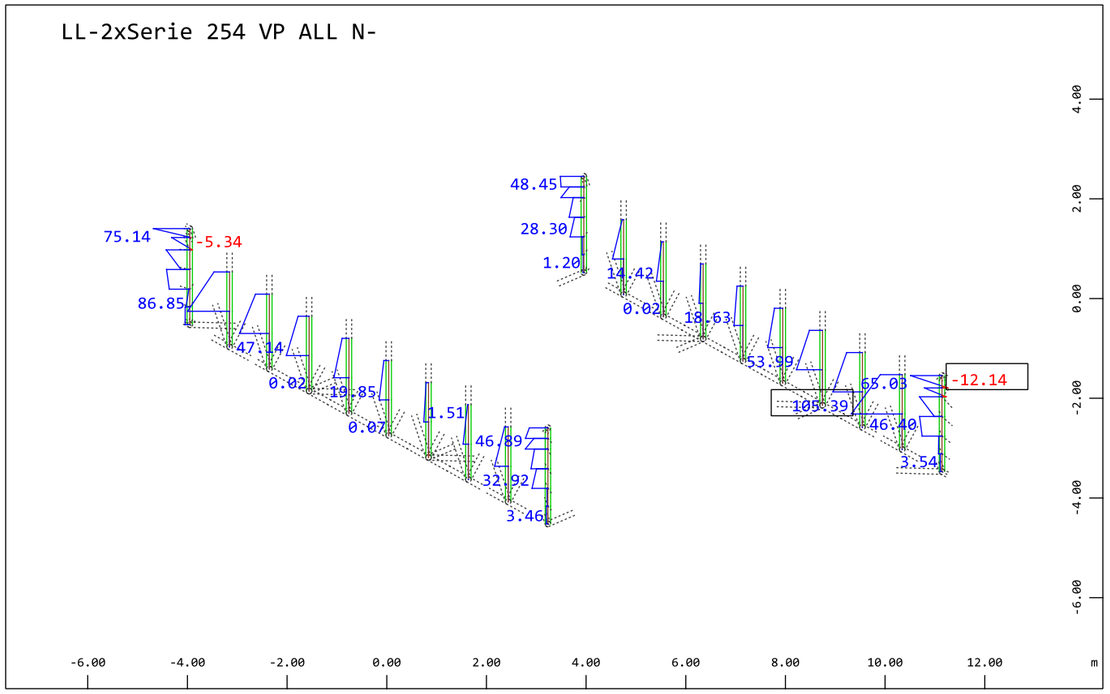
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1332 LL-2xSerie 254 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-125.77) (Max=0.02)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962



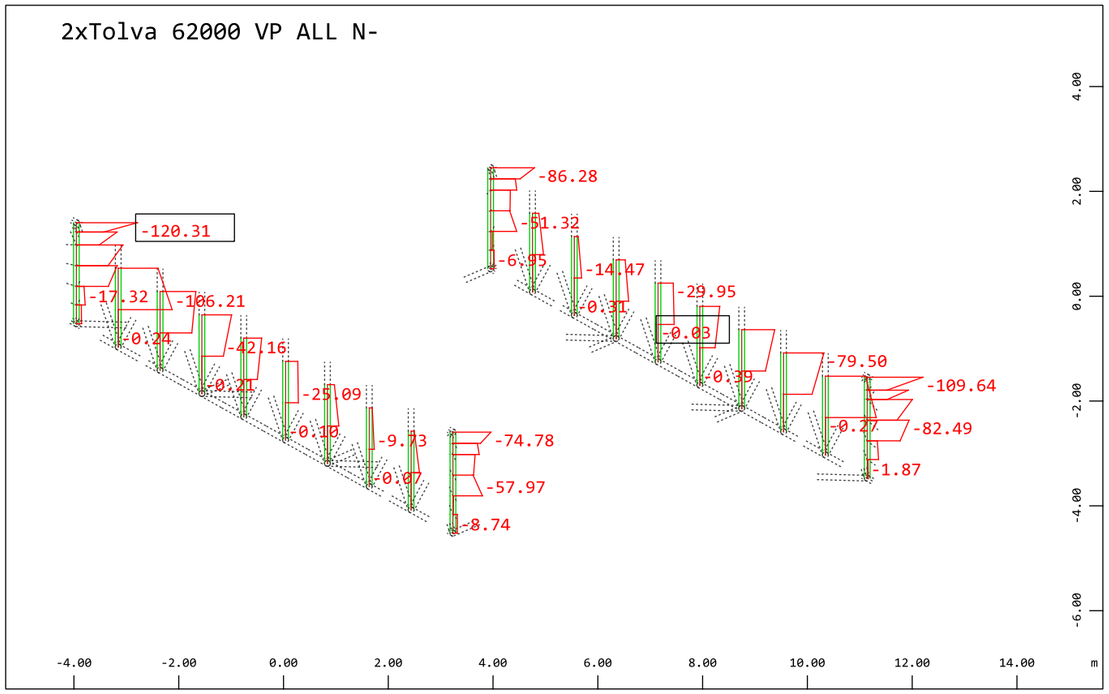

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1332 LL-2xSerie 254 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.14) (Max=105.39)

M 1 : 123
X * 0.502
Y * 0.906
Z * 0.962

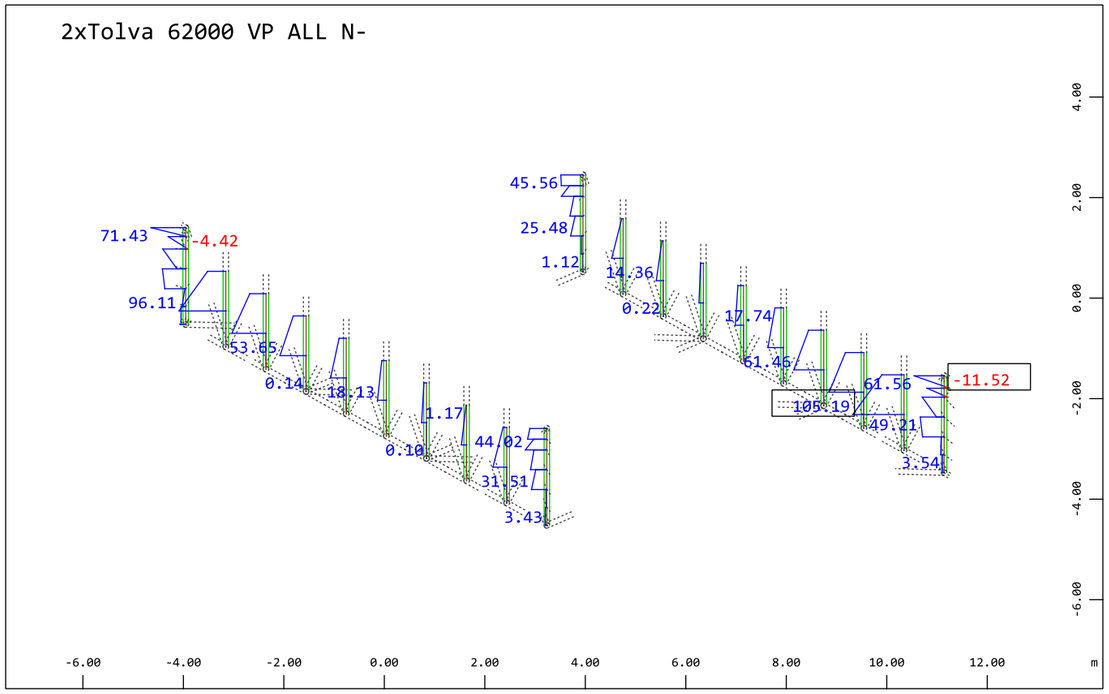
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Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1352 2xTolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-120.31) (Max=-0.03)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962



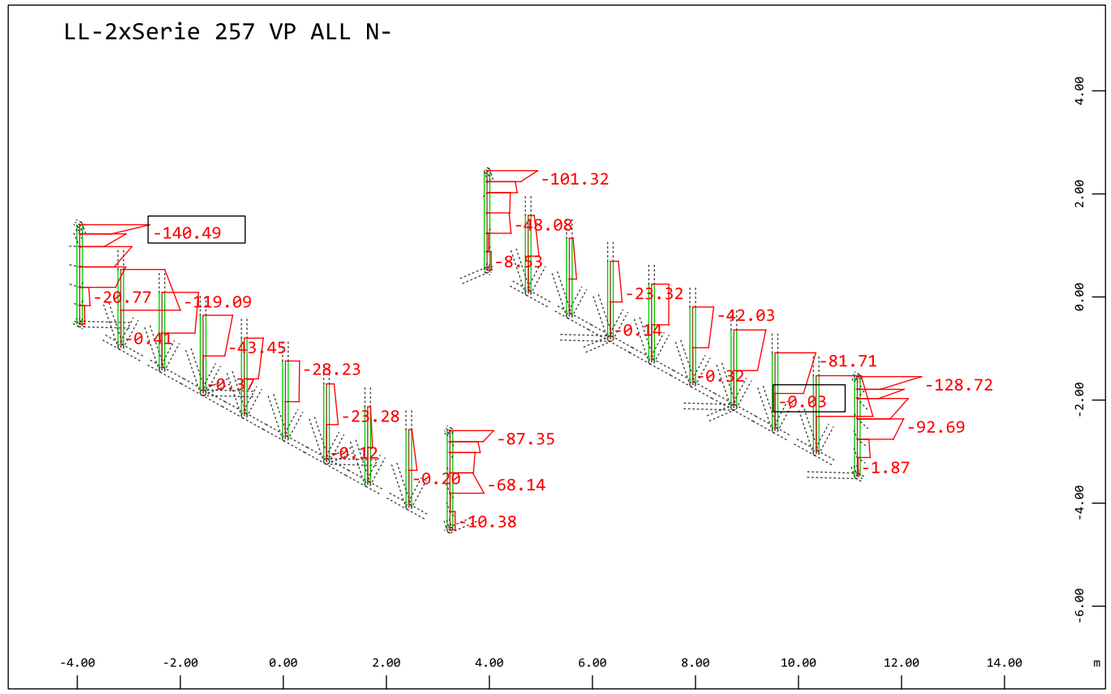

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1352 2xTolva 62000 VP ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-11.52) (Max=105.19)

M 1 : 122
X * 0.502
Y * 0.906
Z * 0.962

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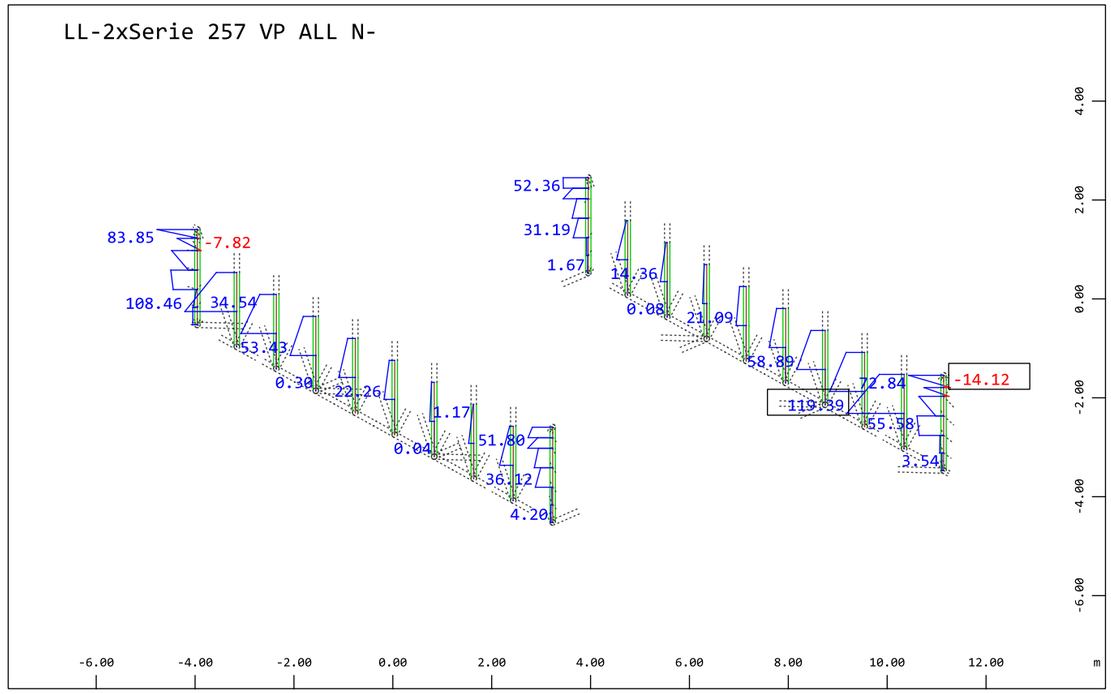


Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1342 LL-2xSerie 257 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-140.49) (Max=-0.03)

M 1 : 119
X * 0.502
Y * 0.906
Z * 0.962

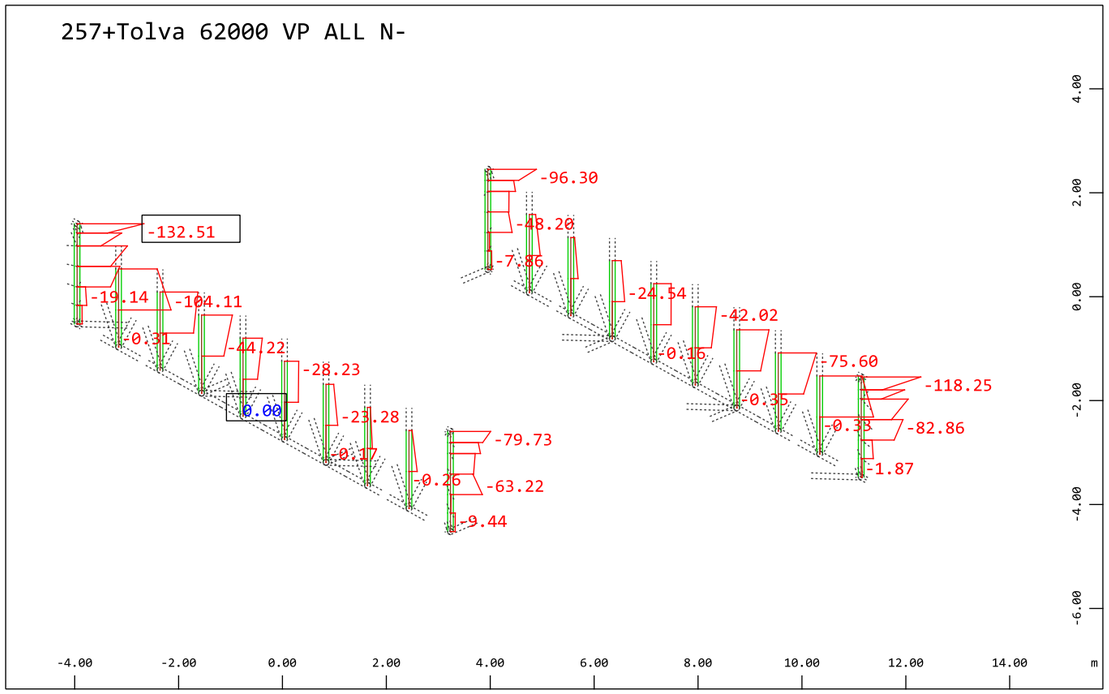


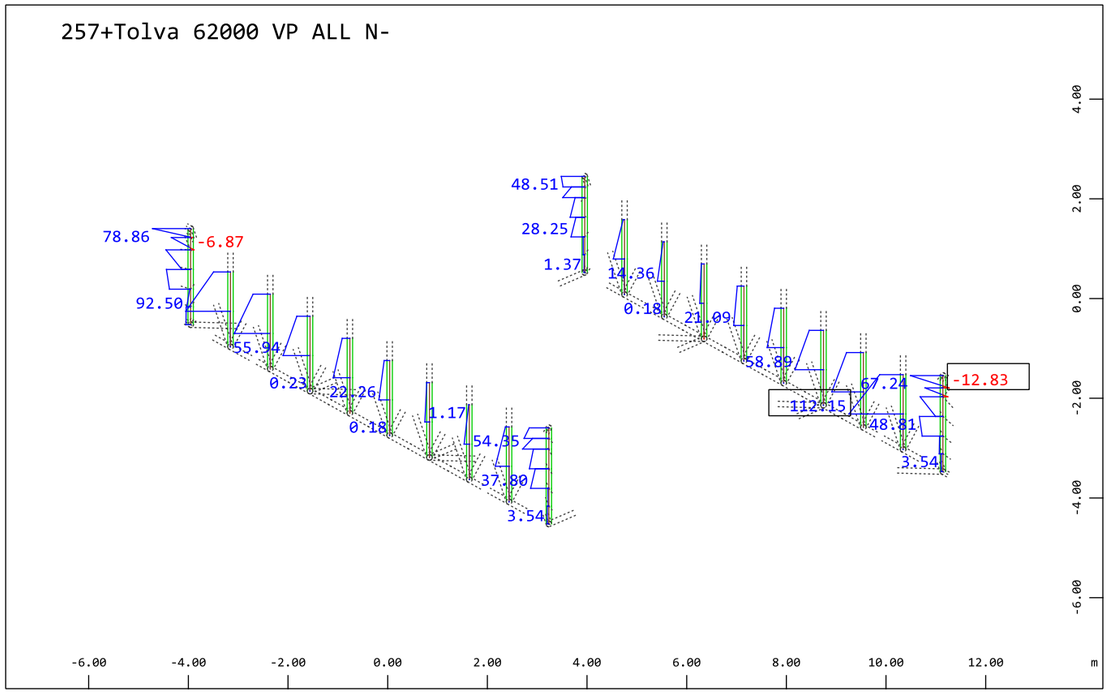

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1342 LL-2xSerie 257 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-14.12) (Max=119.39)

M 1 : 124
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones

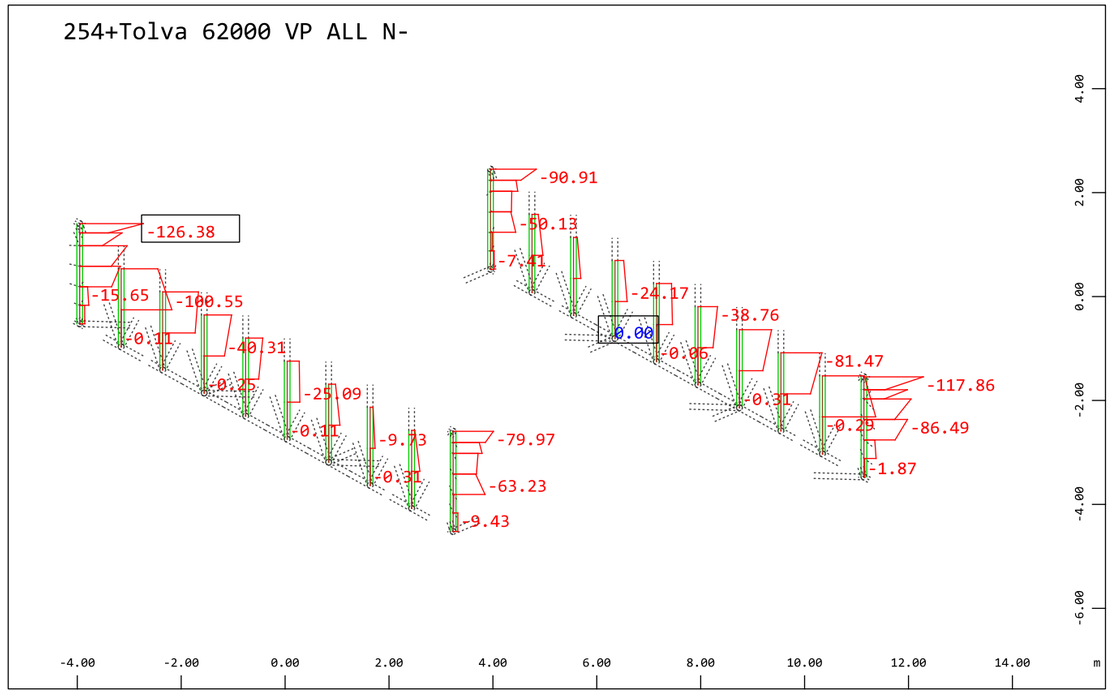


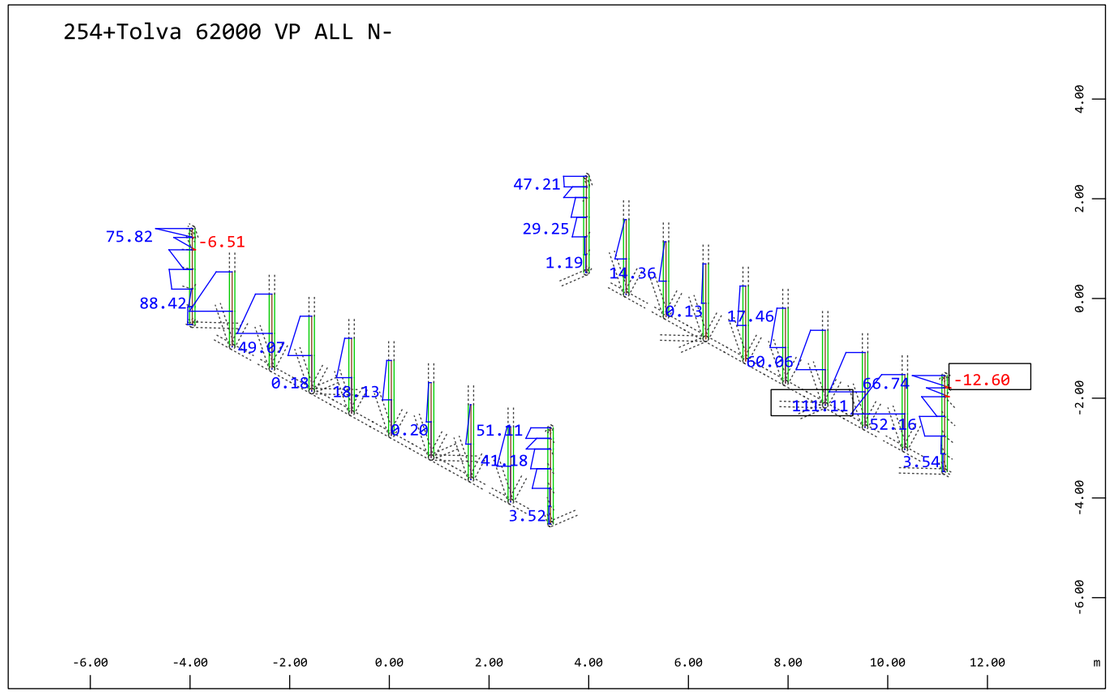




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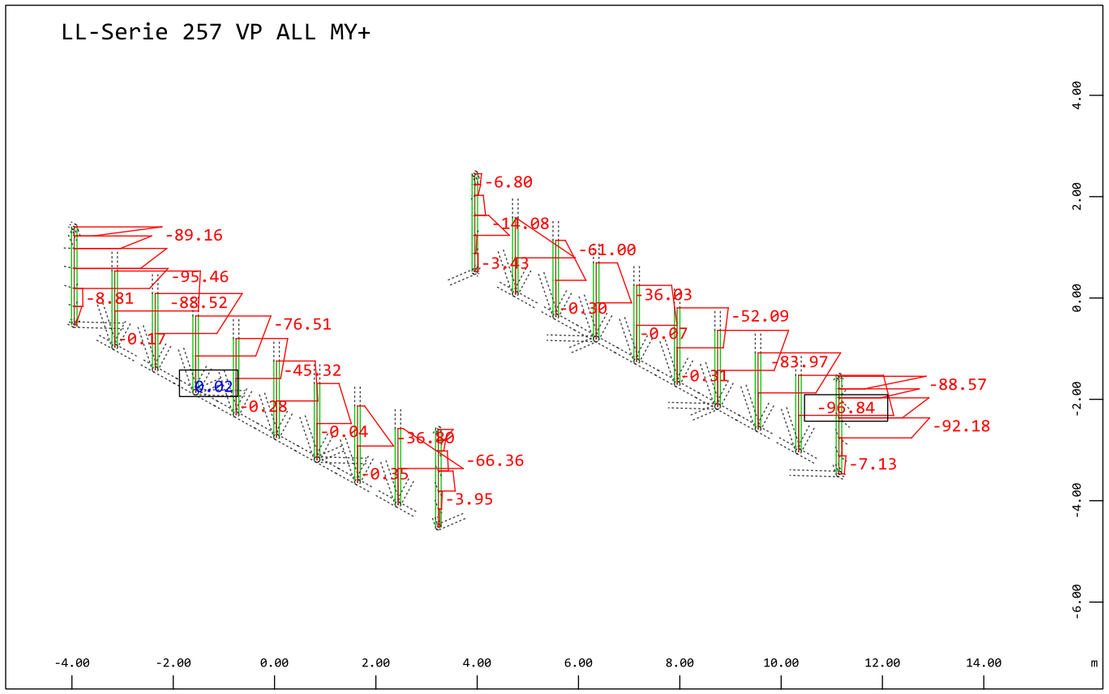
Pont Carretera Vic
Tensiones




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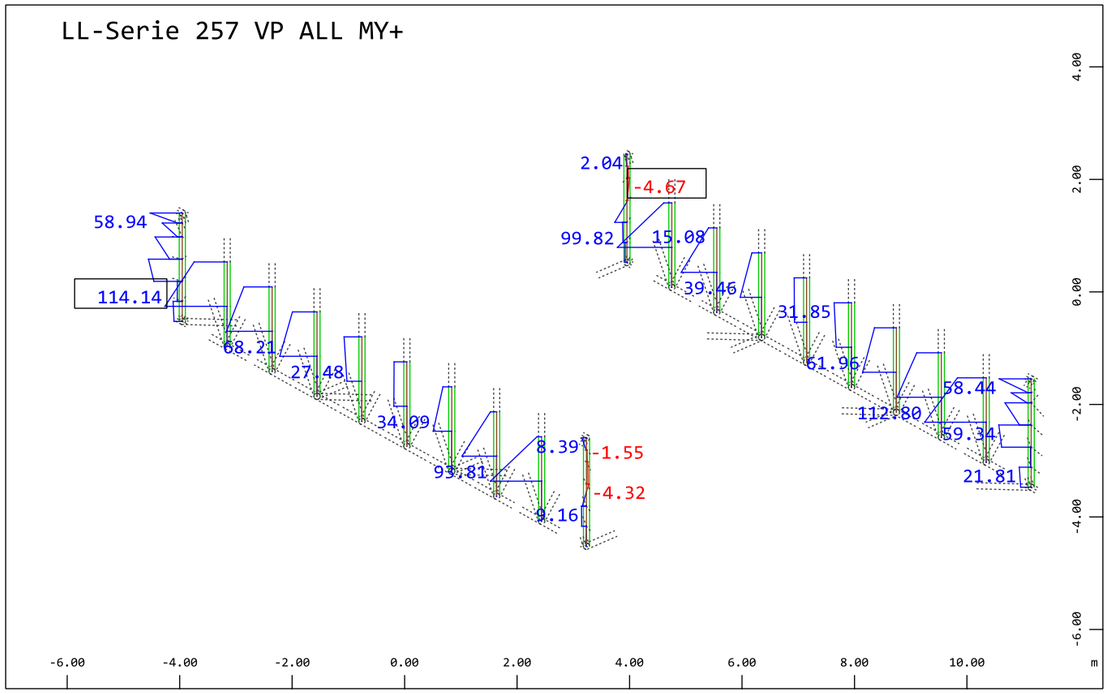
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1313 LL-Serie 257 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-96.84) (Max=0.02)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

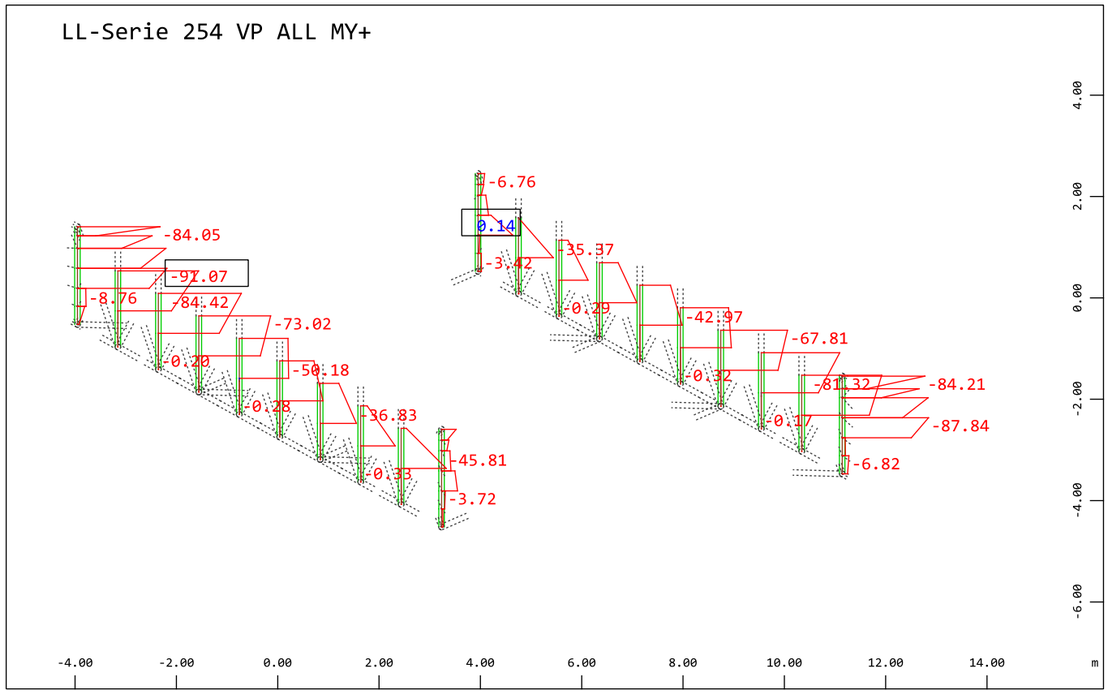
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1313 LL-Serie 257 VP ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-4.67) (Max=114.14)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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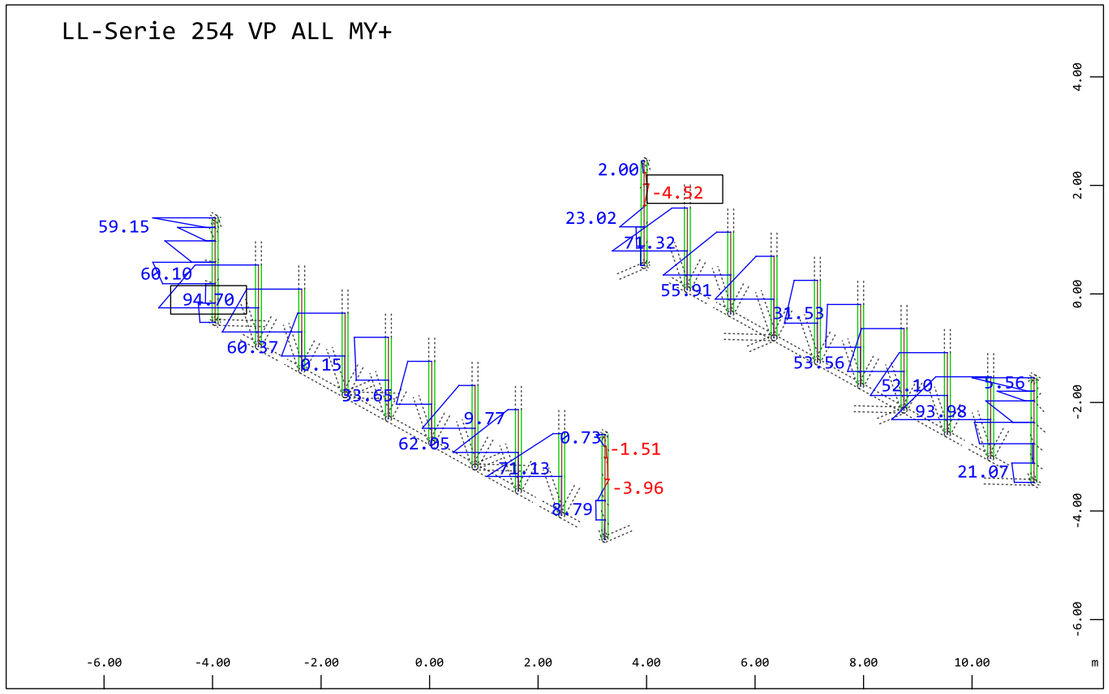
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1303 LL-Serie 254 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-91.07) (Max=0.14)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962



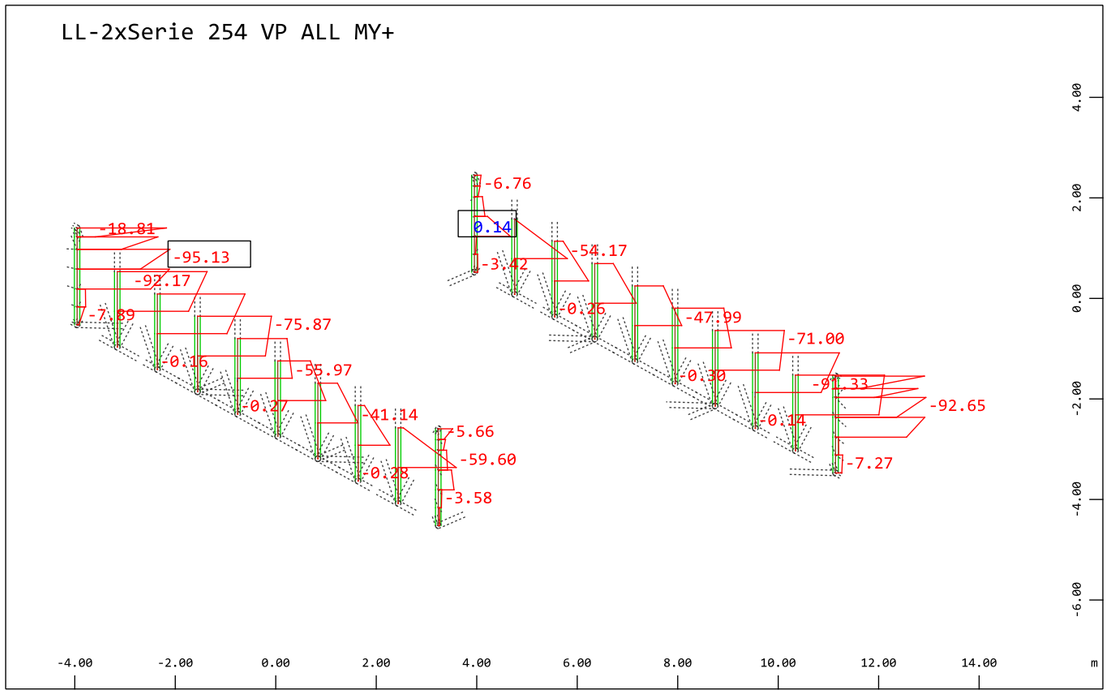

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1303 LL-Serie 254 VP ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-4.52) (Max=94.70)

M 1 : 113
X * 0.502
Y * 0.906
Z * 0.962

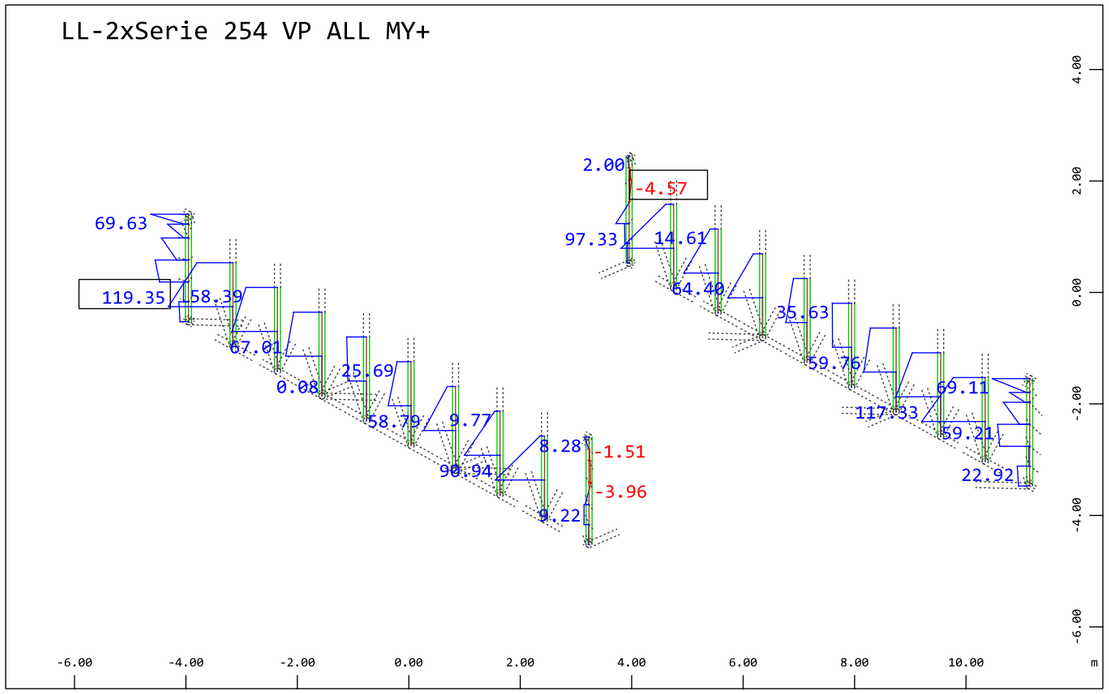
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Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1333 LL-2xSerie 254 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-95.13) (Max=0.14)

M 1 : 122
X * 0.502
Y * 0.906
Z * 0.962

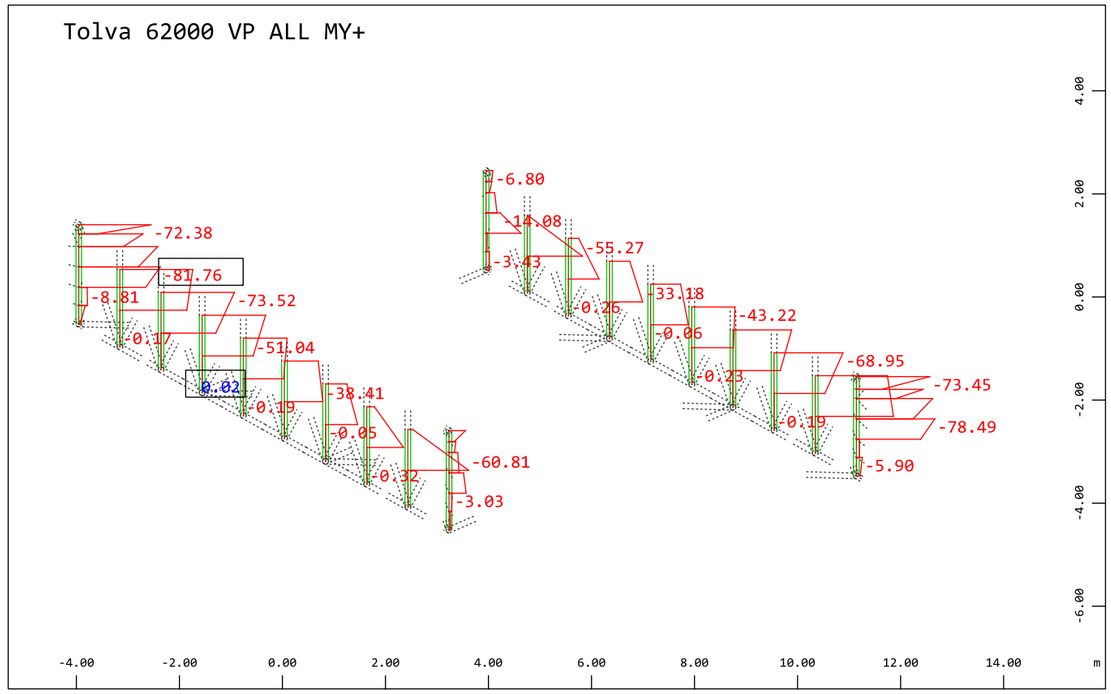



Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1333 LL-2xSerie 254 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-4.57) (Max=119.35)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962

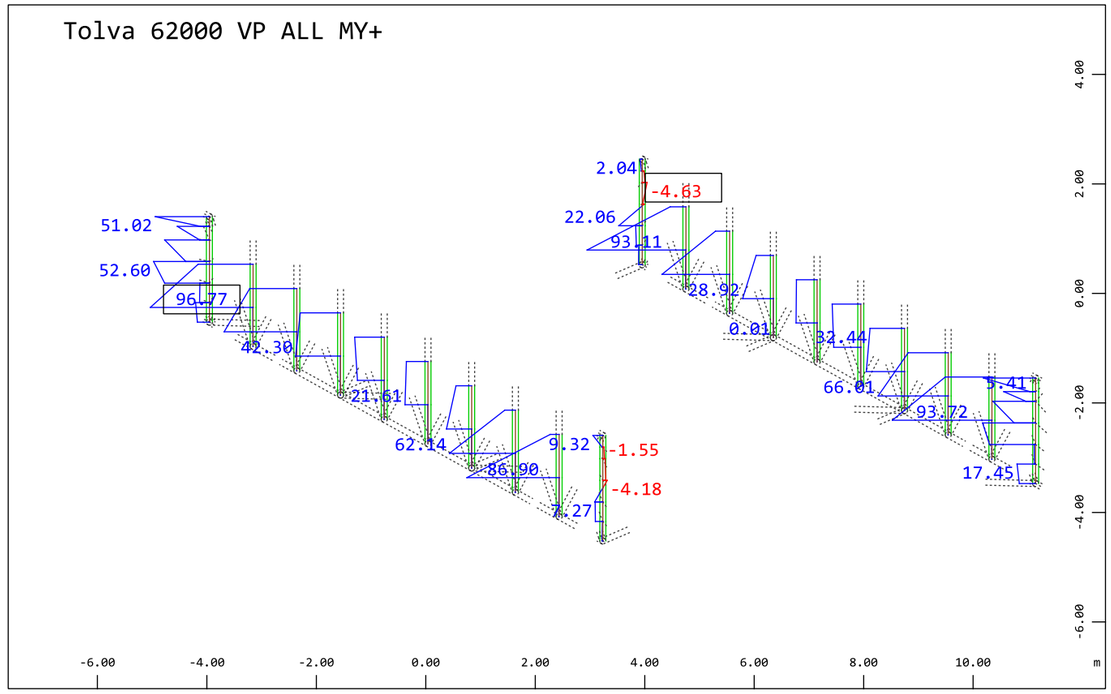


Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1323 Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-81.76) (Max=0.02)

M 1 : 119
X * 0.502
Y * 0.906
Z * 0.962

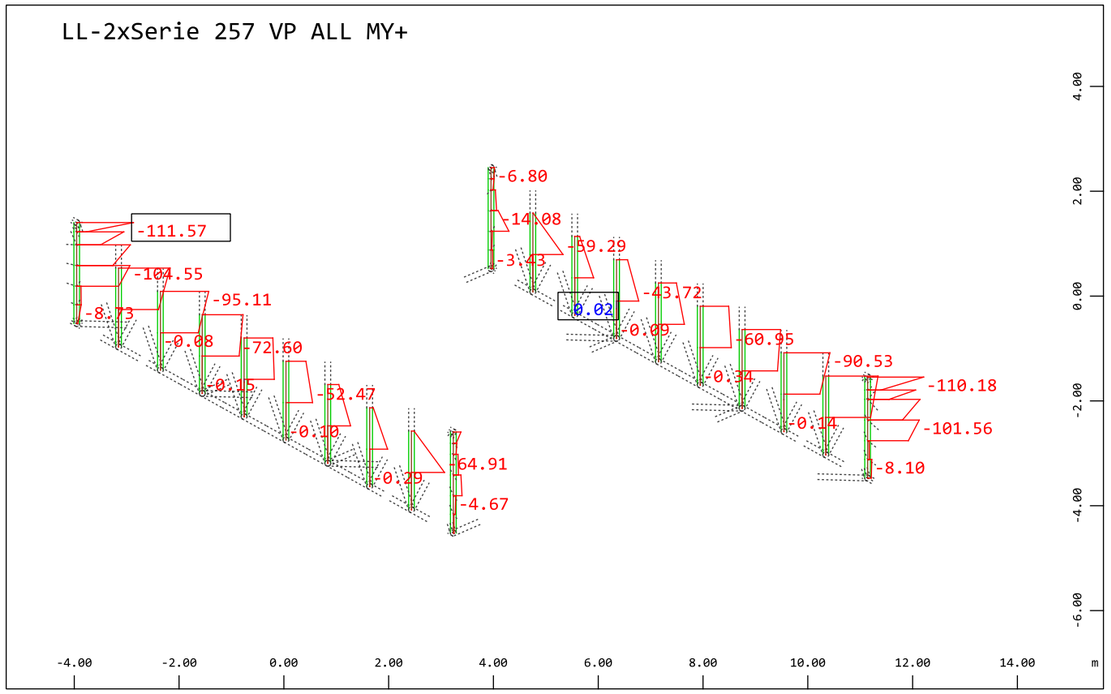



Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1323 Tolva 62000 VP ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-4.63) (Max=96.77)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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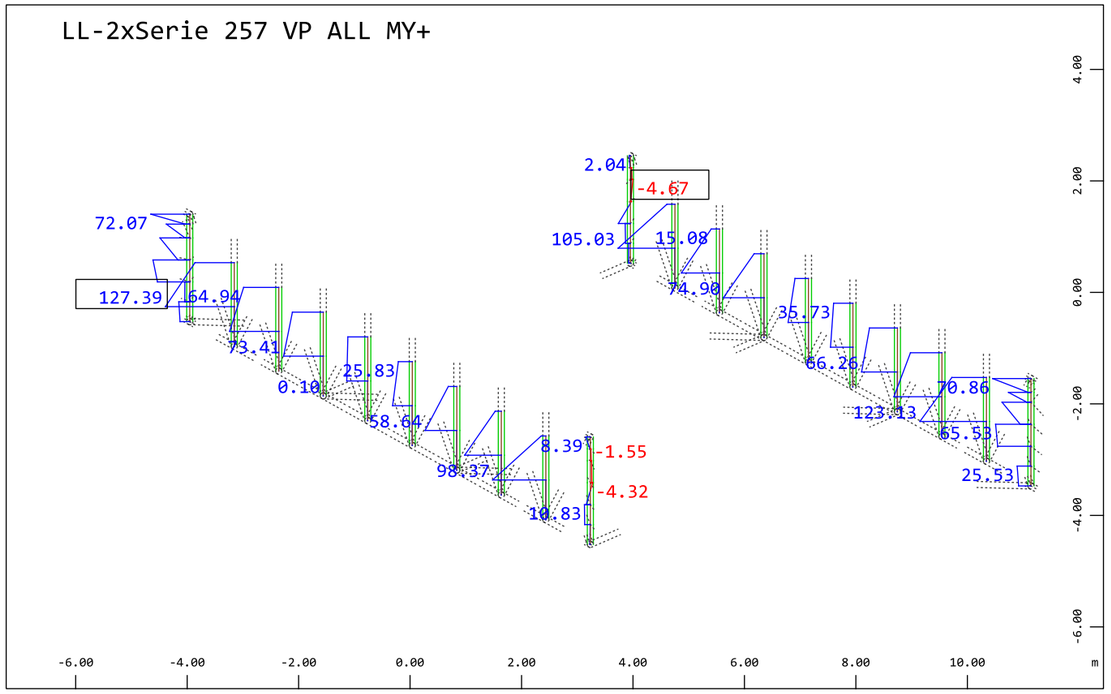
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1343 LL-2xSerie 257 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-111.57) (Max=0.02)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

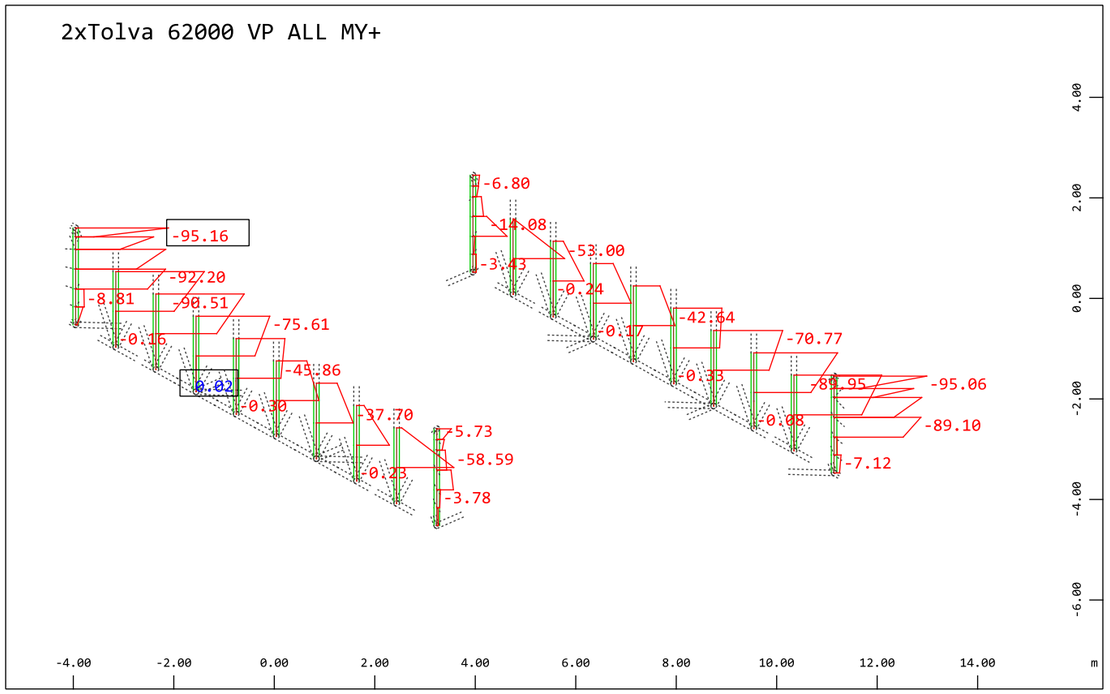
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1343 LL-2xSerie 257 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-4.67) (Max=127.39)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962

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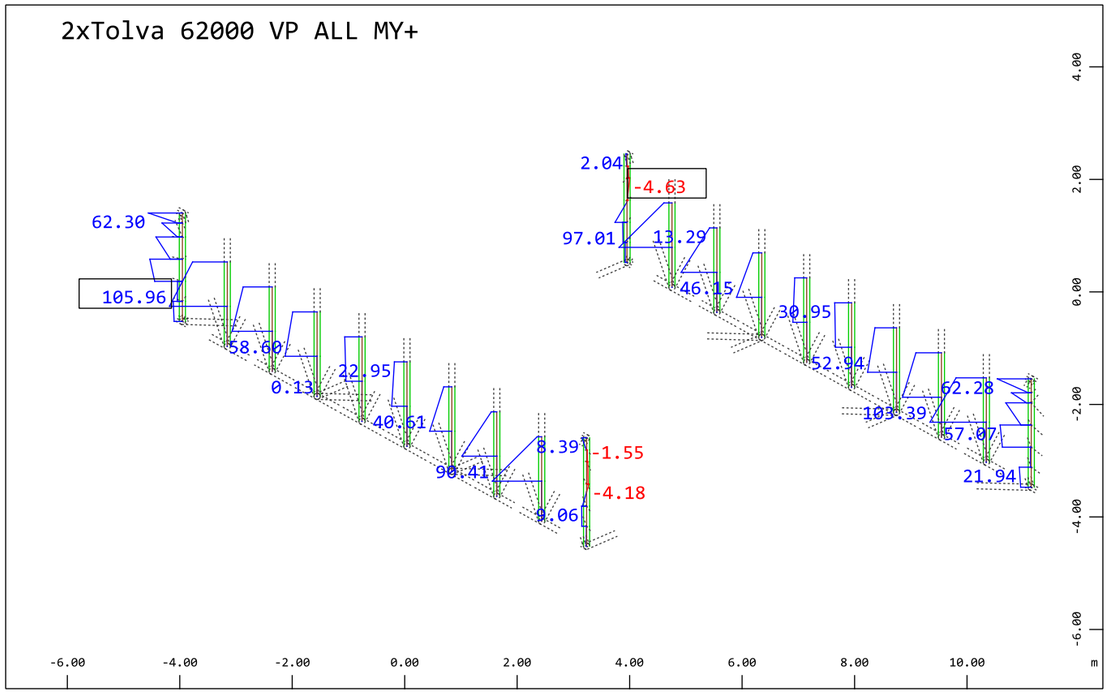
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1353 2xTolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-95.16) (Max=0.02)

M 1 : 122
X * 0.502
Y * 0.906
Z * 0.962



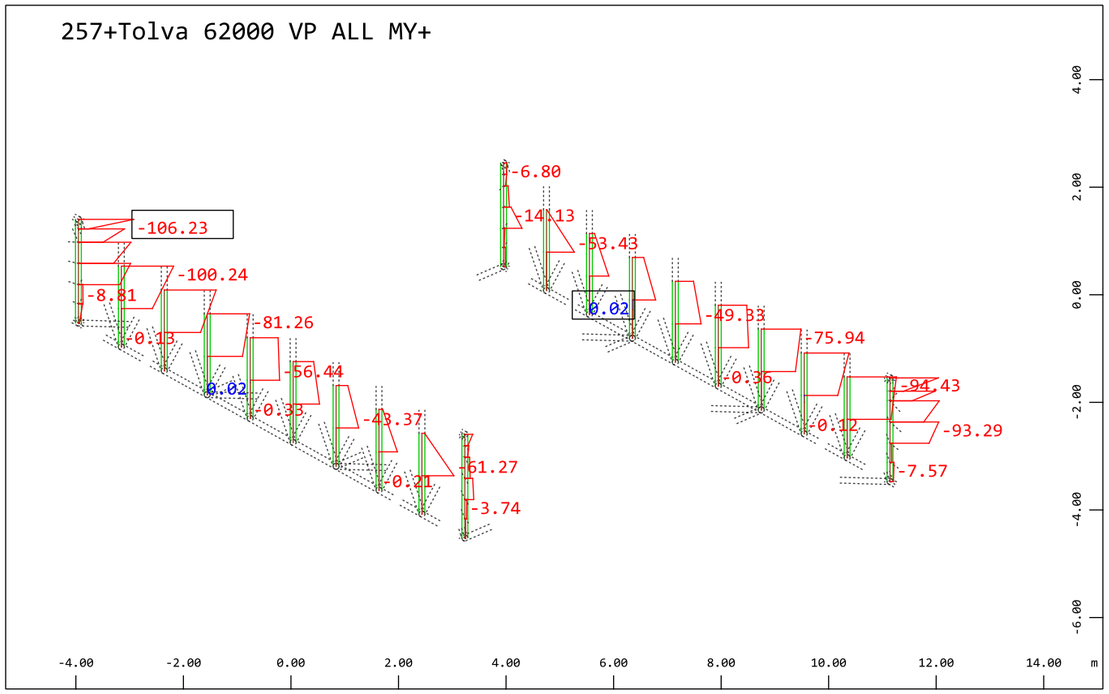

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1353 2xTolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-4.63) (Max=105.96)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

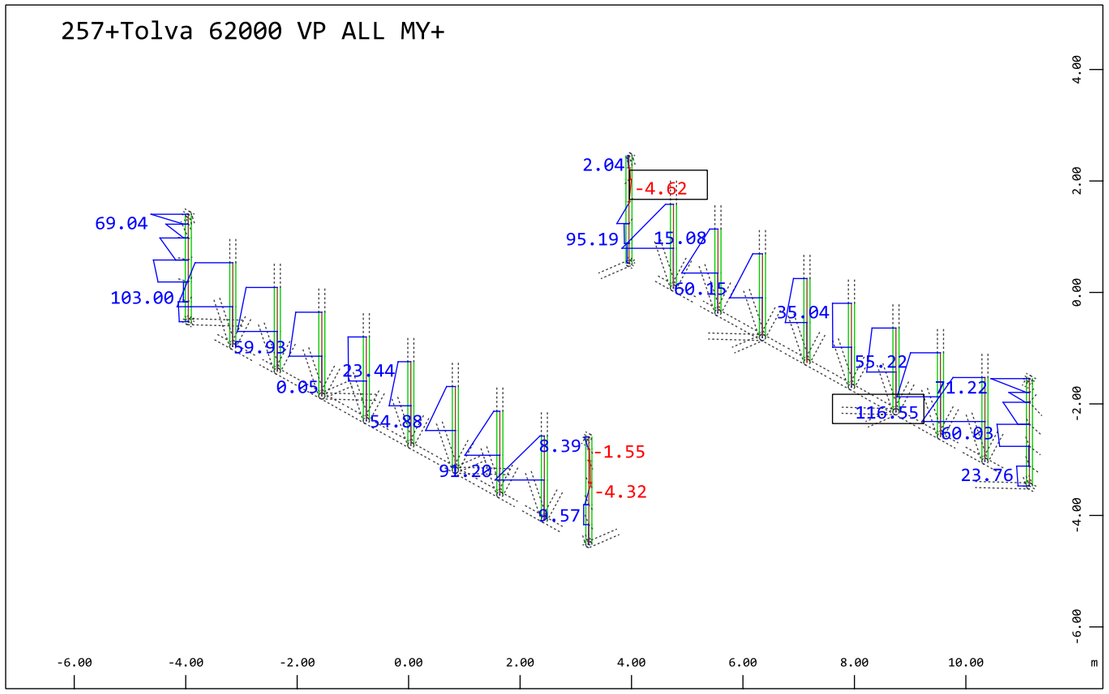
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Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1373 257+Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-106.23) (Max=0.02)

M 1 : 114
X * 0.502
Y * 0.906
Z * 0.962



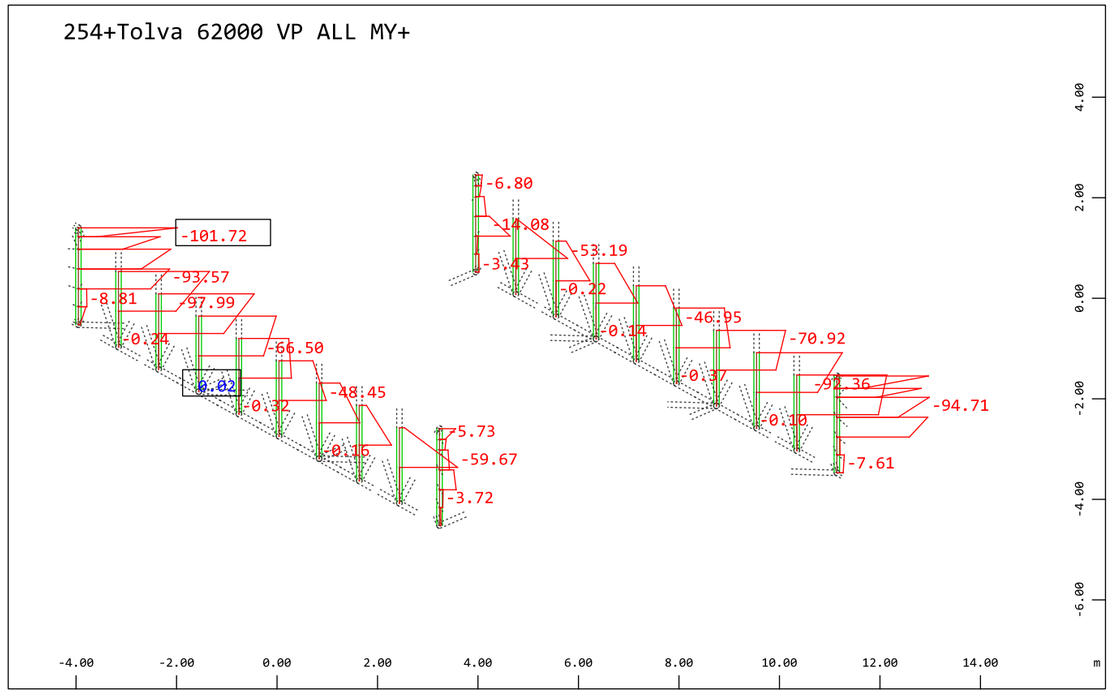

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1373 257+Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-4.62) (Max=116.55)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962

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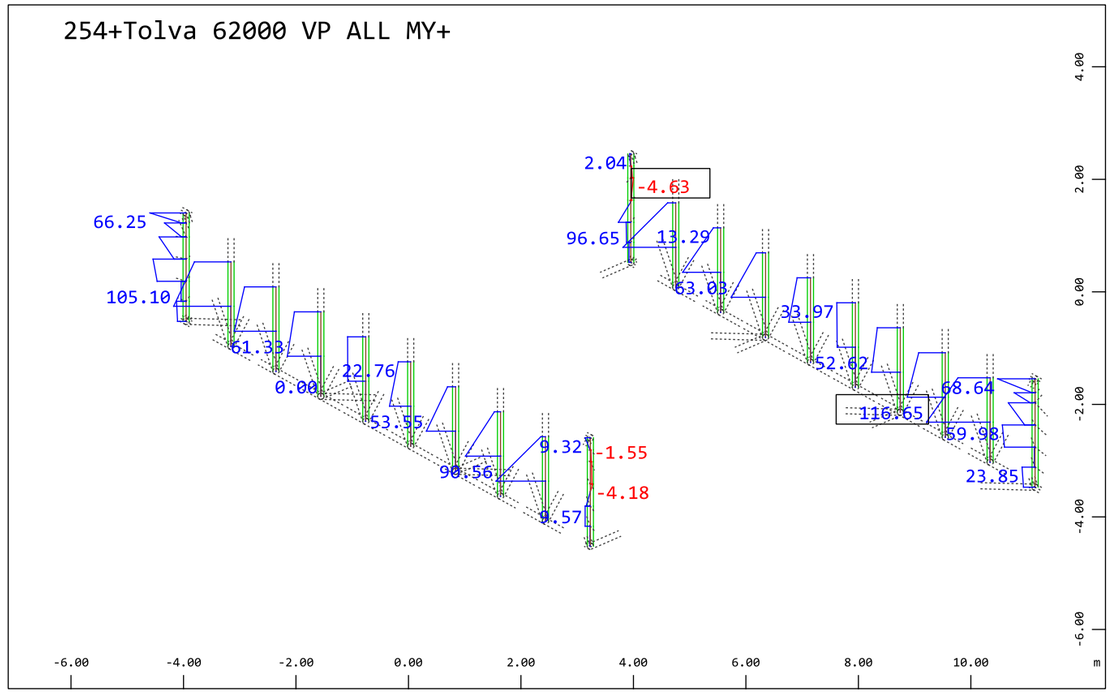


Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1363 254+Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-101.72) (Max=0.02)

M 1 : 122
X * 0.502
Y * 0.906
Z * 0.962

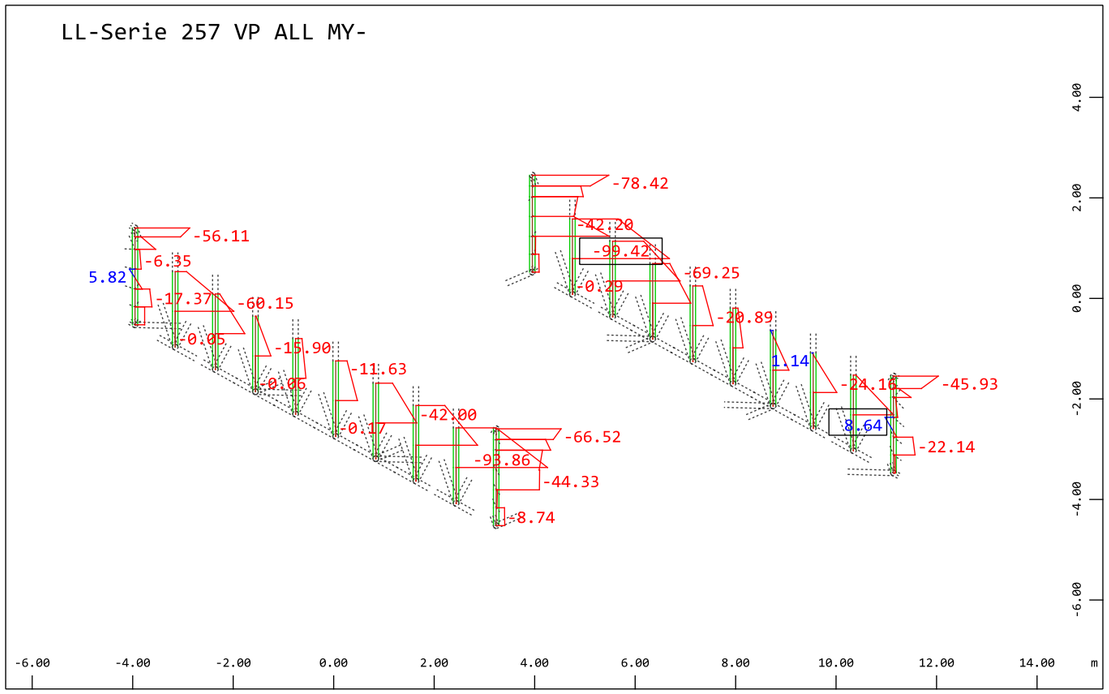



Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1363 254+Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-4.63) (Max=116.65)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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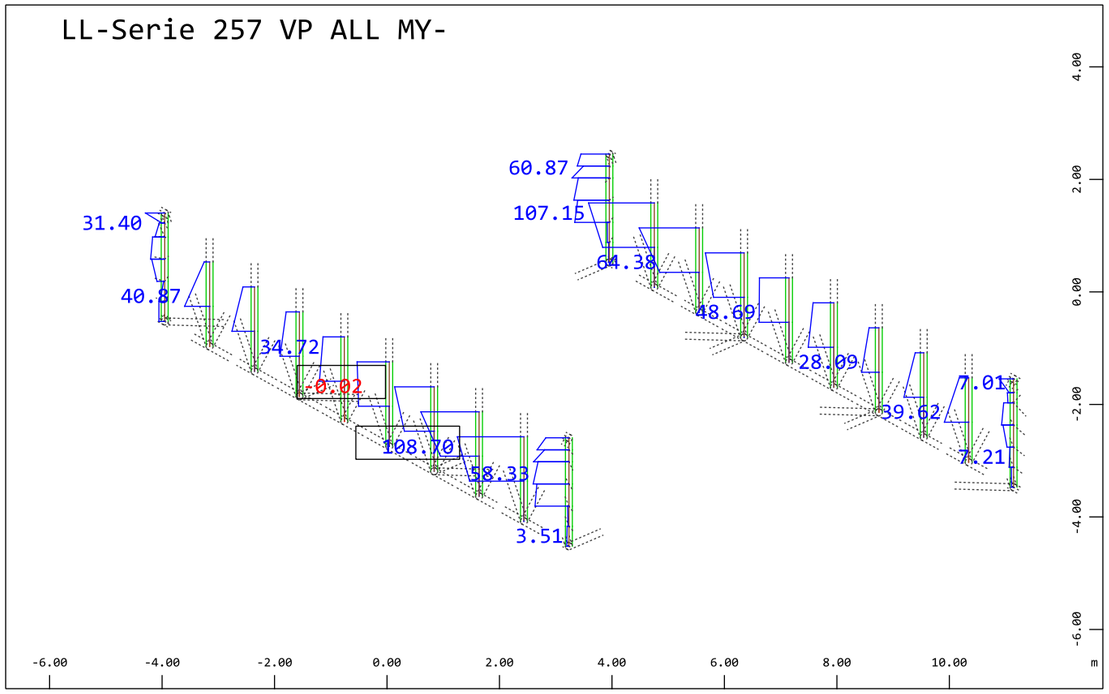
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1314 LL-Serie 257 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-99.42) (Max=8.64)

M 1 : 122
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

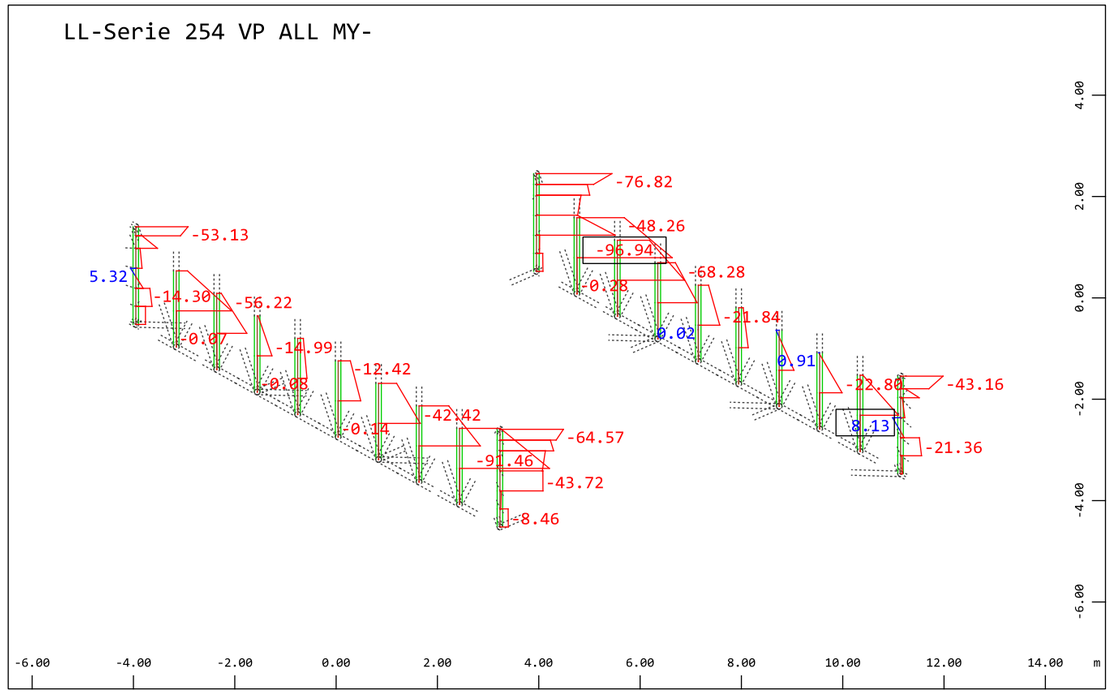
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1314 LL-Serie 257 VP ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=108.70)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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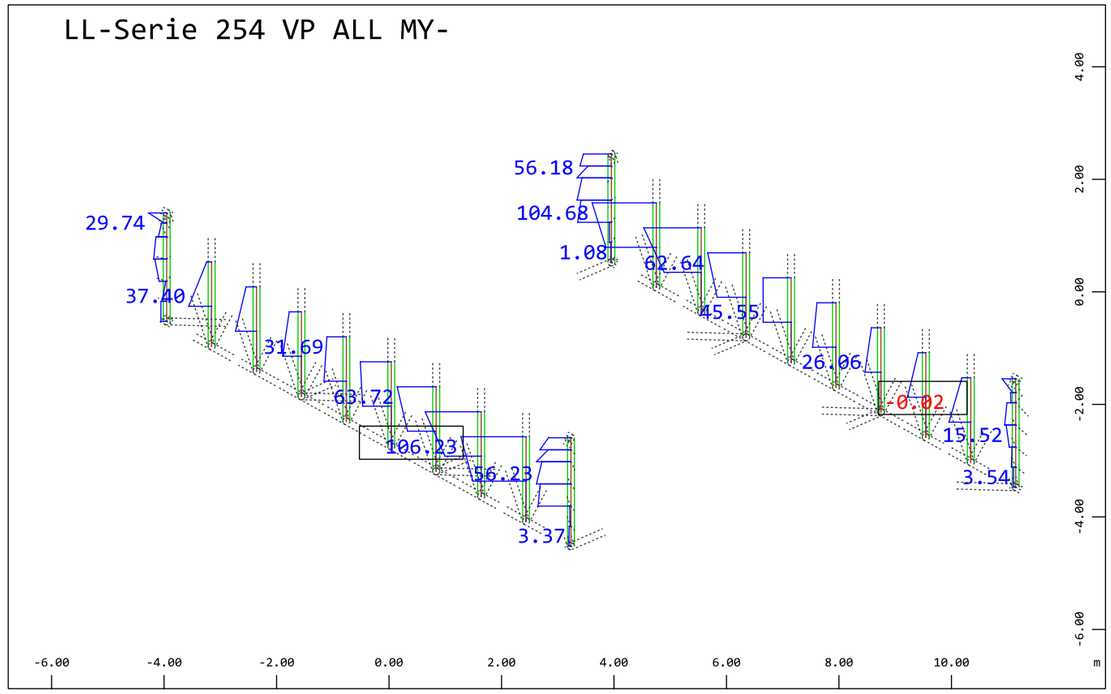
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1304 LL-Serie 254 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-96.94) (Max=8.13)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962



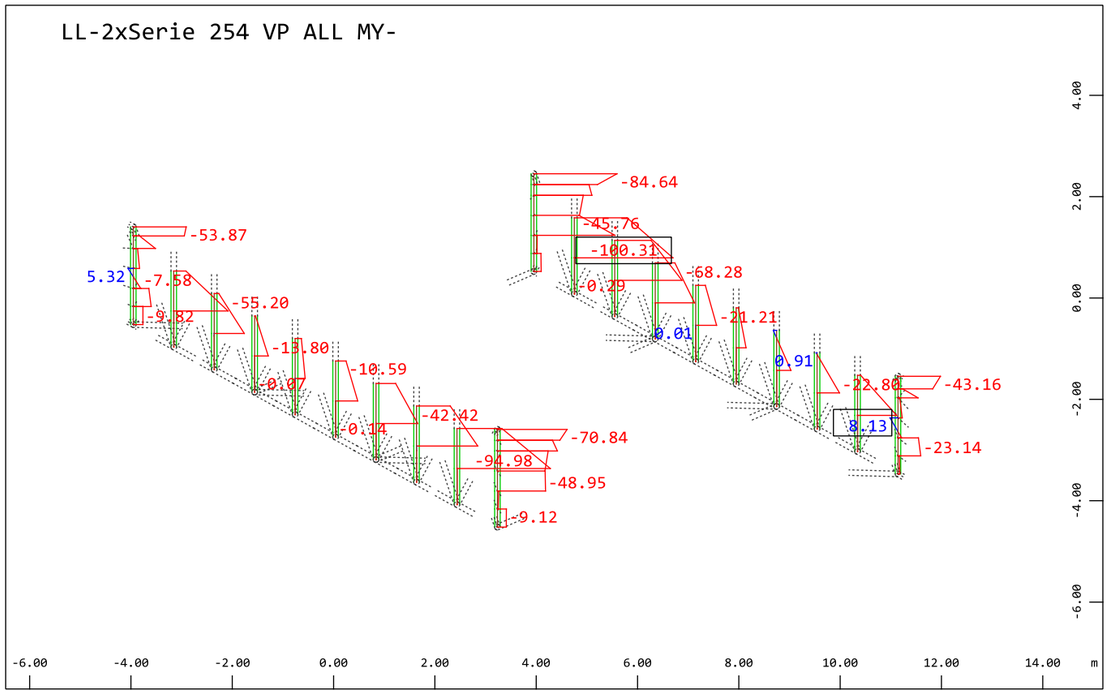

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1304 LL-Serie 254 VP ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=106.23)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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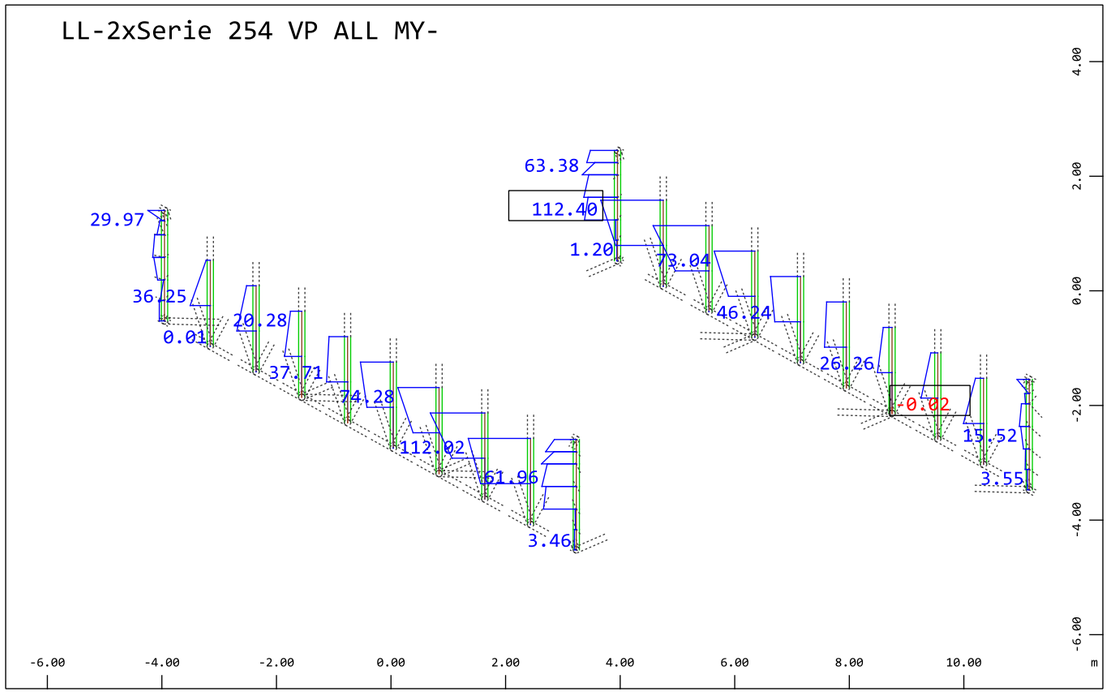
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1334 LL-2xSerie 254 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-100.31) (Max=8.13)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

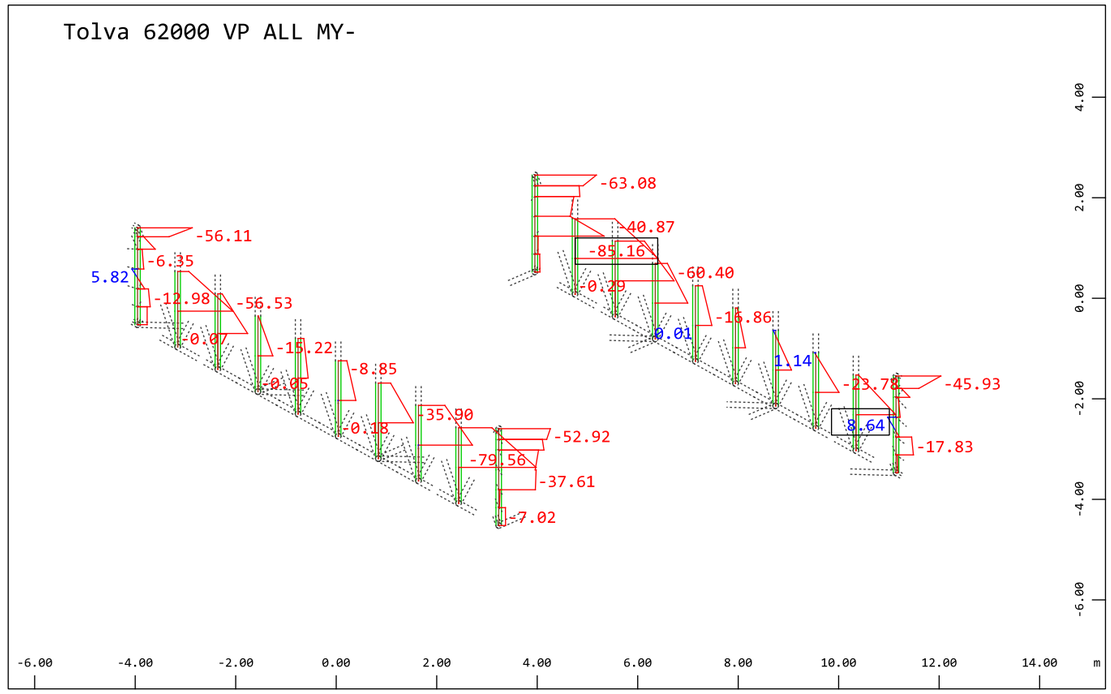
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1334 LL-2xSerie 254 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=112.40)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

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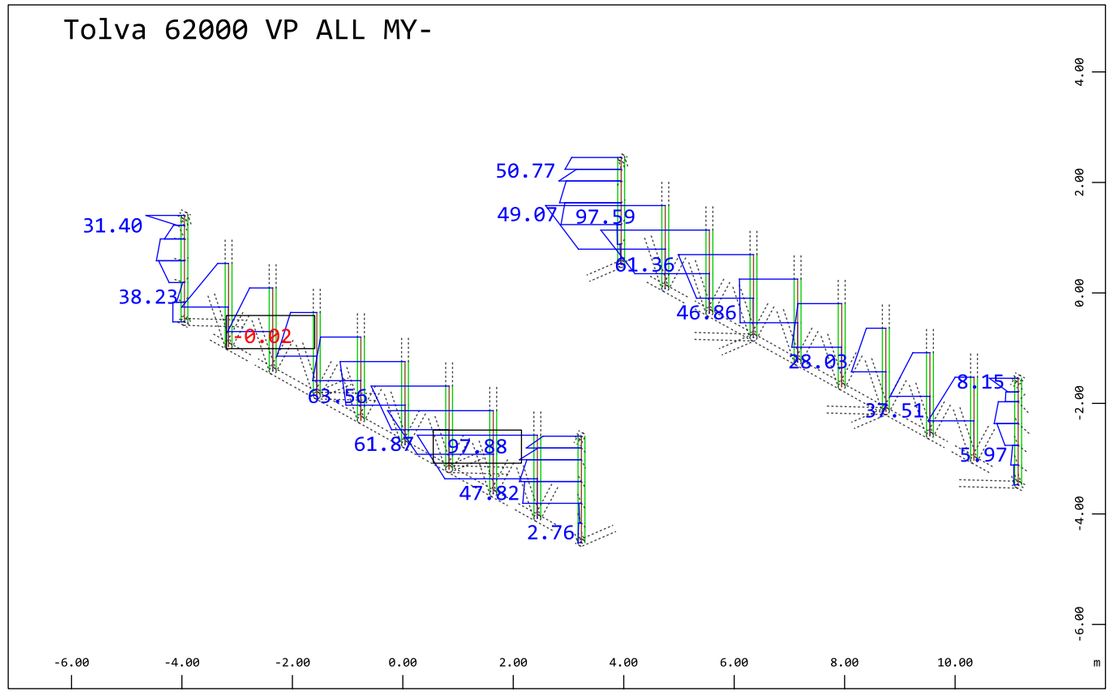
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1324 Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-85.16) (Max=8.64)

M 1 : 122
X * 0.502
Y * 0.906
Z * 0.962



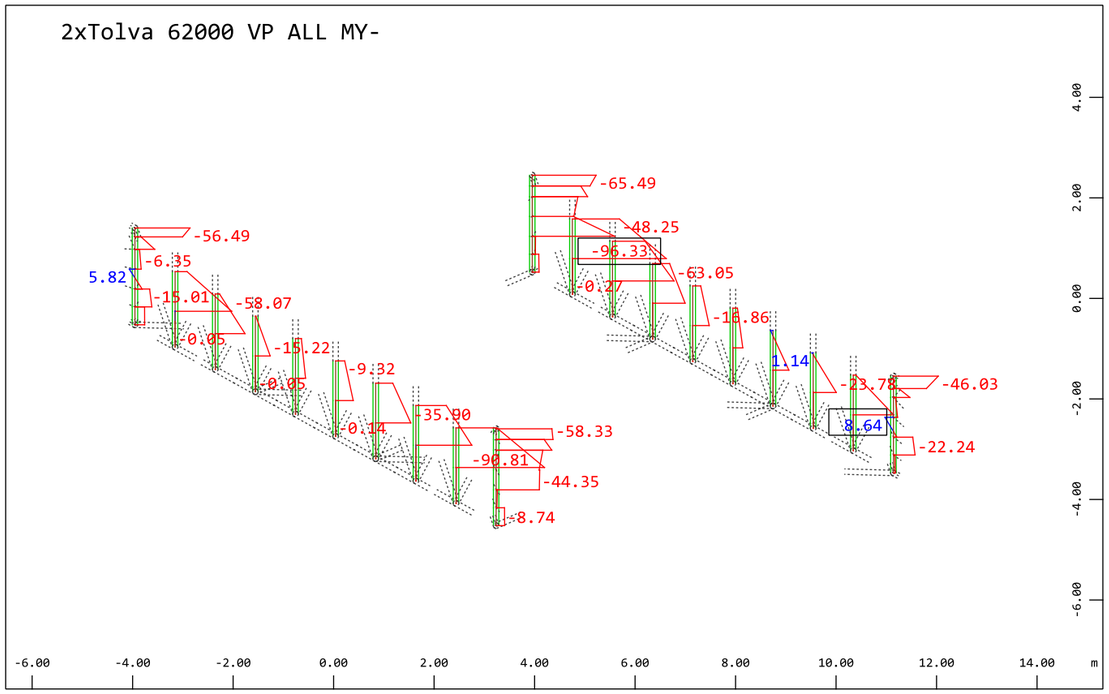

Z
Y
X

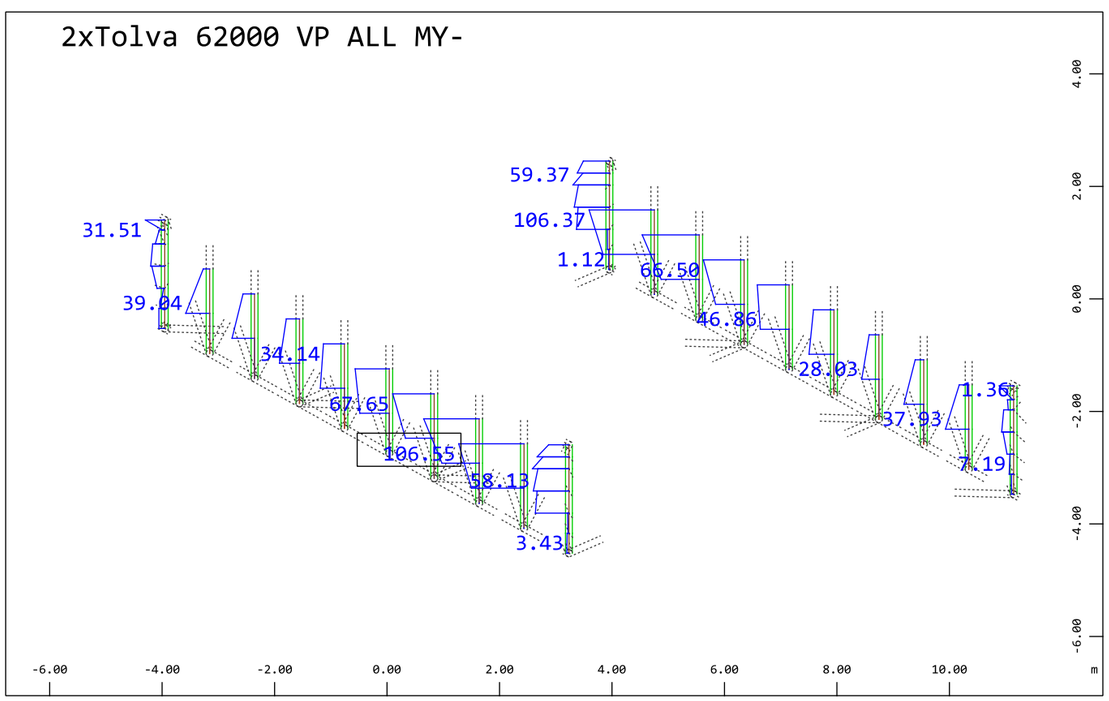
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1324 Tolva 62000 VP ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-0.02) (Max=97.88)

M 1 : 111
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones

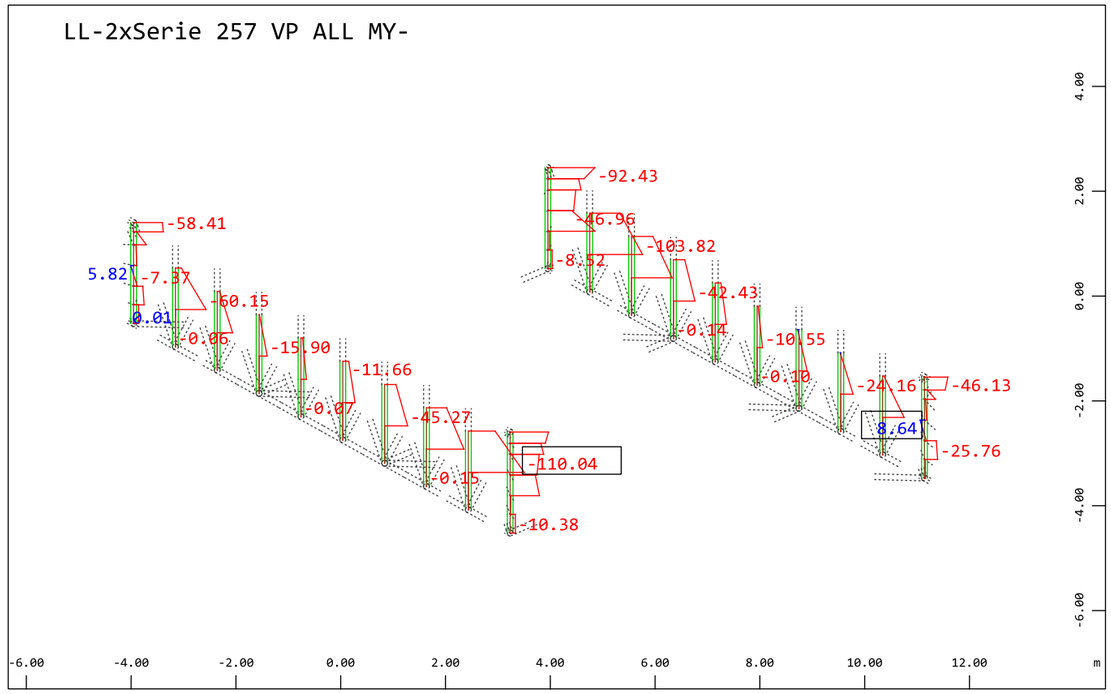


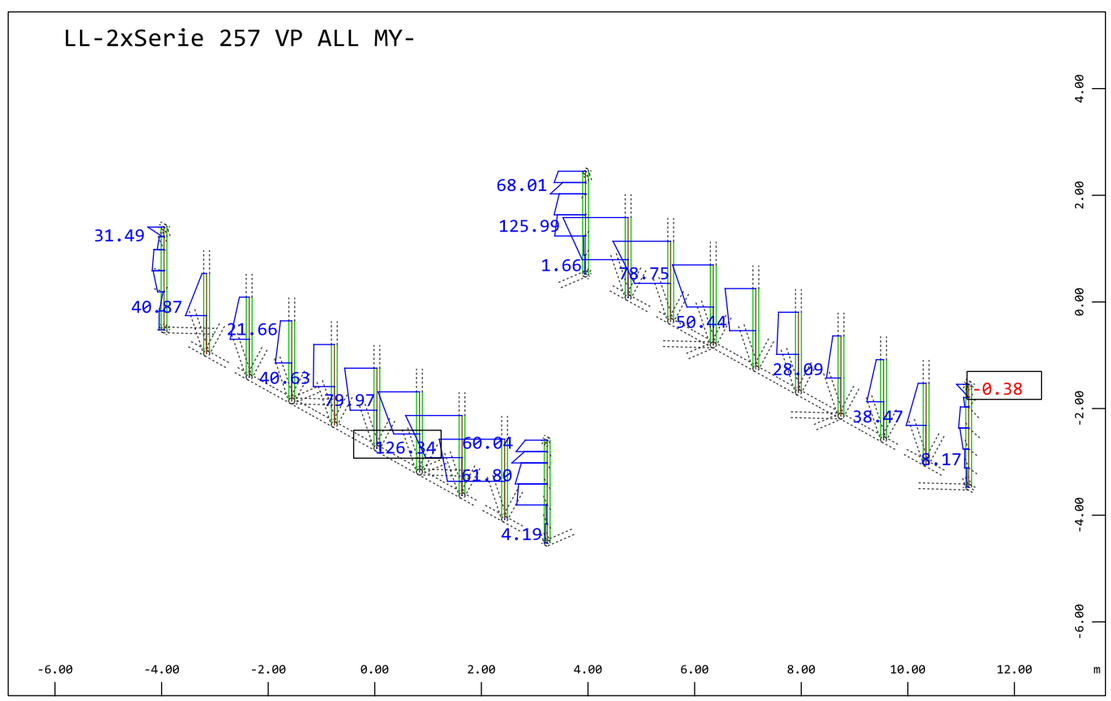




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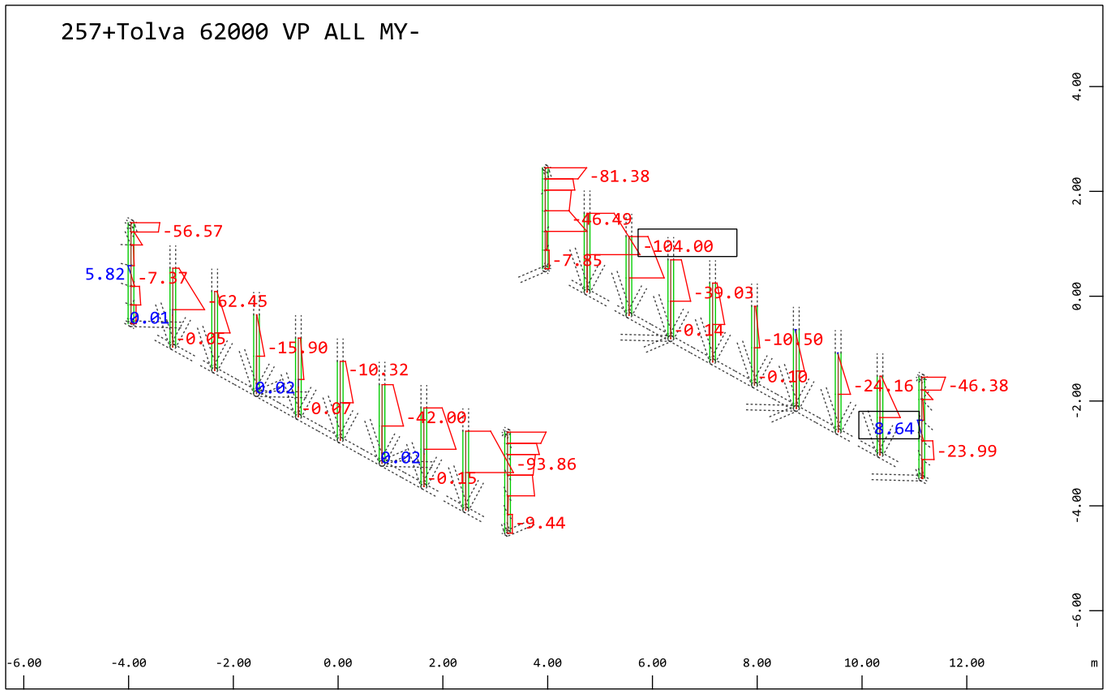
Pont Carretera Vic
Tensiones




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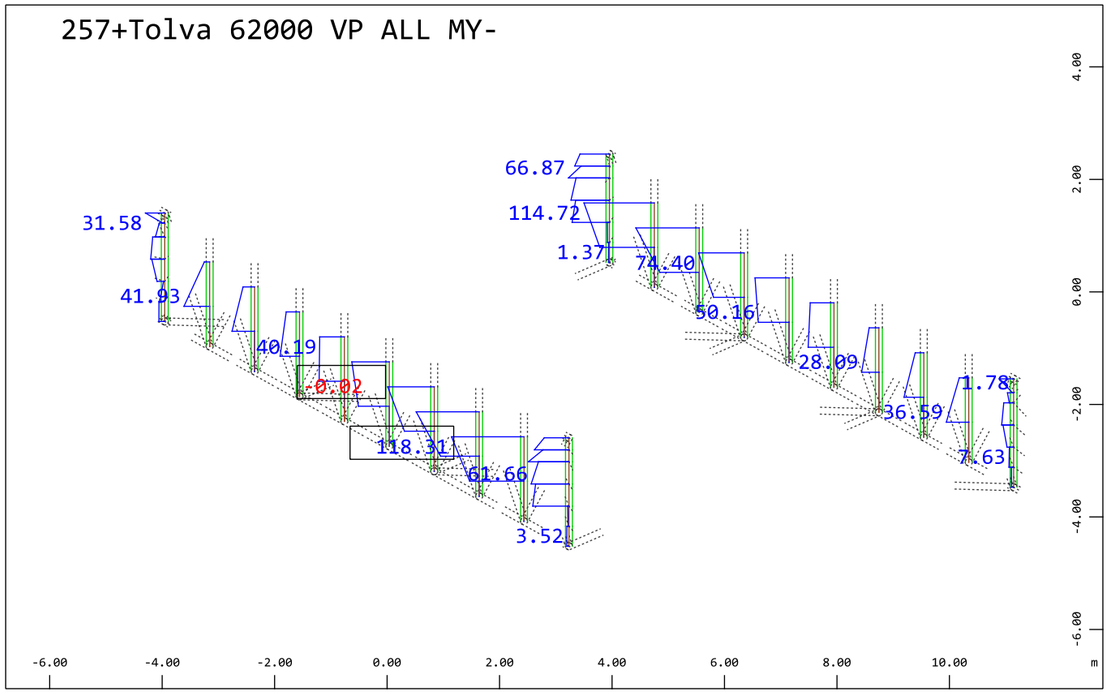
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1374 257+Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-104.00) (Max=8.64)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

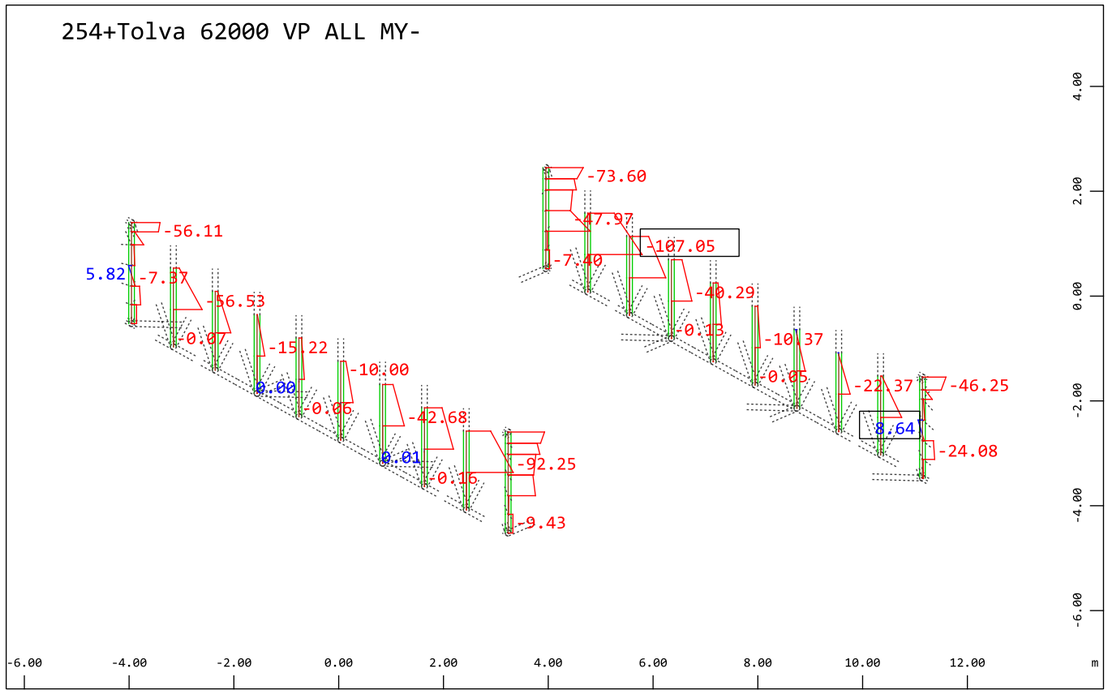
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1374 257+Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=118.31)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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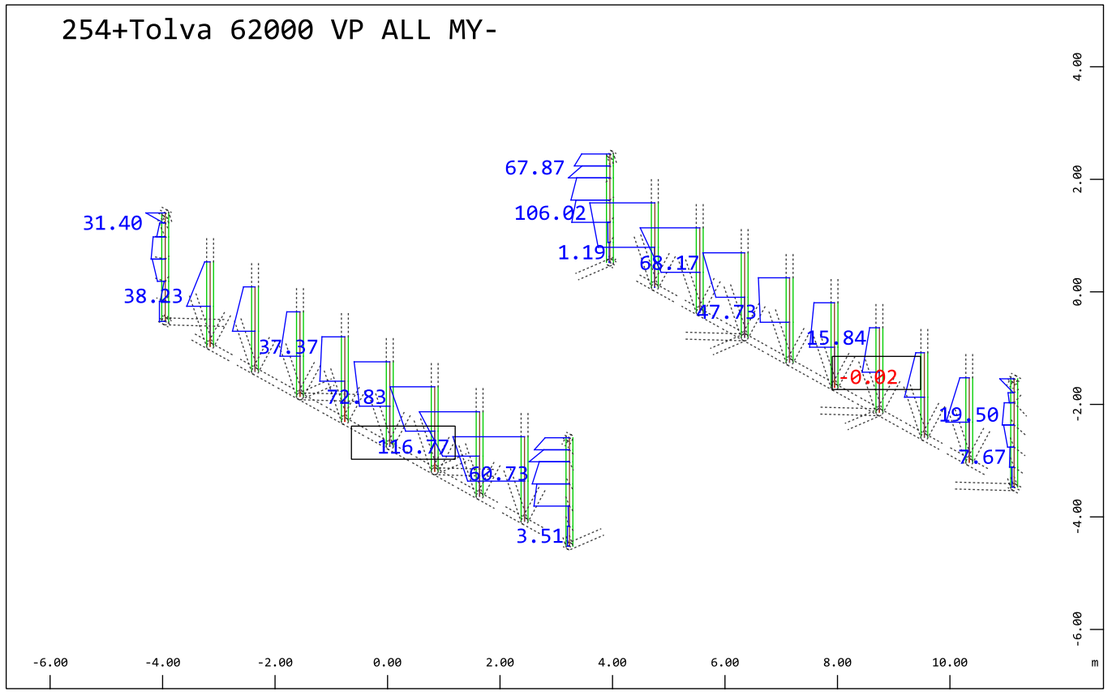
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1364 254+Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-107.05) (Max=8.64)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962



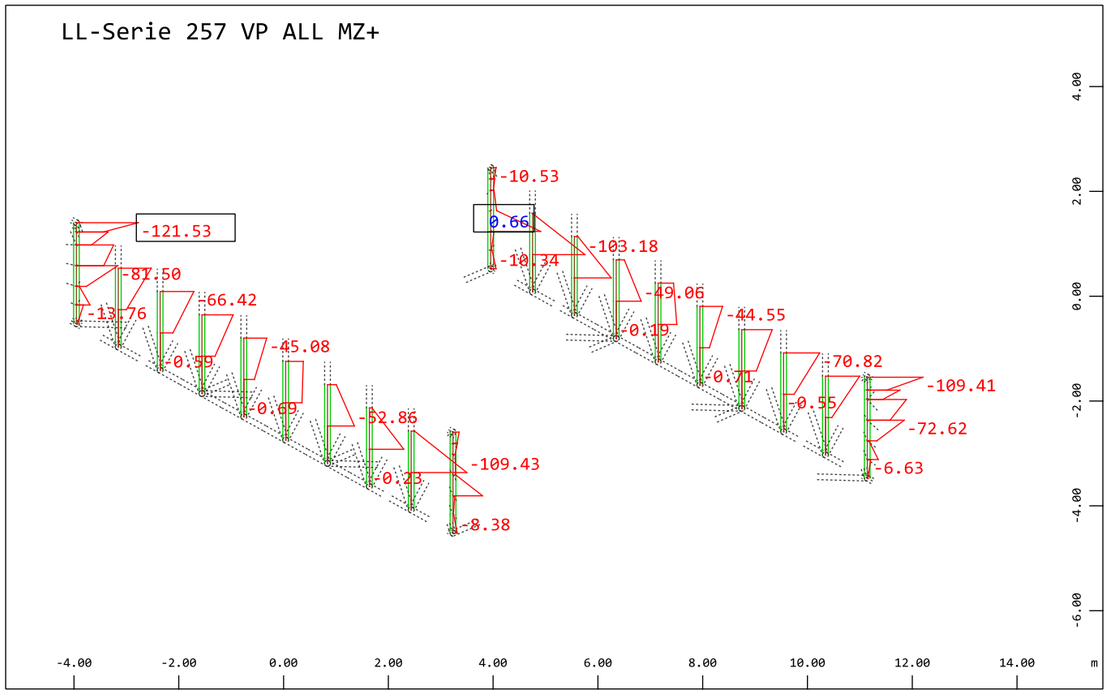

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1364 254+Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=116.77)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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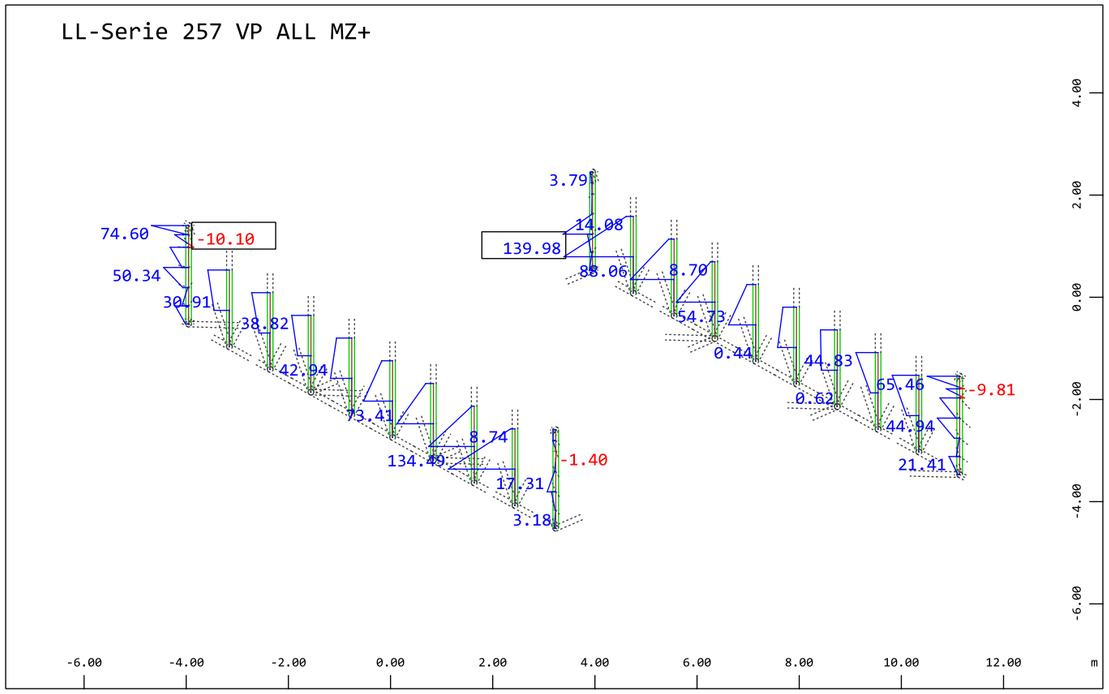
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1315 LL-Serie 257 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-121.53) (Max=0.66)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

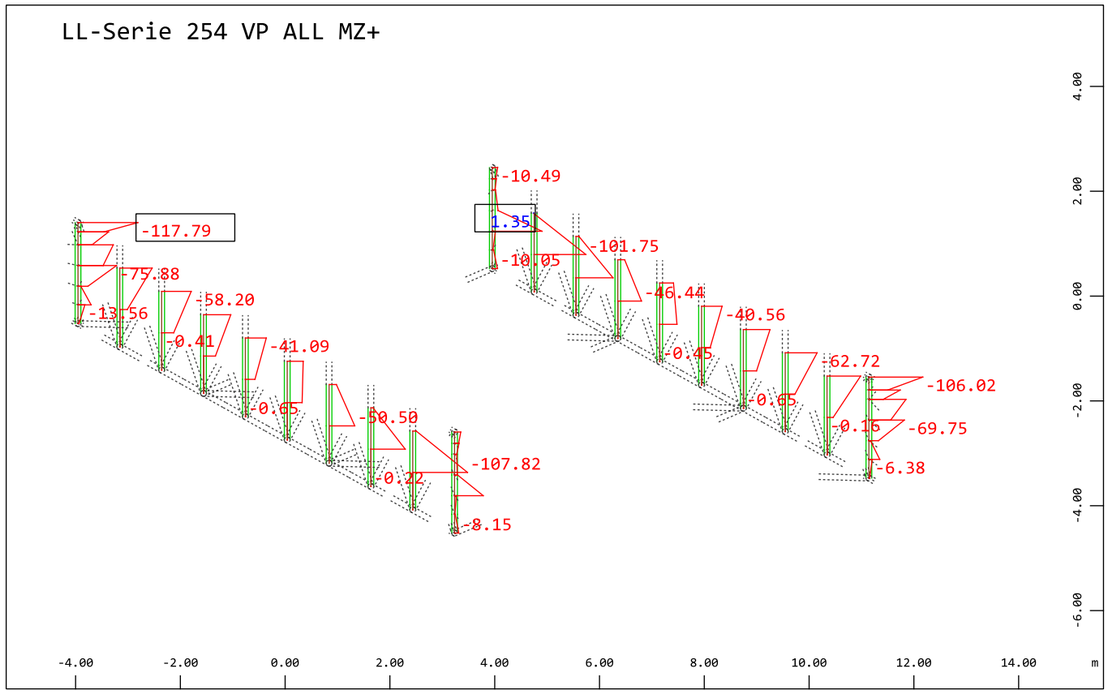
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1315 LL-Serie 257 VP ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-10.10) (Max=139.98)

M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

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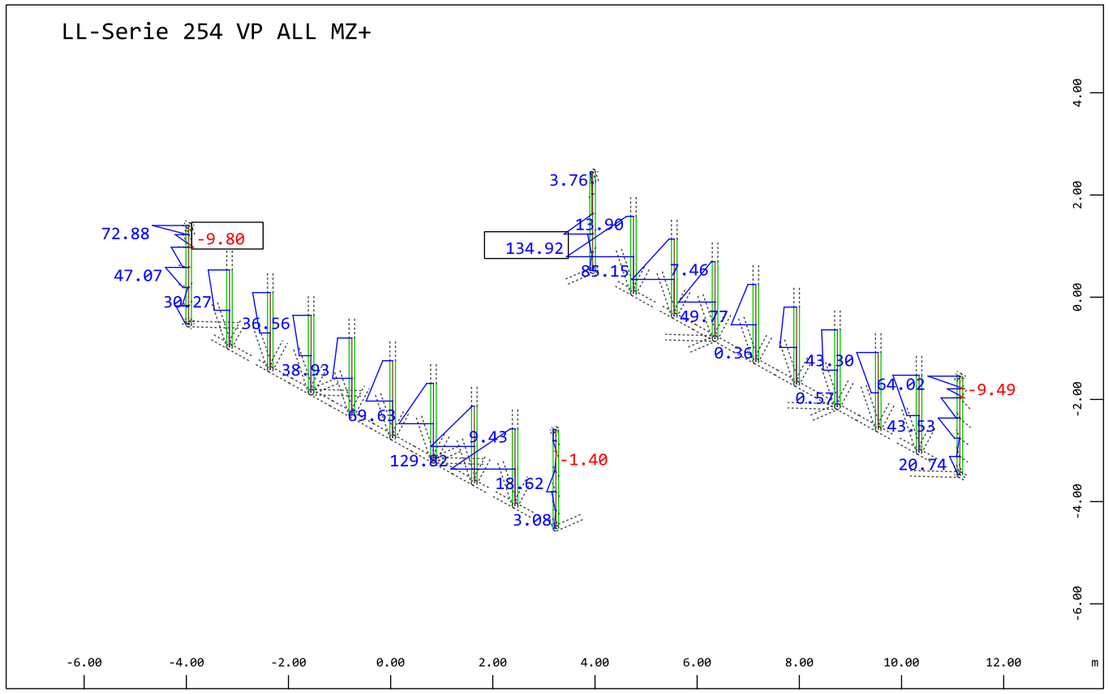
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1305 LL-Serie 254 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-117.79) (Max=1.35)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962



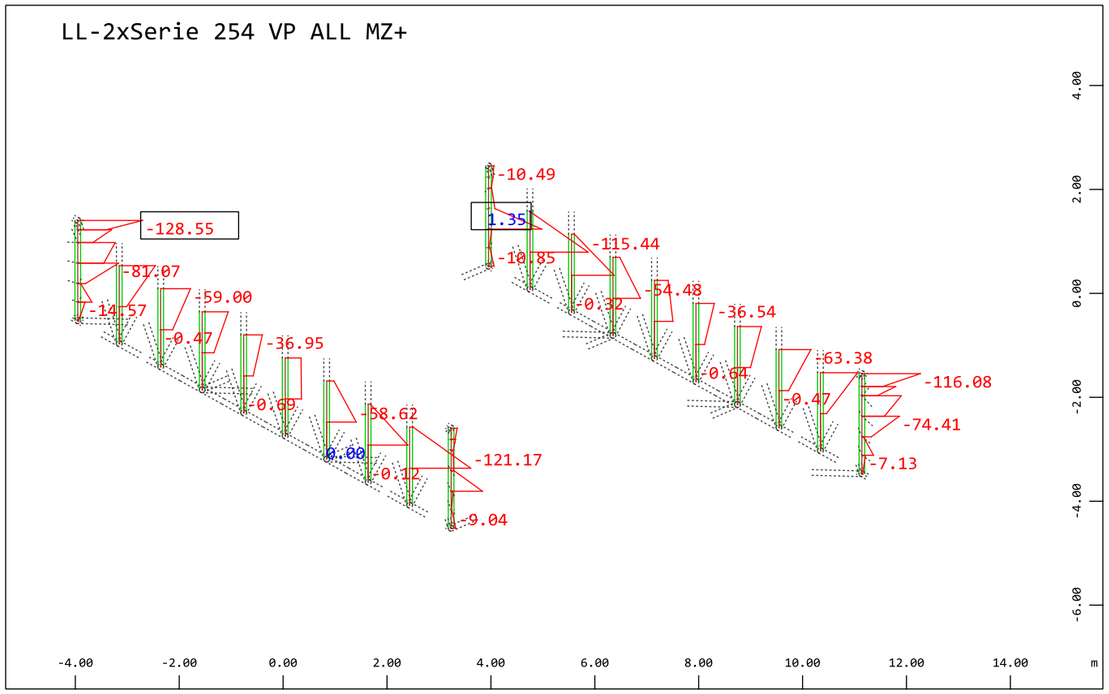

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1305 LL-Serie 254 VP ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-9.80) (Max=134.92)

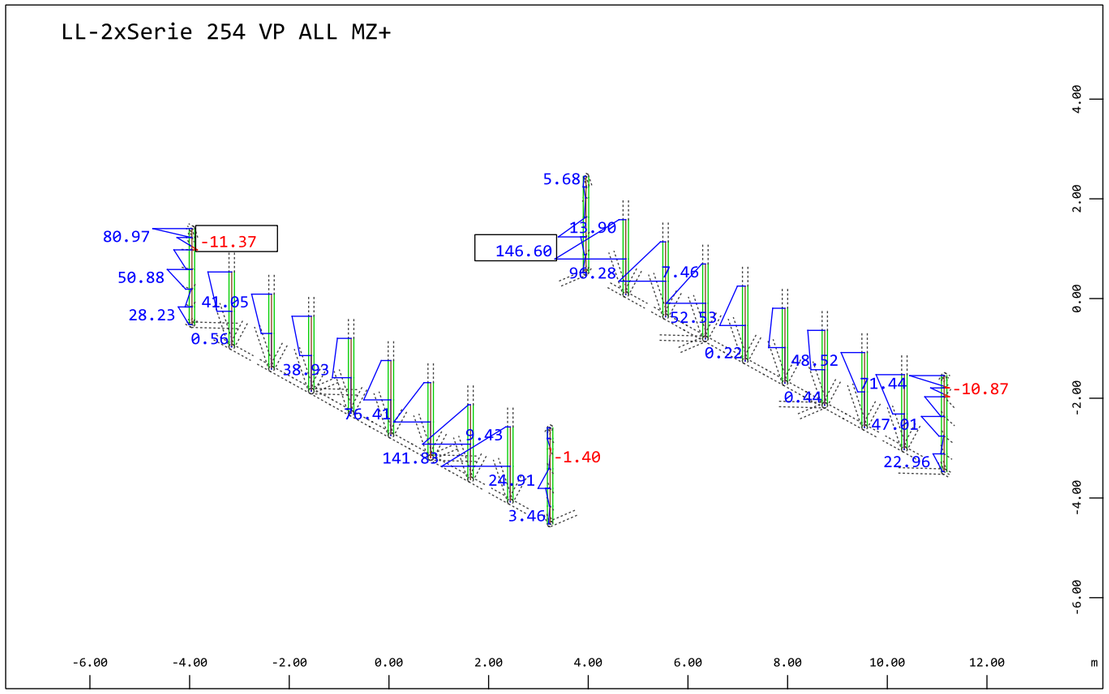
M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones




Z Y X Sector of system Group 7 M 1 : 118
Beam Elements , Maximum compression stress, Design Case 1335 LL-2xSerie 254 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-128.55) (Max=1.35)
X * 0.502
Y * 0.906
Z * 0.962

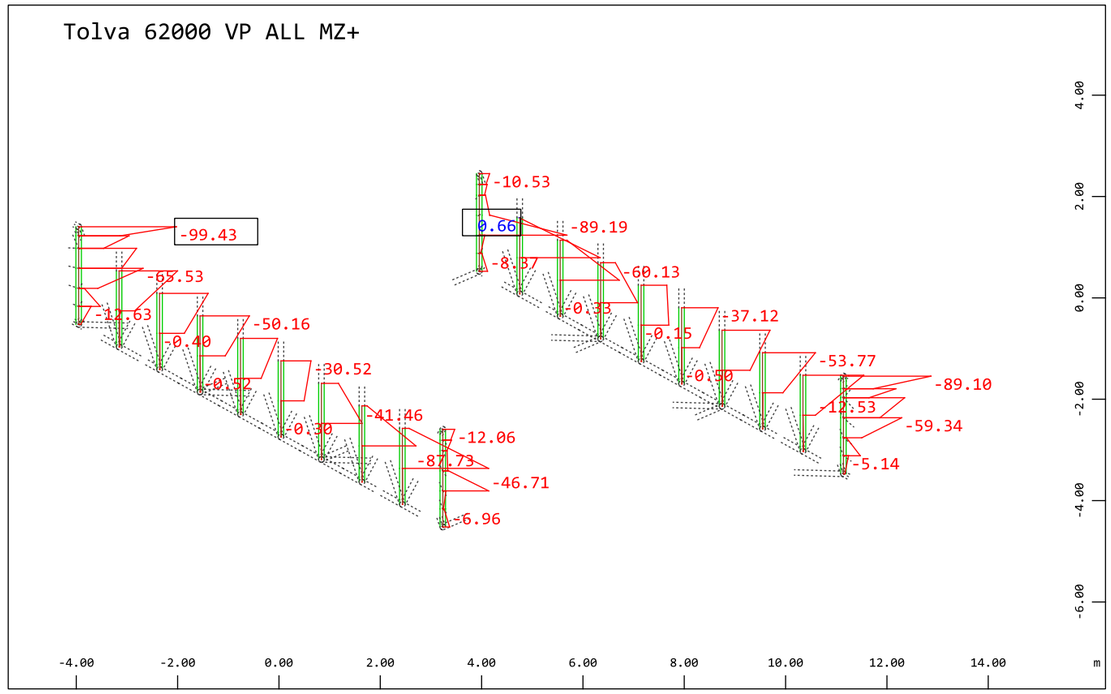



Z Y X Sector of system Group 7 M 1 : 123
Beam Elements , Maximum tensile stress, Design Case 1335 LL-2xSerie 254 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-11.37) (Max=146.60)
X * 0.502
Y * 0.906
Z * 0.962

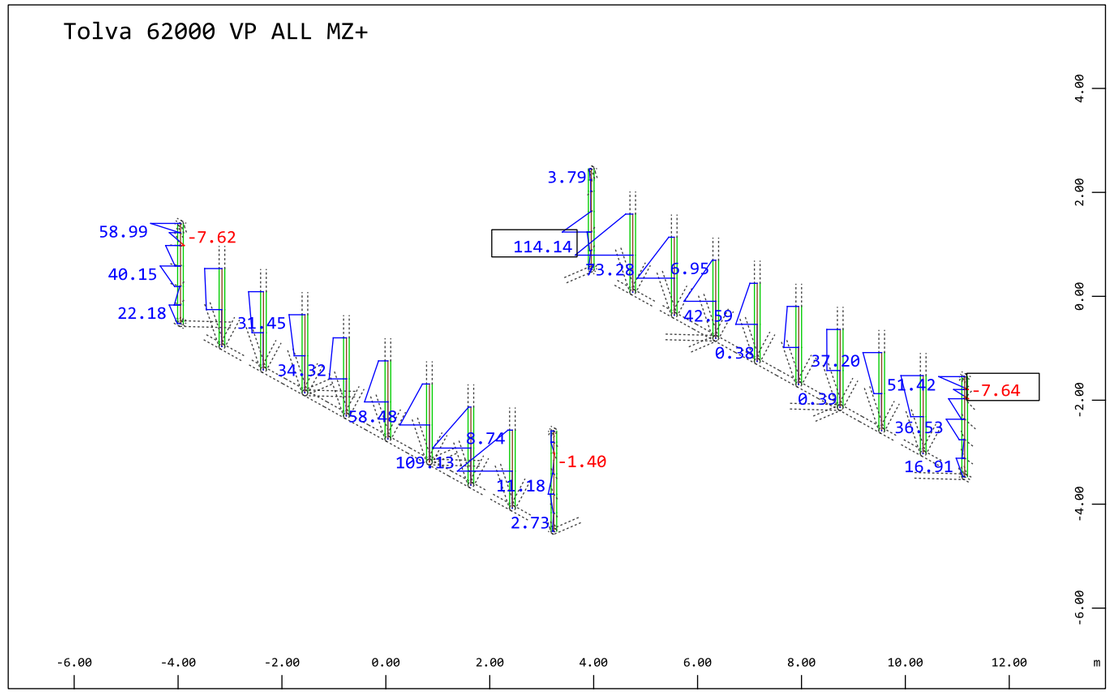
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Pont Carretera Vic
Tensiones



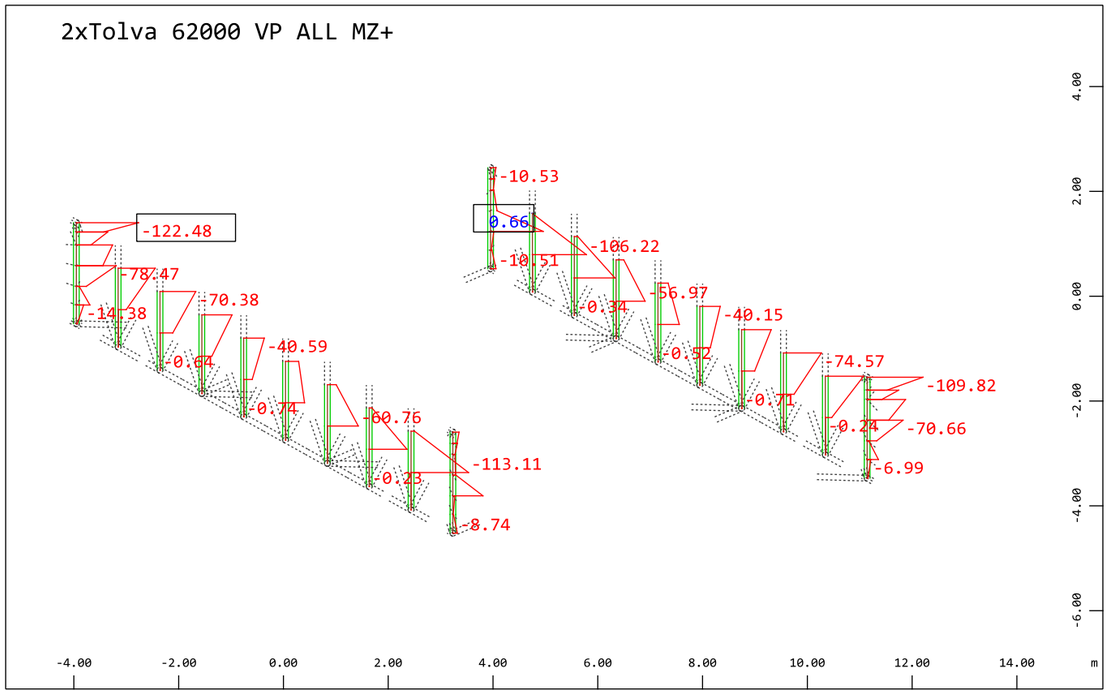

Z Y X Sector of system Group 7 M 1 : 121
Beam Elements , Maximum compression stress, Design Case 1325 Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-99.43) (Max=0.66)
X * 0.502
Y * 0.906
Z * 0.962




Z Y X Sector of system Group 7 M 1 : 118
Beam Elements , Maximum tensile stress, Design Case 1325 Tolva 62000 VP ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-7.64) (Max=114.14)
X * 0.502
Y * 0.906
Z * 0.962

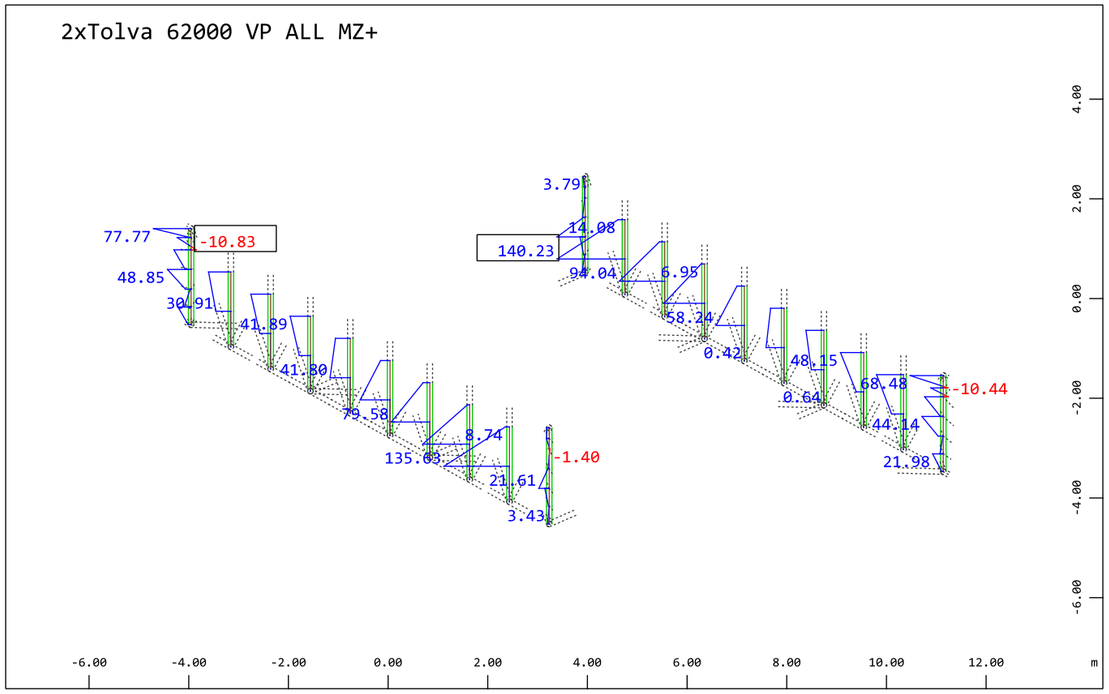
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Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1355 2xTolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-122.48) (Max=0.66)

M 1 : 117
X * 0.502
Y * 0.906
Z * 0.962



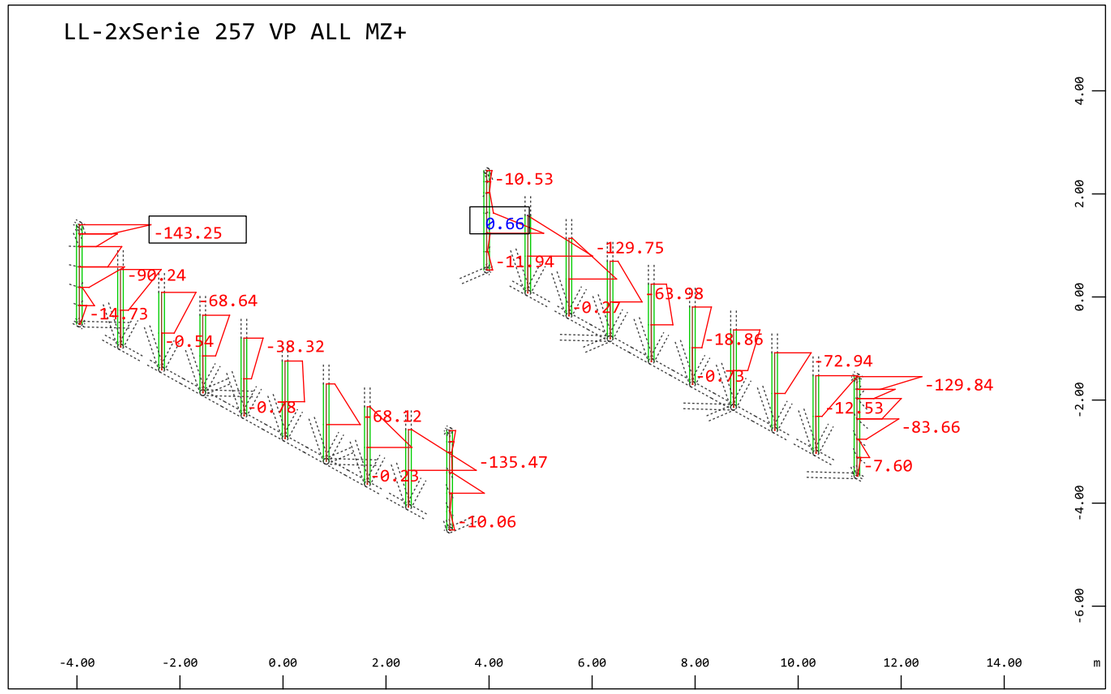

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1355 2xTolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-10.83) (Max=140.23)

M 1 : 123
X * 0.502
Y * 0.906
Z * 0.962

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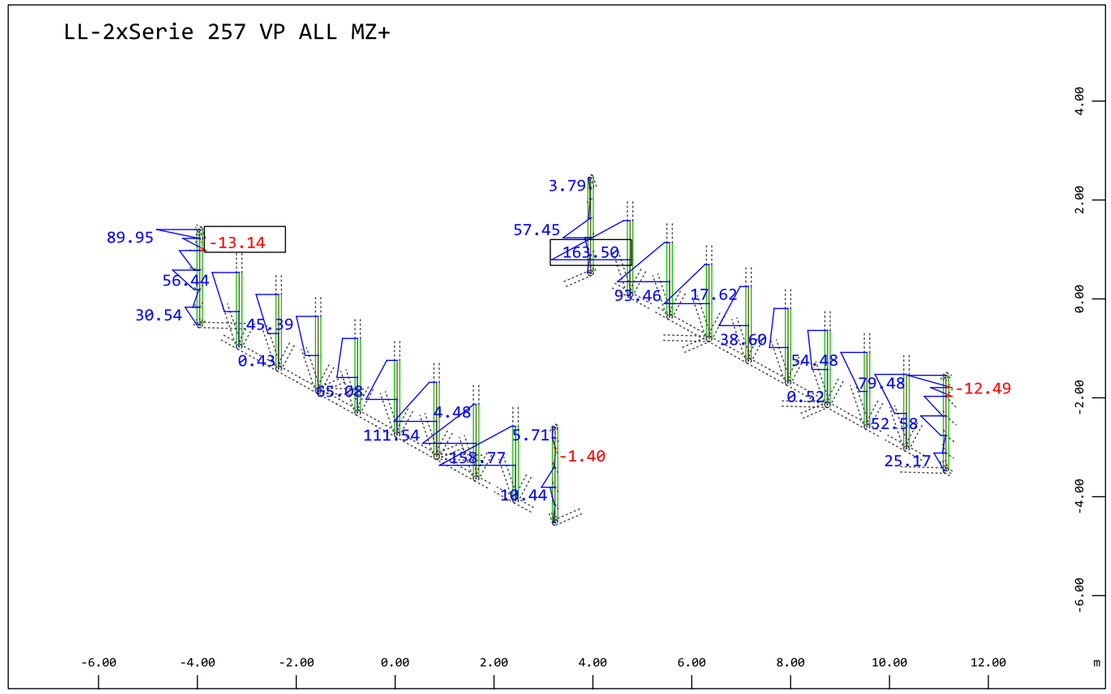


Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1345 LL-2xSerie 257 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-143.25) (Max=0.66)

M 1 : 119
X * 0.502
Y * 0.906
Z * 0.962

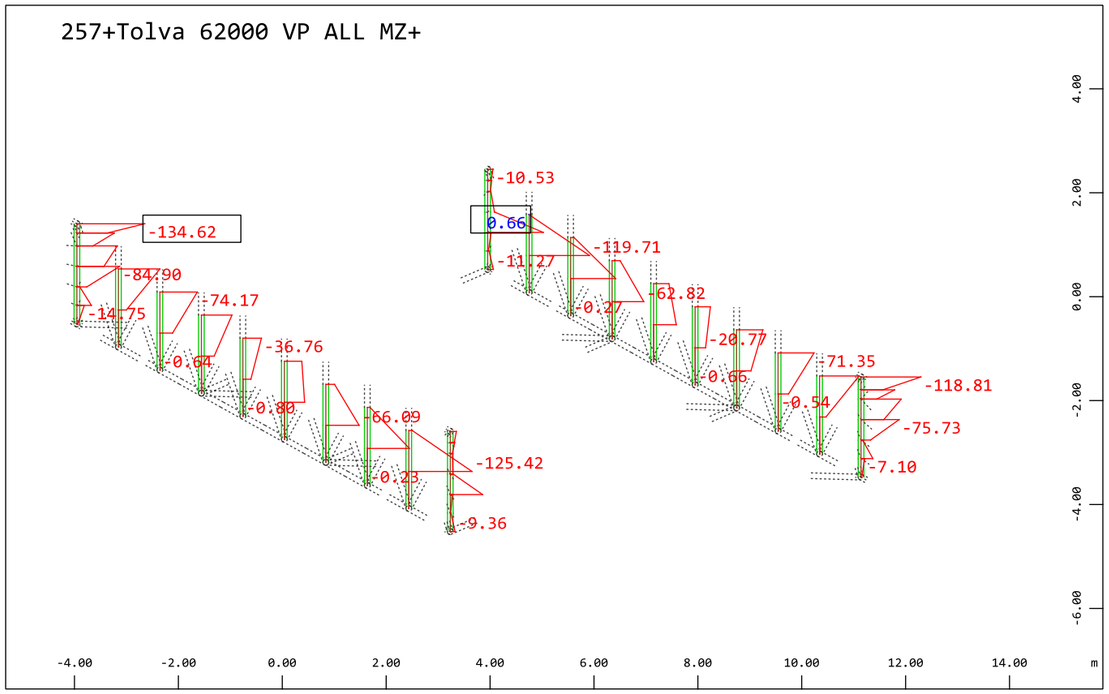



Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1345 LL-2xSerie 257 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-13.14) (Max=163.50)

M 1 : 124
X * 0.502
Y * 0.906
Z * 0.962

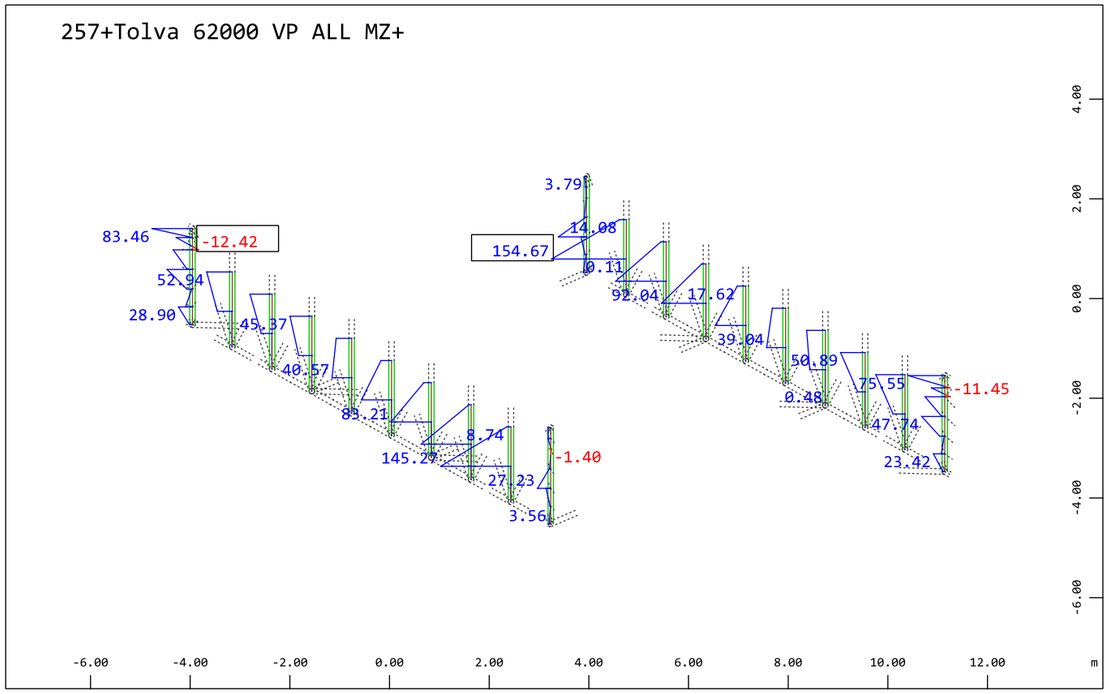
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Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1375 257+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-134.62) (Max=0.66)

M 1 : 118
X * 0.502
Y * 0.906
Z * 0.962



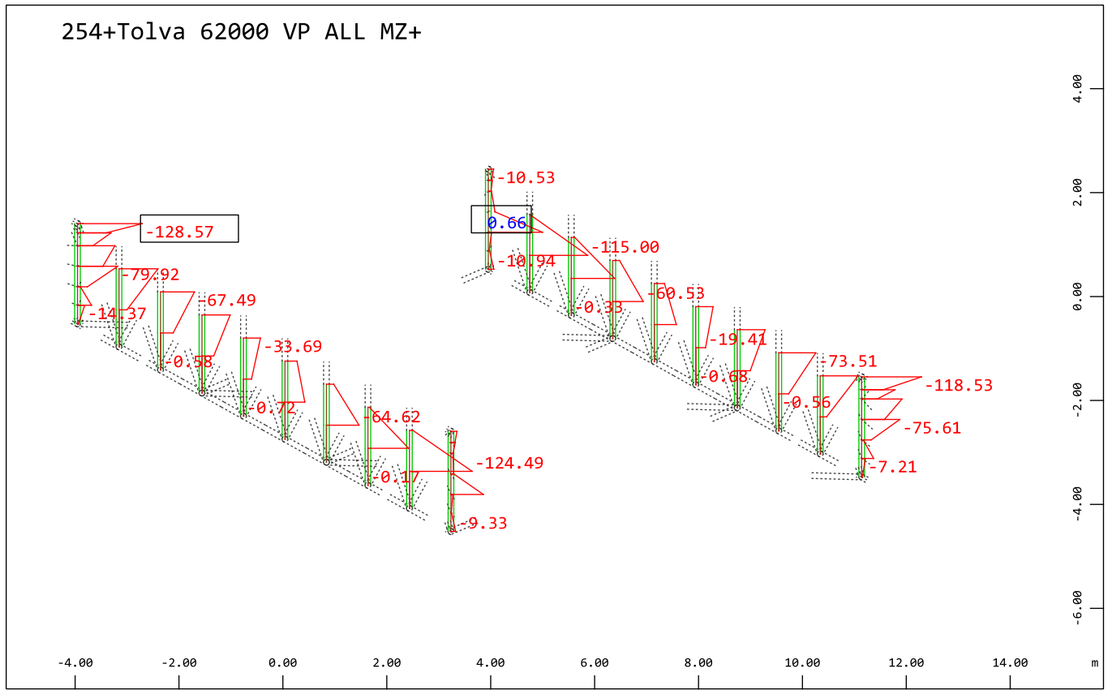

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1375 257+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-12.42) (Max=154.67)

M 1 : 123
X * 0.502
Y * 0.906
Z * 0.962

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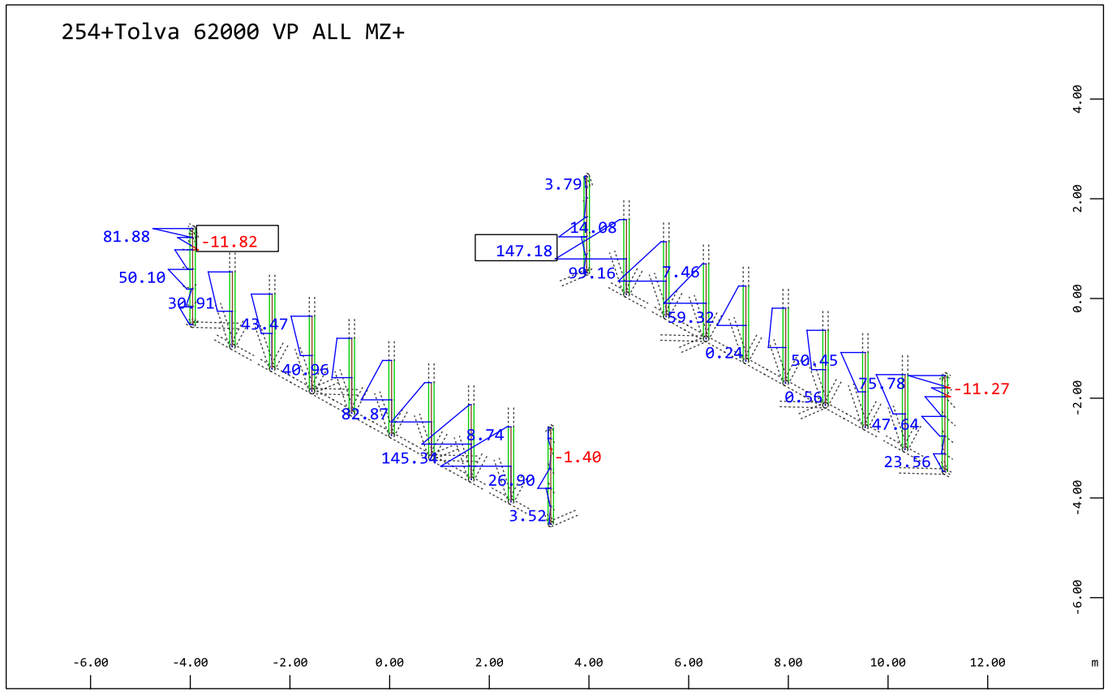


Pont Carretera Vic
Tensiones




Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1365 254+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-128.57) (Max=0.66)

M 1 : 118
X * 0.502
Y * 0.906
Z * 0.962

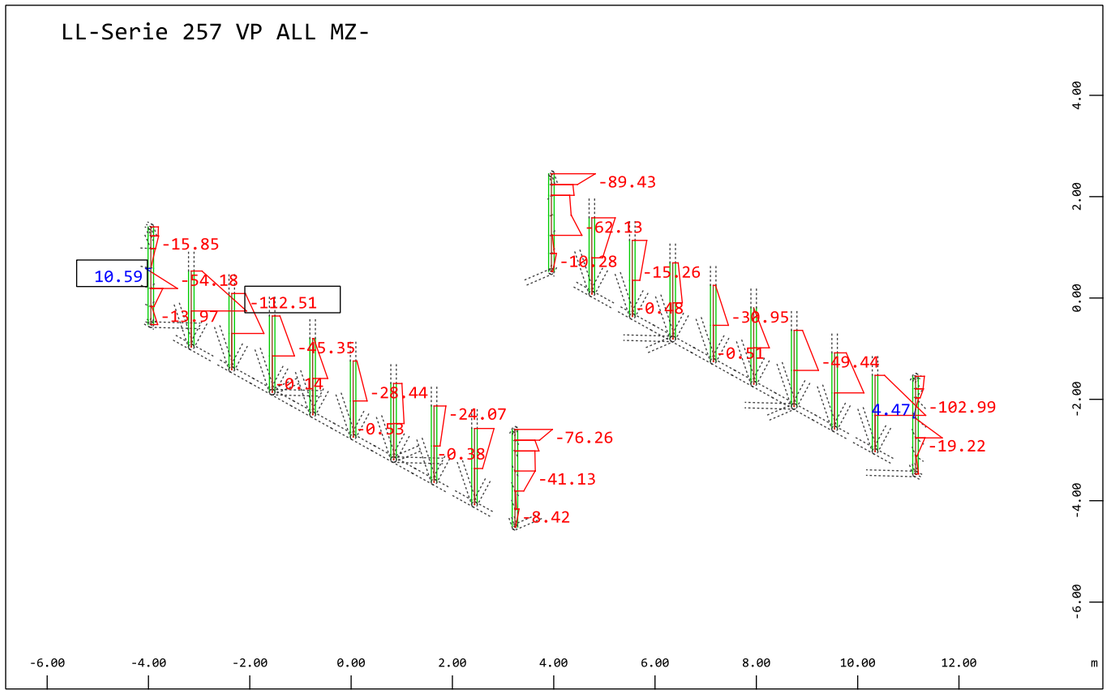



Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1365 254+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-11.82) (Max=147.18)

M 1 : 123
X * 0.502
Y * 0.906
Z * 0.962

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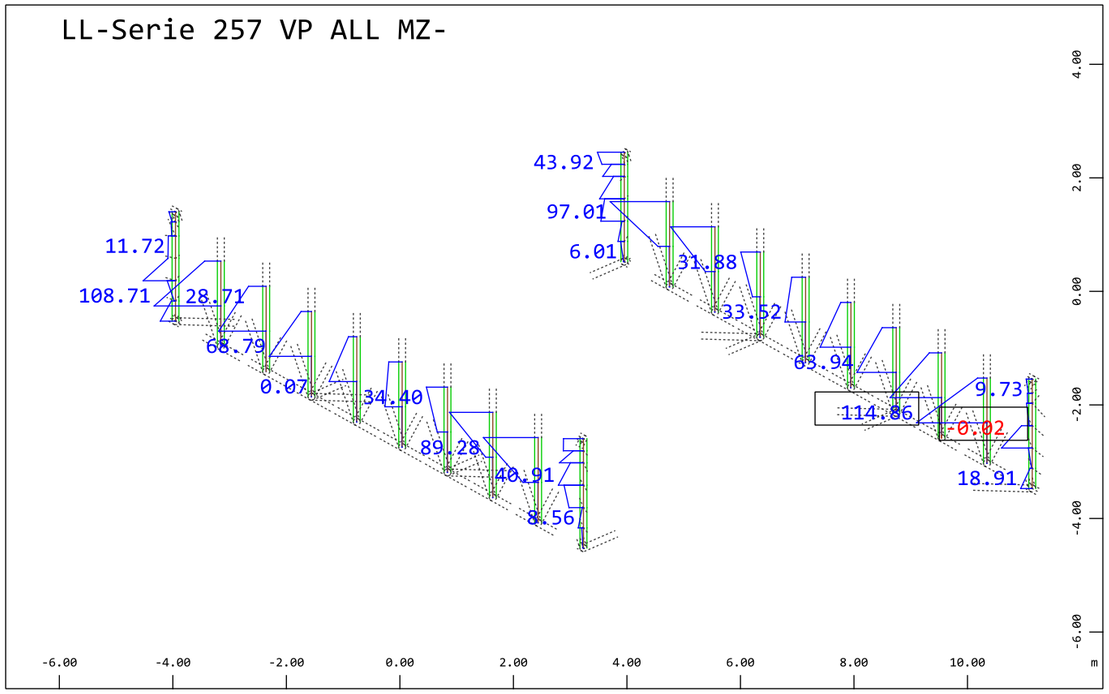
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1316 LL-Serie 257 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-112.51) (Max=10.59)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

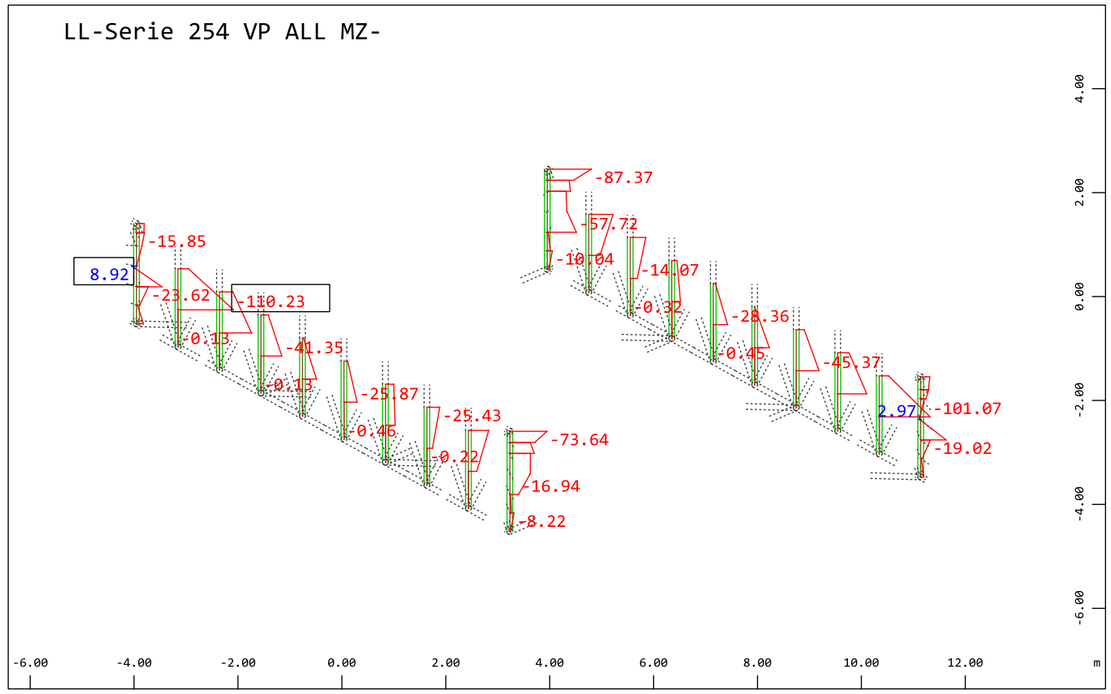
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1316 LL-Serie 257 VP ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=114.86)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962

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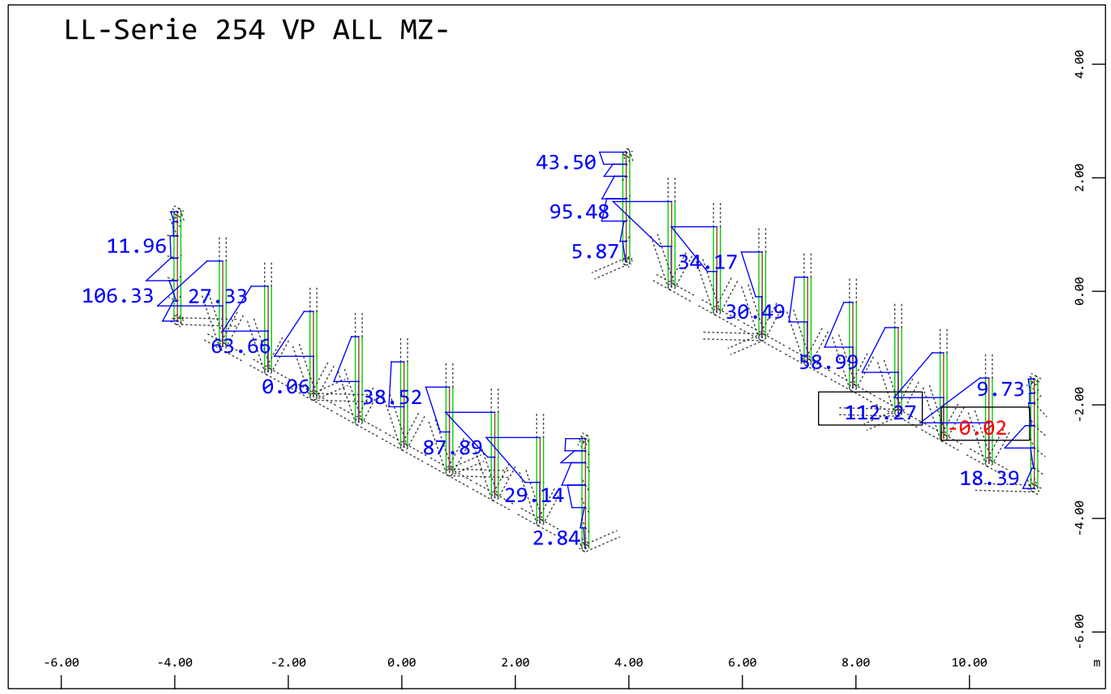
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1306 LL-Serie 254 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-110.23) (Max=8.92)

M 1 : 118
X * 0.502
Y * 0.906
Z * 0.962



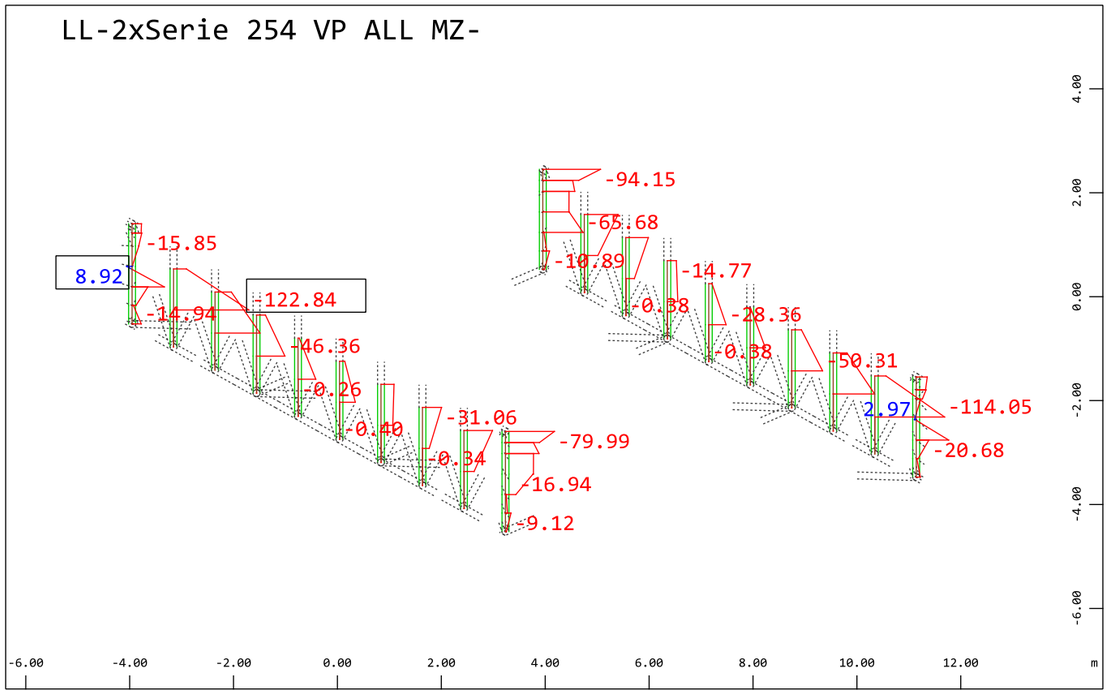

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1306 LL-Serie 254 VP ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=112.27)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962

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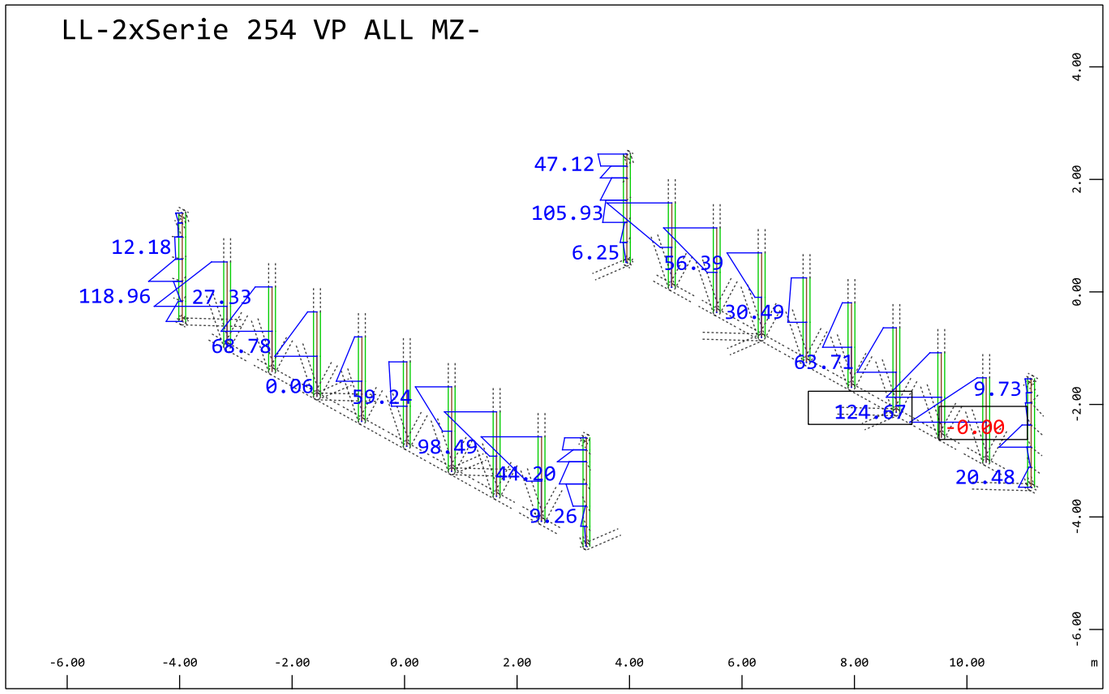
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1326 Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-91.99) (Max=10.59)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1326 Tolva 62000 VP ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-0.02) (Max=95.08)

M 1 : 111
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1336 LL-2xSerie 254 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-122.84) (Max=8.92)

M 1 : 118
X * 0.502
Y * 0.906
Z * 0.962



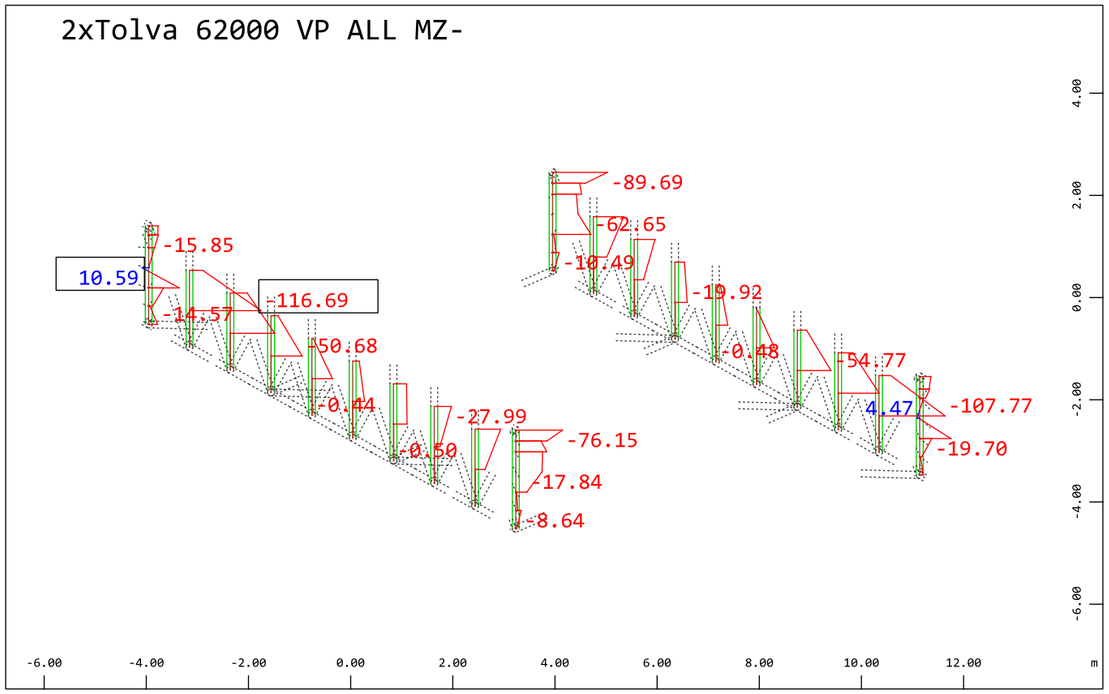

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1336 LL-2xSerie 254 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.00) (Max=124.67)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

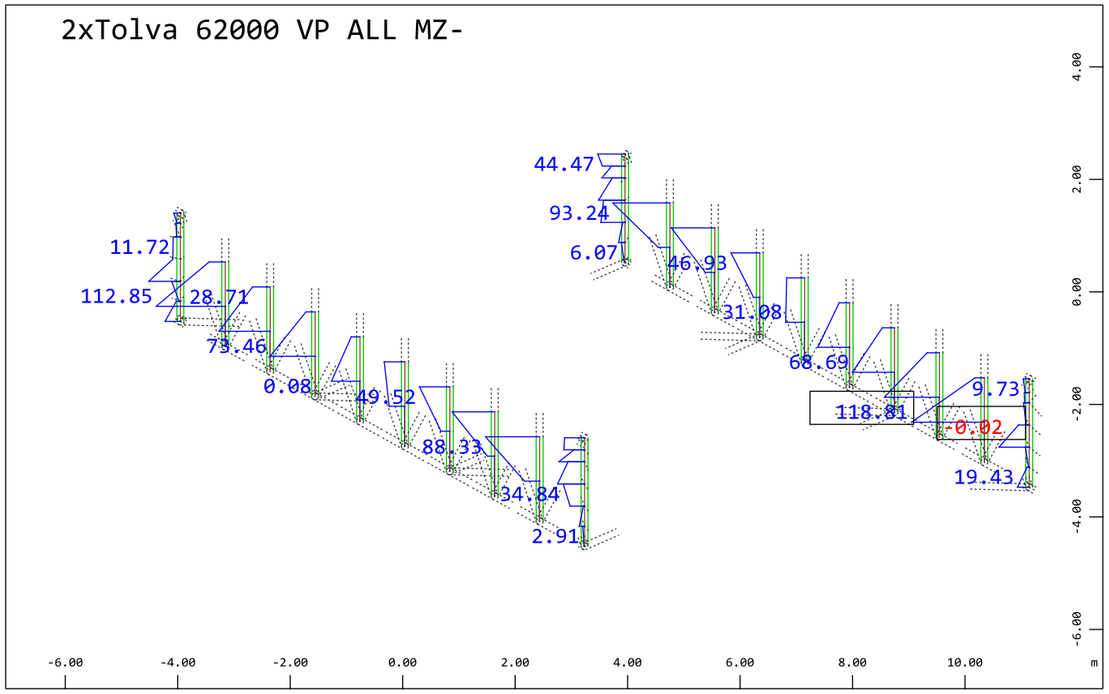
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Pont Carretera Vic
Tensiones




Z Y X
Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1356 2xTolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-116.69) (Max=10.59)

M 1 : 120
X * 0.502
Y * 0.906
Z * 0.962



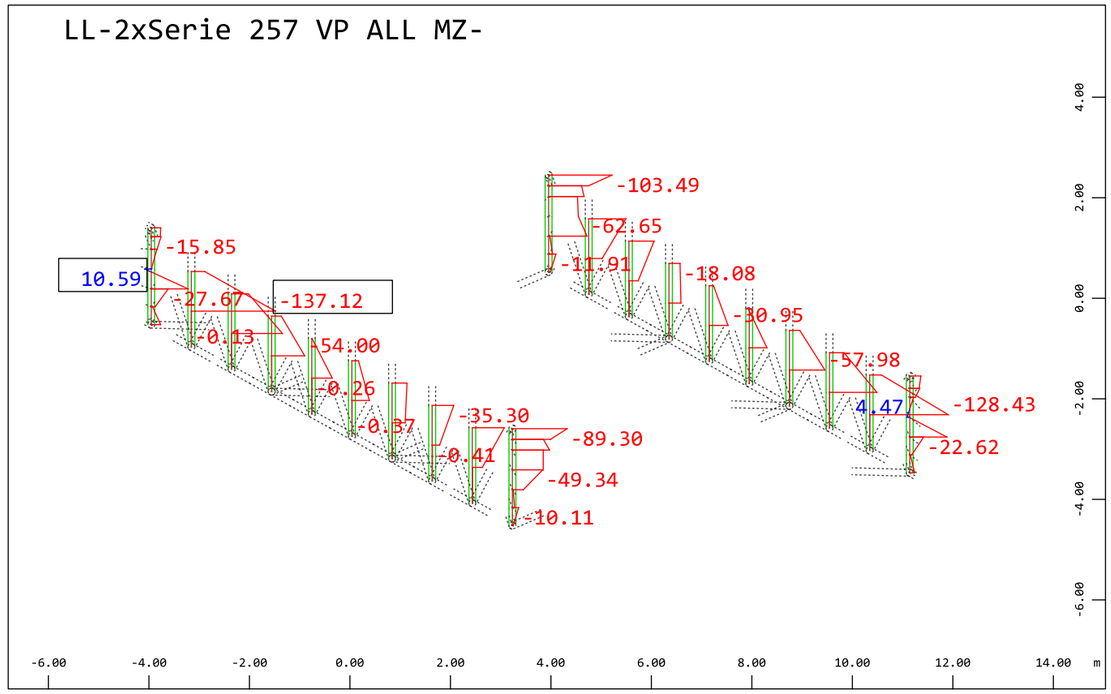

Z Y X
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1356 2xTolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=118.81)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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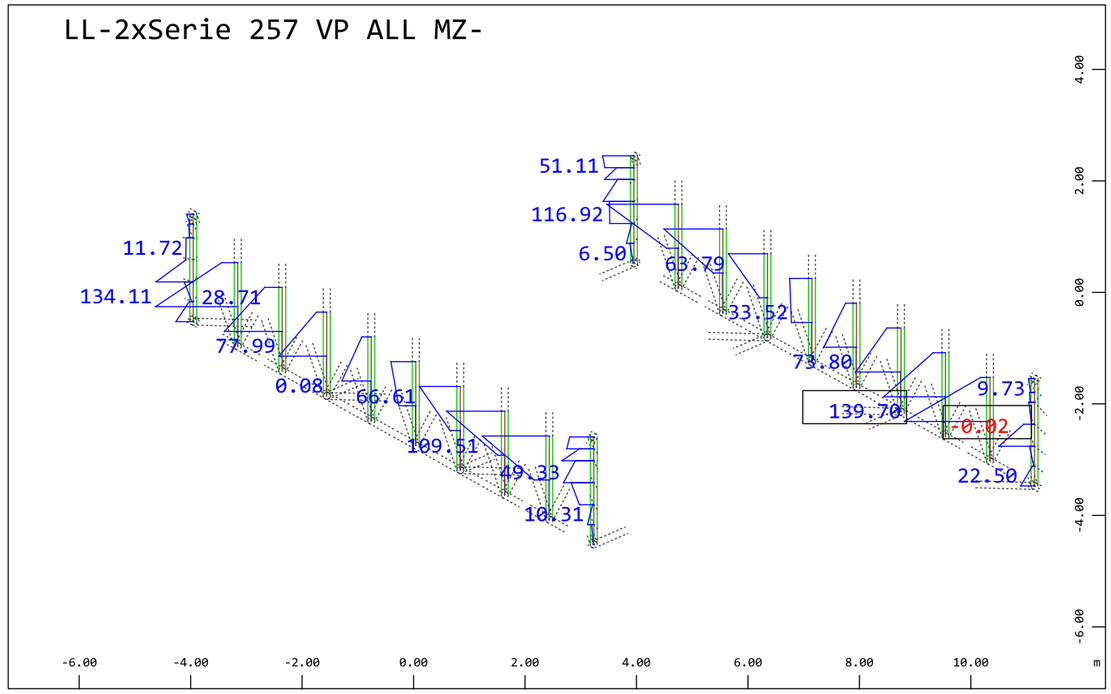


Pont Carretera Vic
Tensiones




Z Y X
Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1346 LL-2xSerie 257 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-137.12) (Max=10.59)

M 1 : 122
X * 0.502
Y * 0.906
Z * 0.962

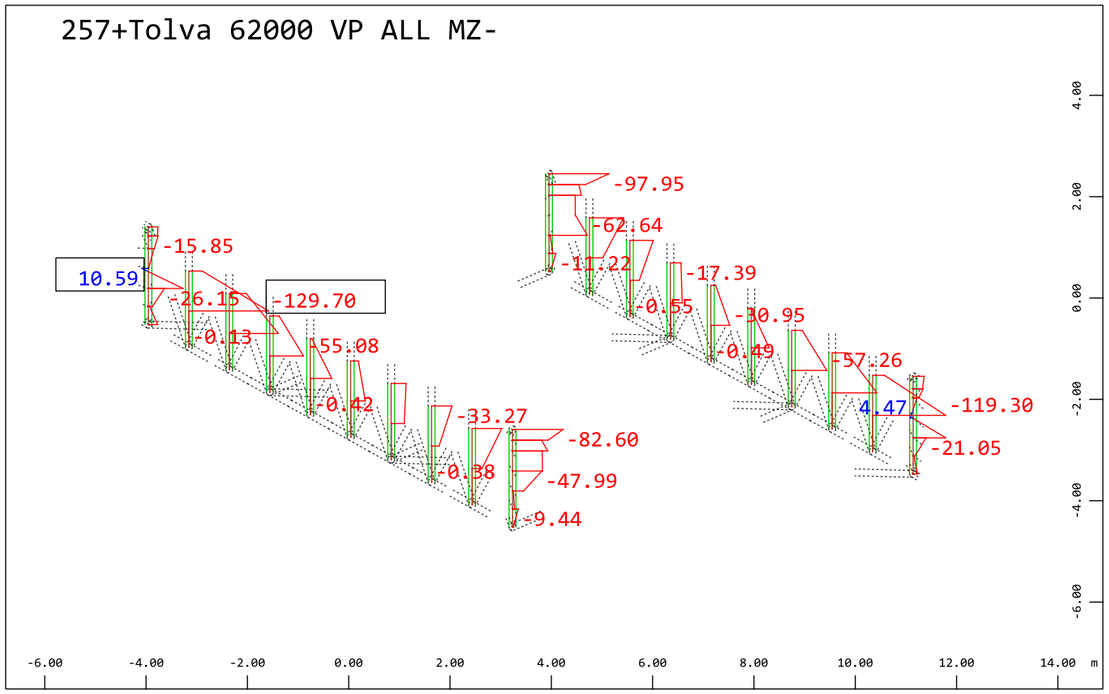



Z Y X
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1346 LL-2xSerie 257 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=139.70)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962

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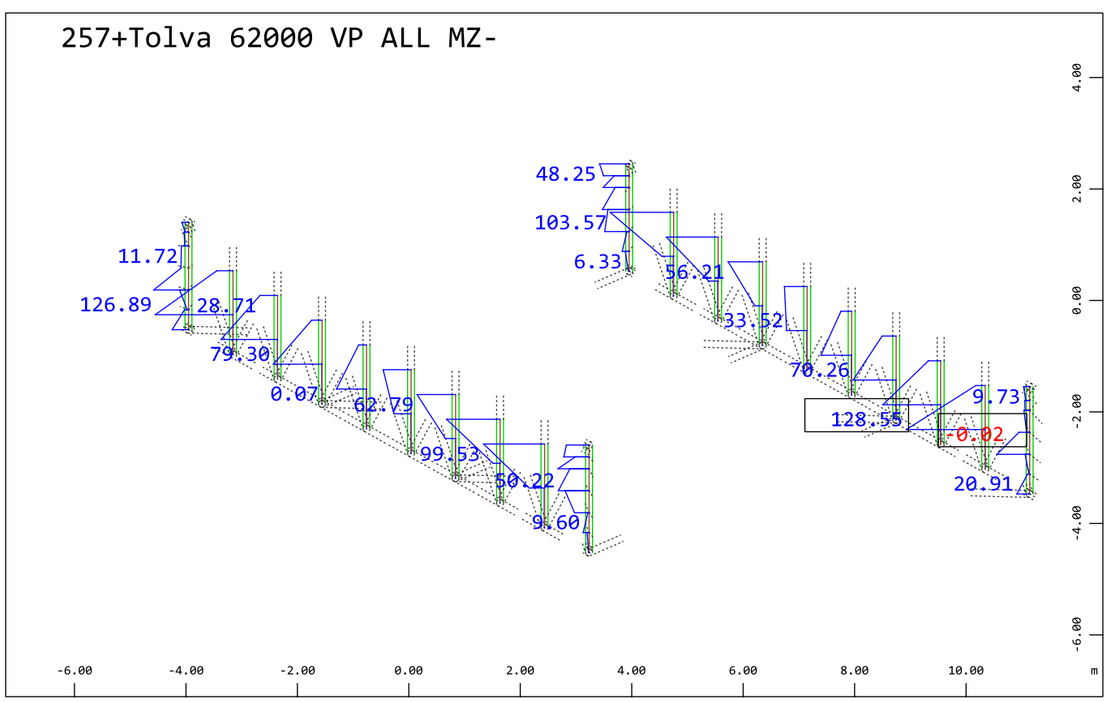
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1376 257+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-129.70) (Max=10.59)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

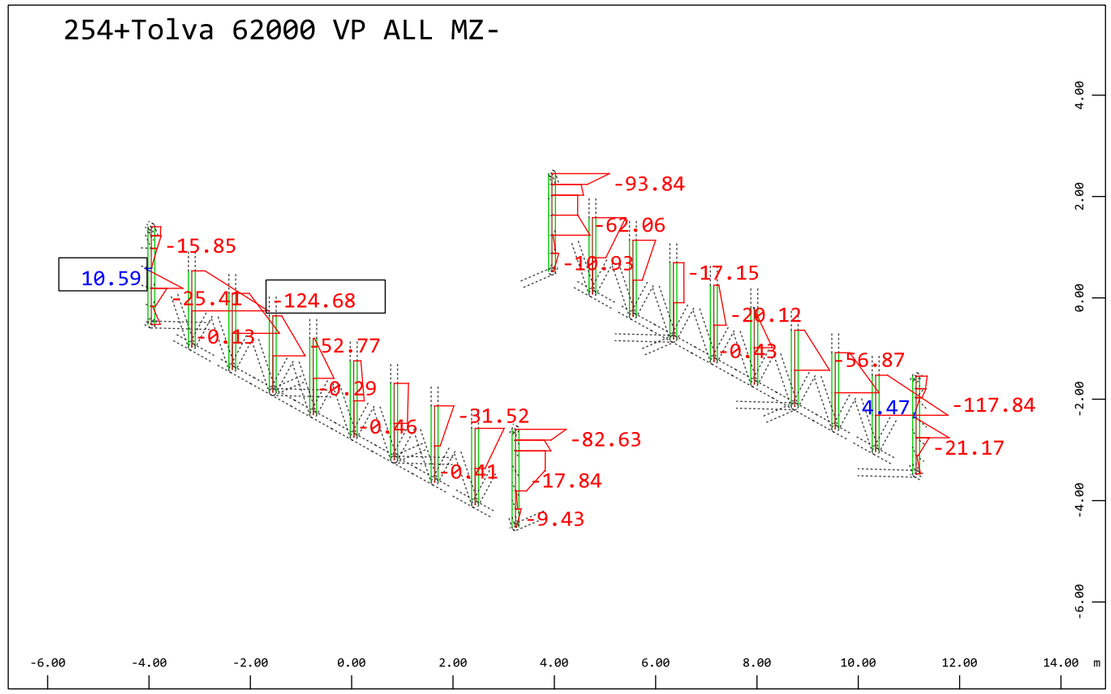
Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1376 257+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=128.55)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962

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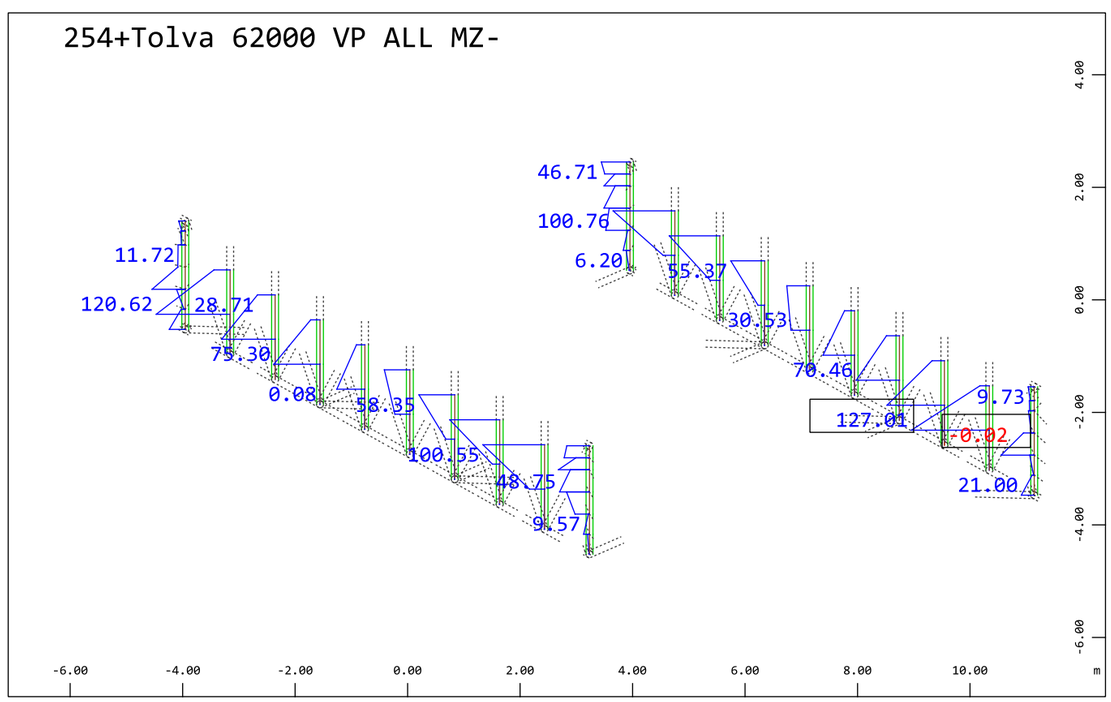
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 7
Beam Elements , Maximum compression stress, Design Case 1366 254+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-124.68) (Max=10.59)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962



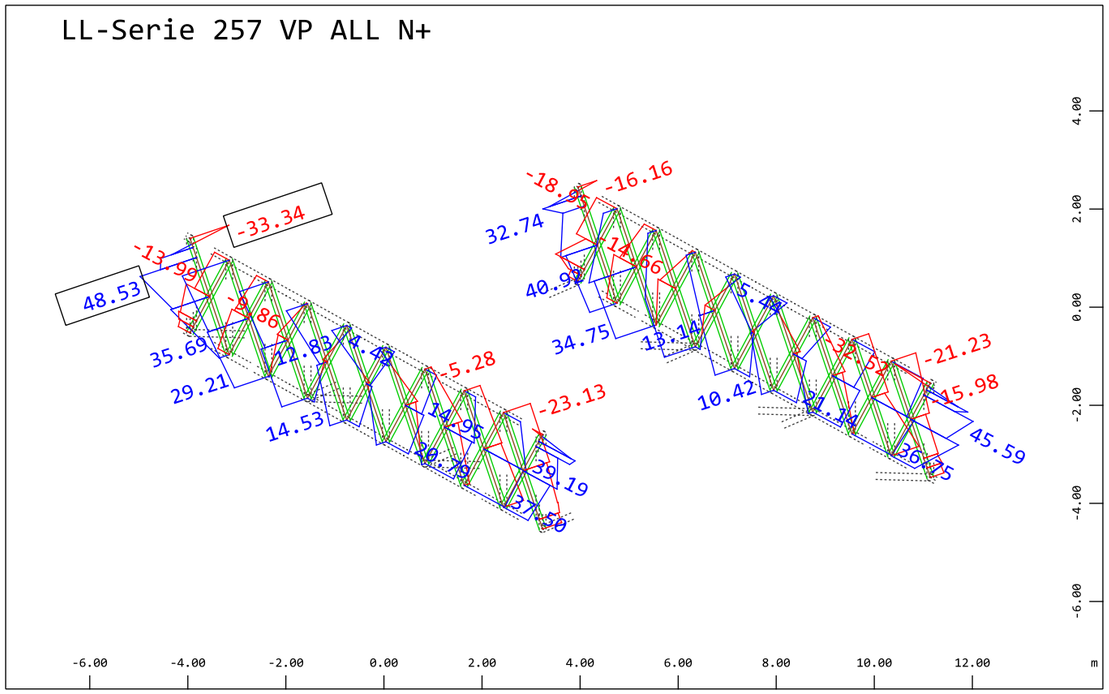

Z
Y
X

Sector of system Group 7
Beam Elements , Maximum tensile stress, Design Case 1366 254+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-0.02) (Max=127.01)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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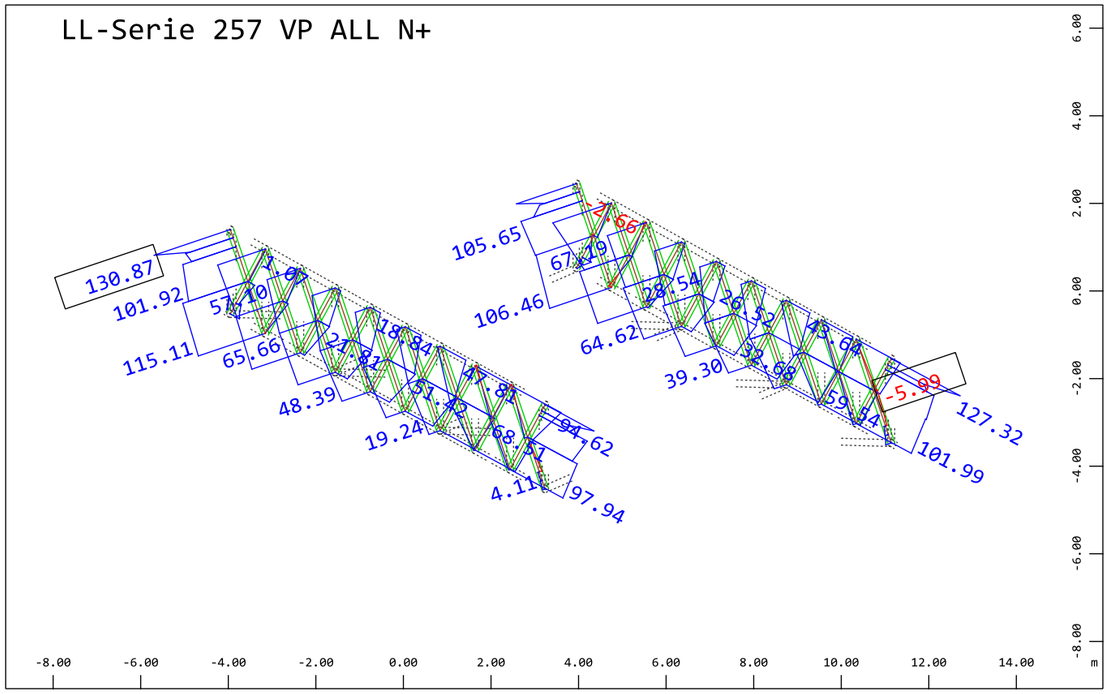
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1311 LL-Serie 257 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-33.34) (Max=48.53)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

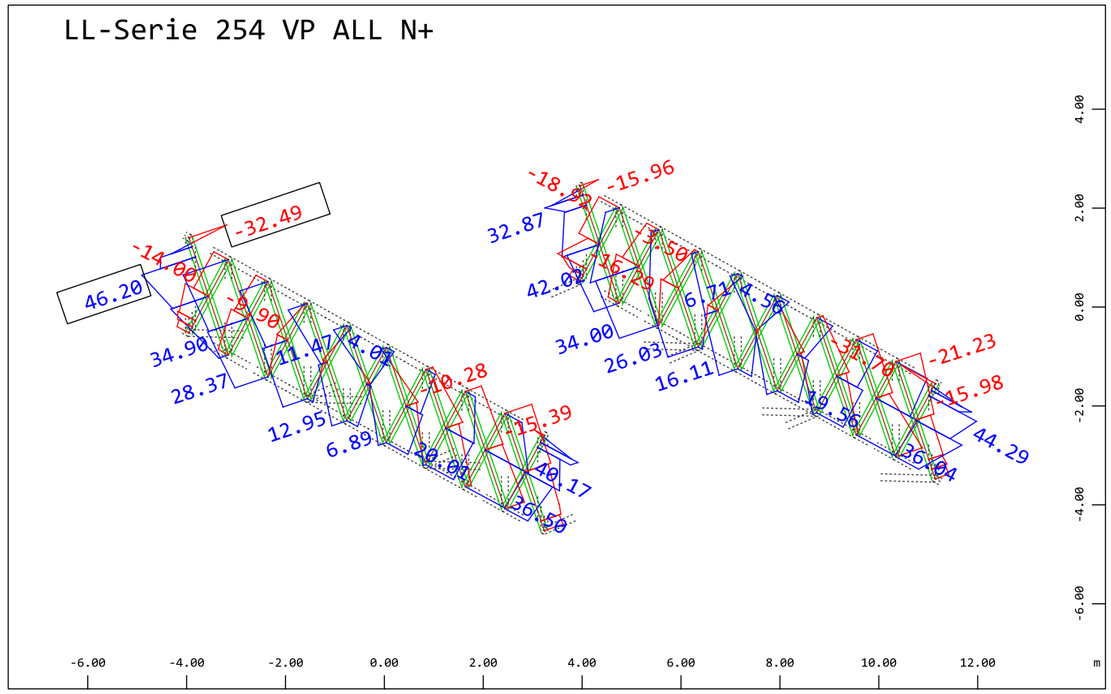
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1311 LL-Serie 257 VP ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-5.99) (Max=130.87)

M 1 : 140
X * 0.502
Y * 0.906
Z * 0.962

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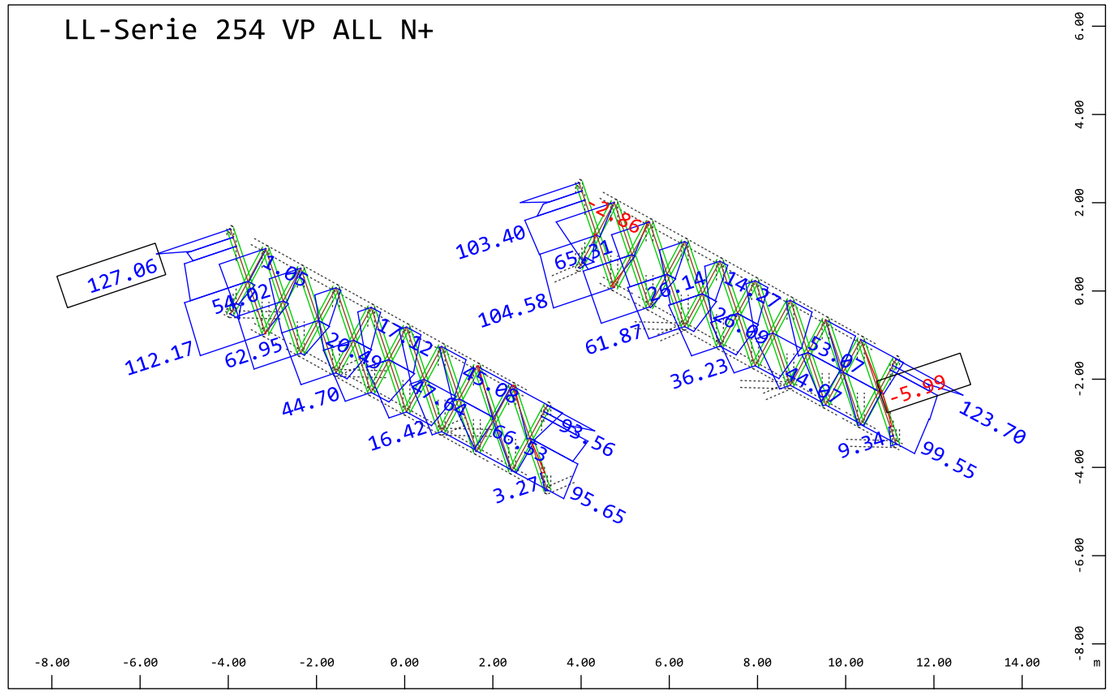
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1301 LL-Serie 254 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-32.49) (Max=46.20)

M 1 : 124
X * 0.502
Y * 0.906
Z * 0.962



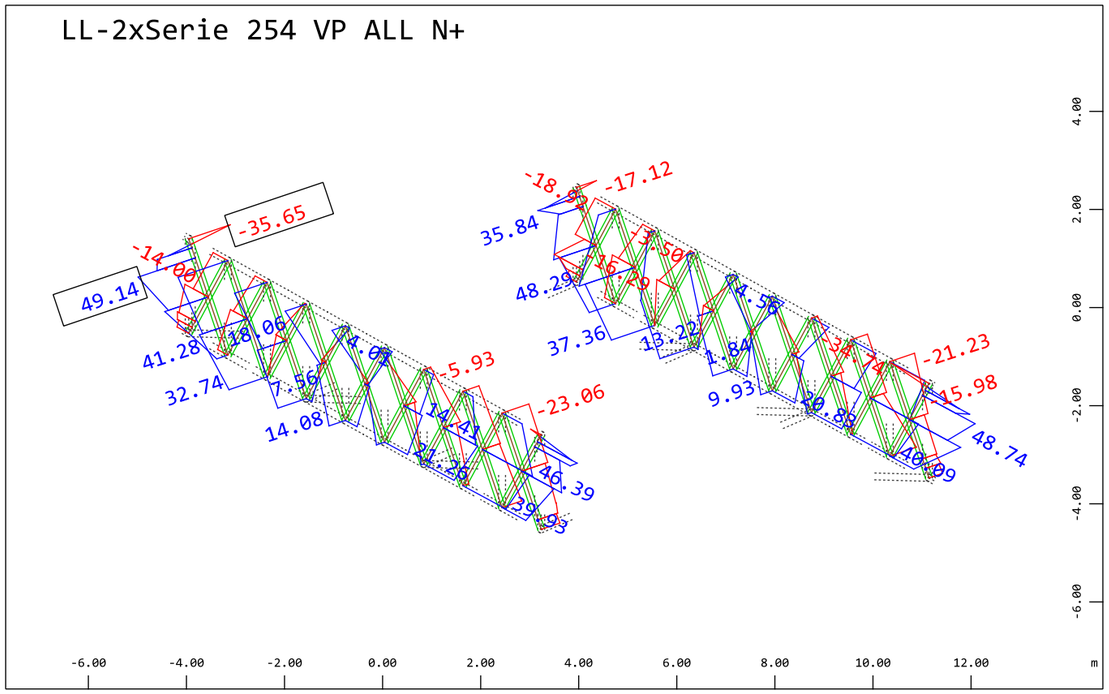

Z
Y
X

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1301 LL-Serie 254 VP ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-5.99) (Max=127.06)

M 1 : 139
X * 0.502
Y * 0.906
Z * 0.962

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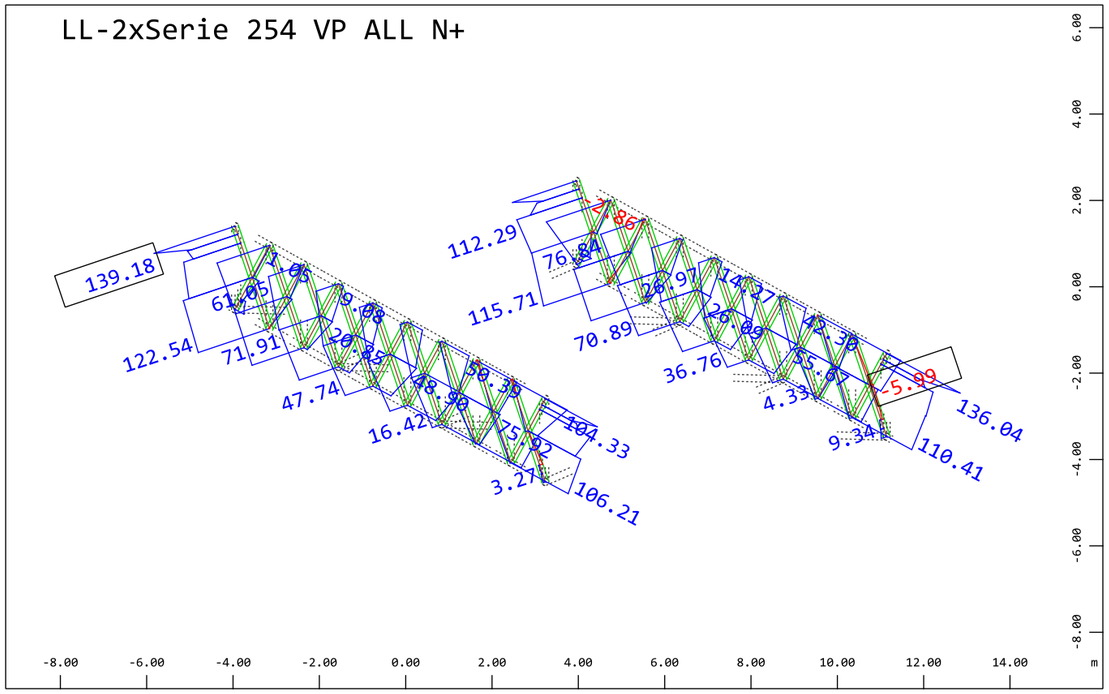
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1331 LL-2xSerie 254 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-35.65) (Max=49.14)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

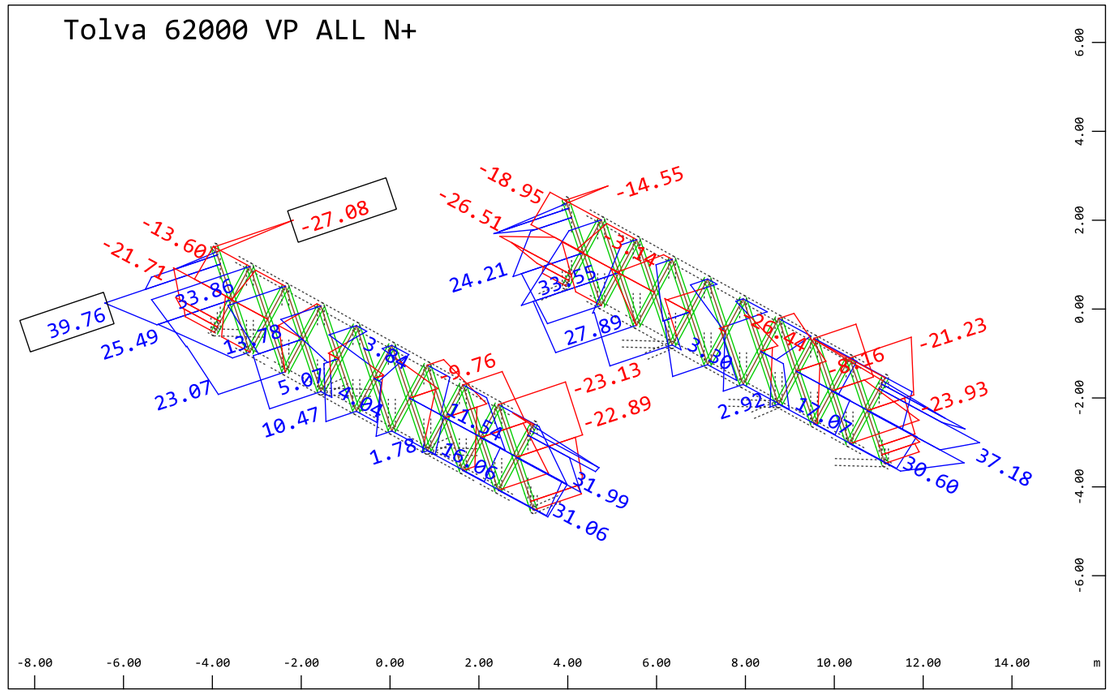
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1331 LL-2xSerie 254 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-5.99) (Max=139.18)

M 1 : 142
X * 0.502
Y * 0.906
Z * 0.962

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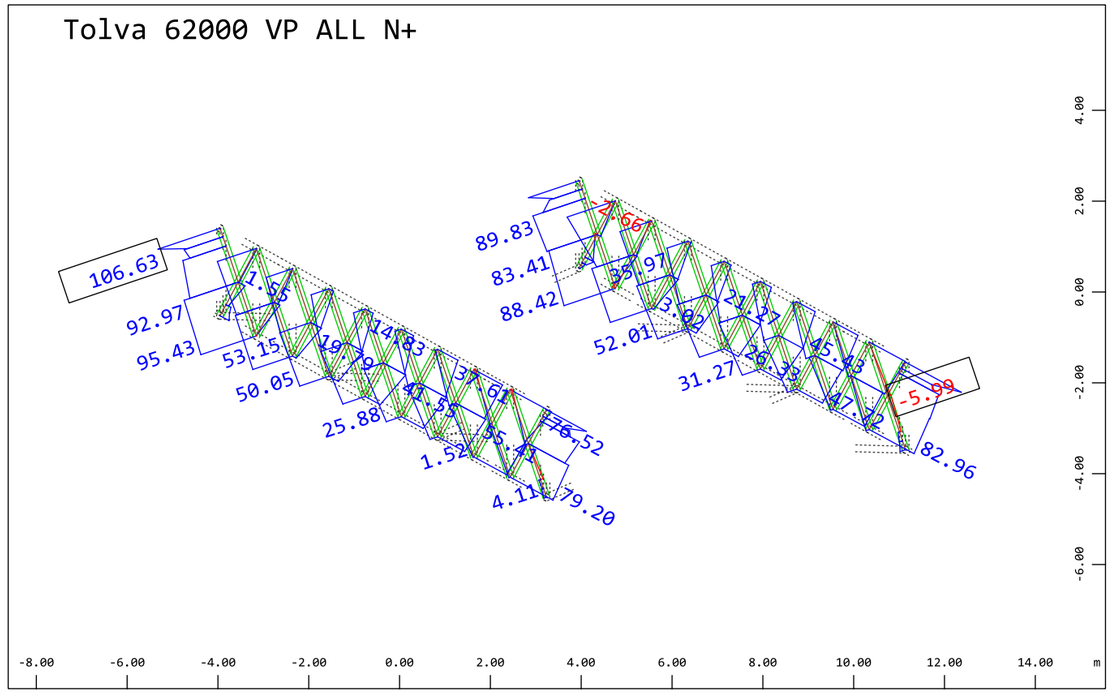
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1321 Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 20.000 MPa (Min=-27.08) (Max=39.76)

M 1 : 138
X * 0.502
Y * 0.906
Z * 0.962



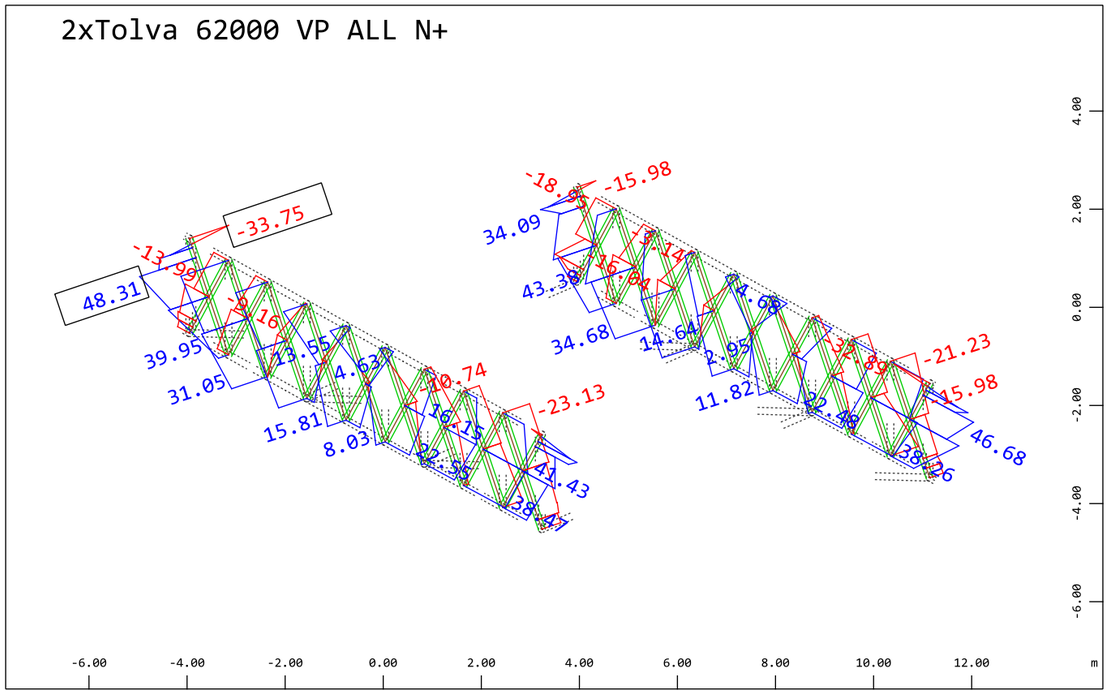

Z
Y
X

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1321 Tolva 62000 VP ALL N+, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-5.99) (Max=106.63)

M 1 : 135
X * 0.502
Y * 0.906
Z * 0.962

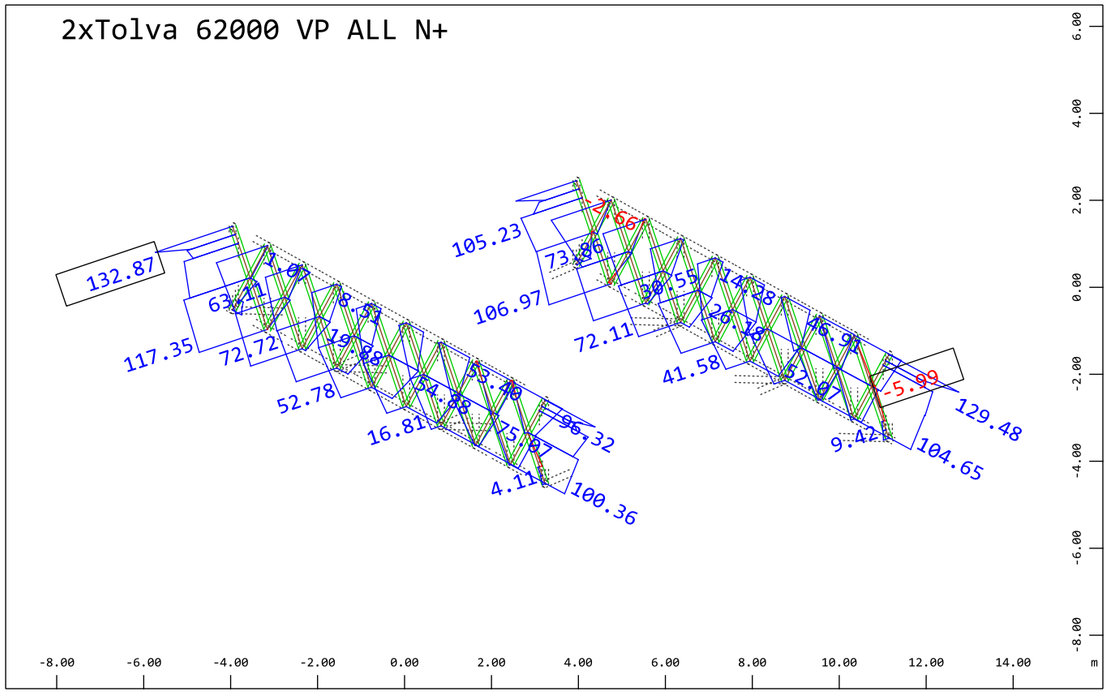
SOFiSTiK AG - www.sofistik.de

Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1351 2xTolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-33.75) (Max=48.31)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962

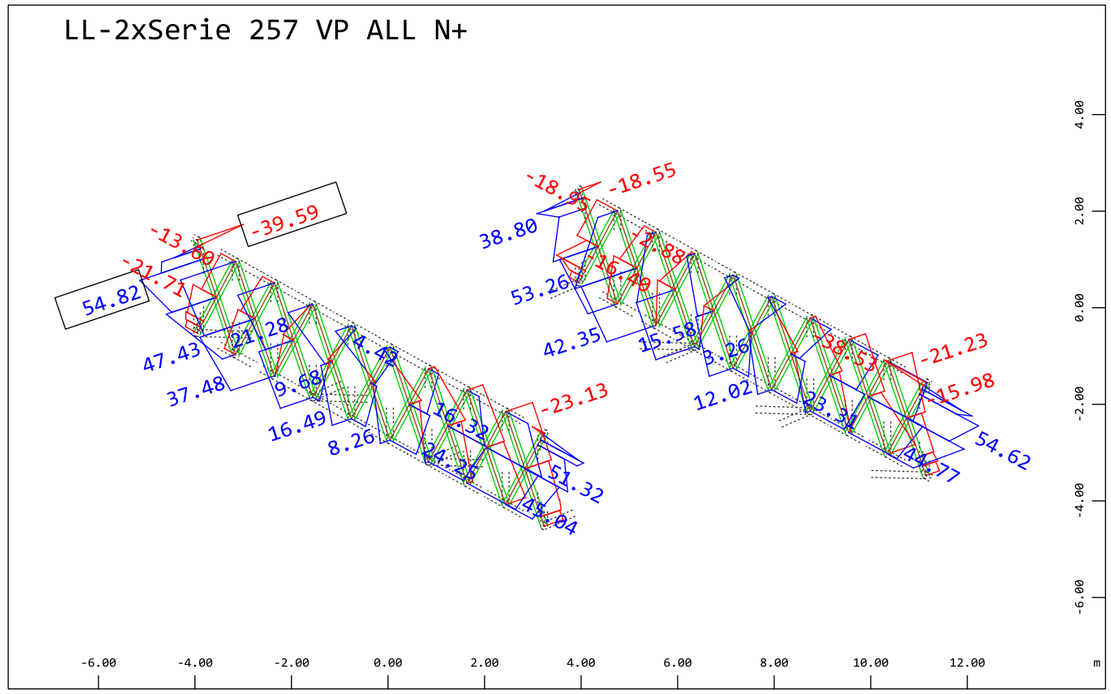



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1351 2xTolva 62000 VP ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-5.99) (Max=132.87)

M 1 : 141
X * 0.502
Y * 0.906
Z * 0.962

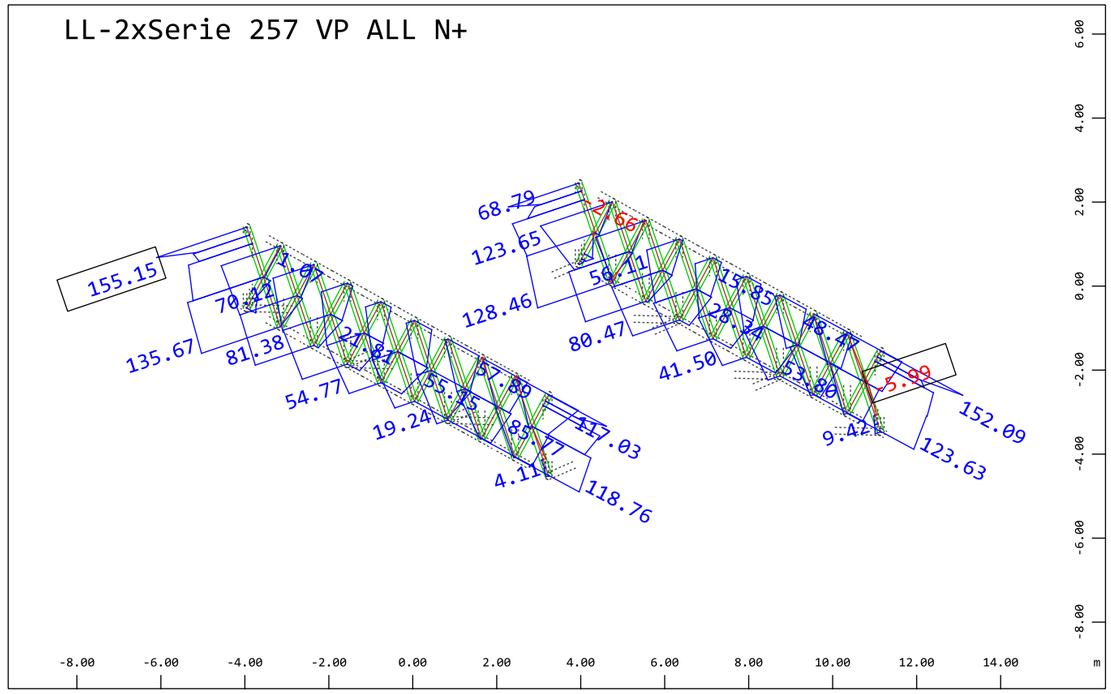


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1341 LL-2xSerie 257 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-39.59) (Max=54.82)

M 1 : 127
X * 0.502
Y * 0.906
Z * 0.962

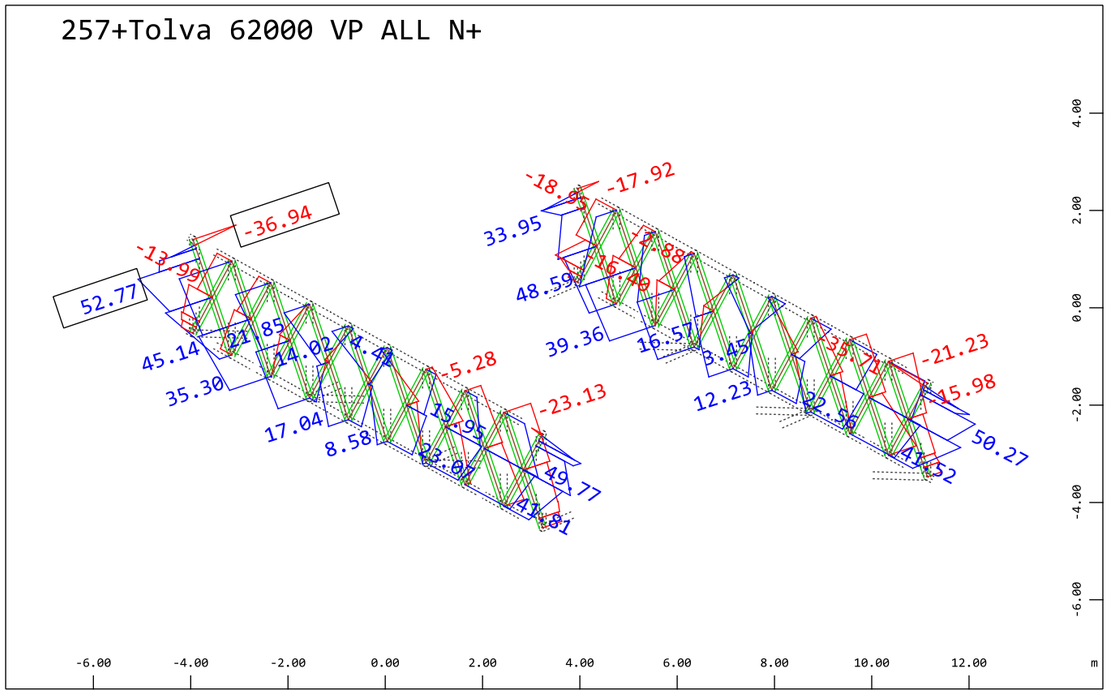



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1341 LL-2xSerie 257 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-5.99) (Max=155.15)

M 1 : 146
X * 0.502
Y * 0.906
Z * 0.962

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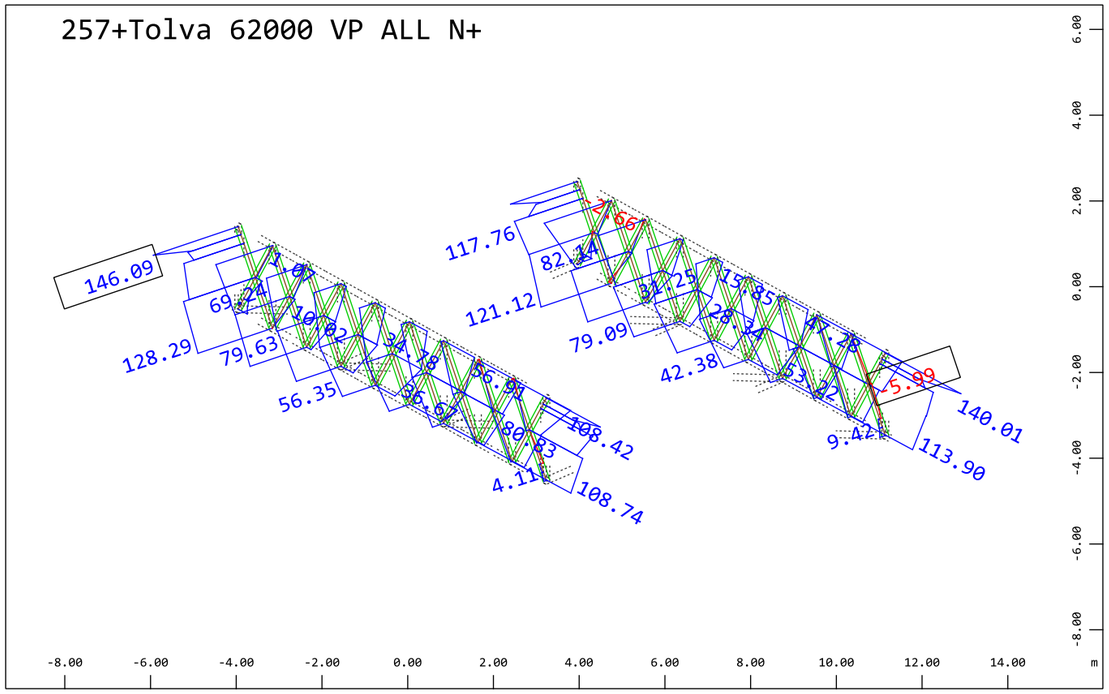
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1371 257+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-36.94) (Max=52.77)

M 1 : 126
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

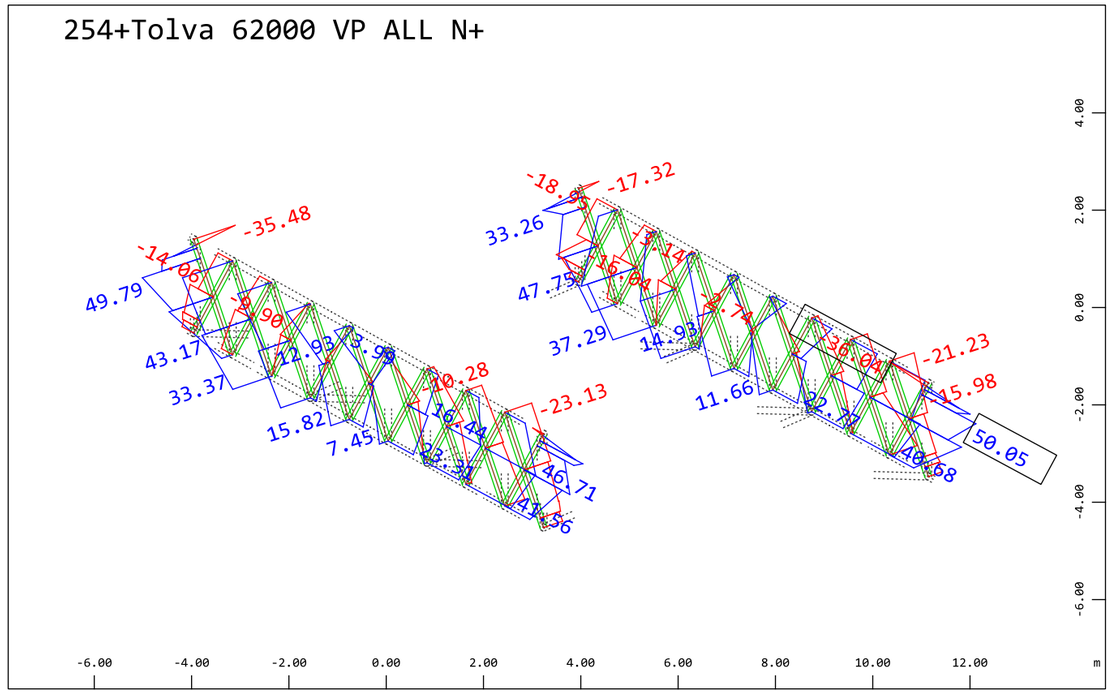
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1371 257+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-5.99) (Max=146.09)

M 1 : 143
X * 0.502
Y * 0.906
Z * 0.962

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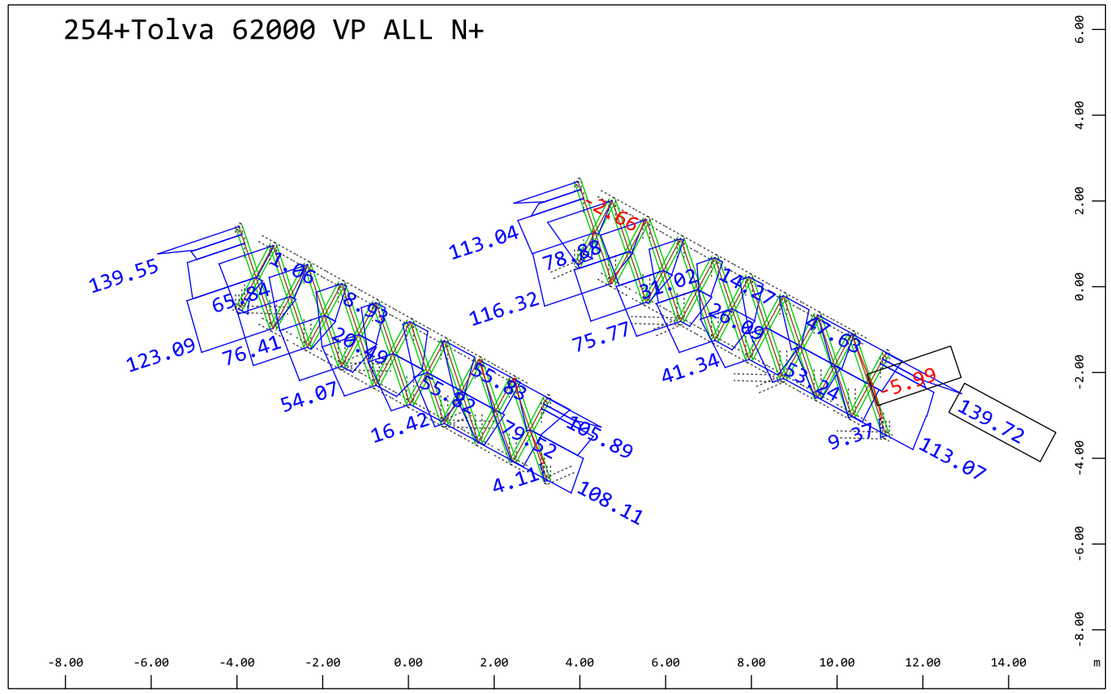
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1361 254+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-36.04) (Max=50.05)

M 1 : 126
X * 0.502
Y * 0.906
Z * 0.962



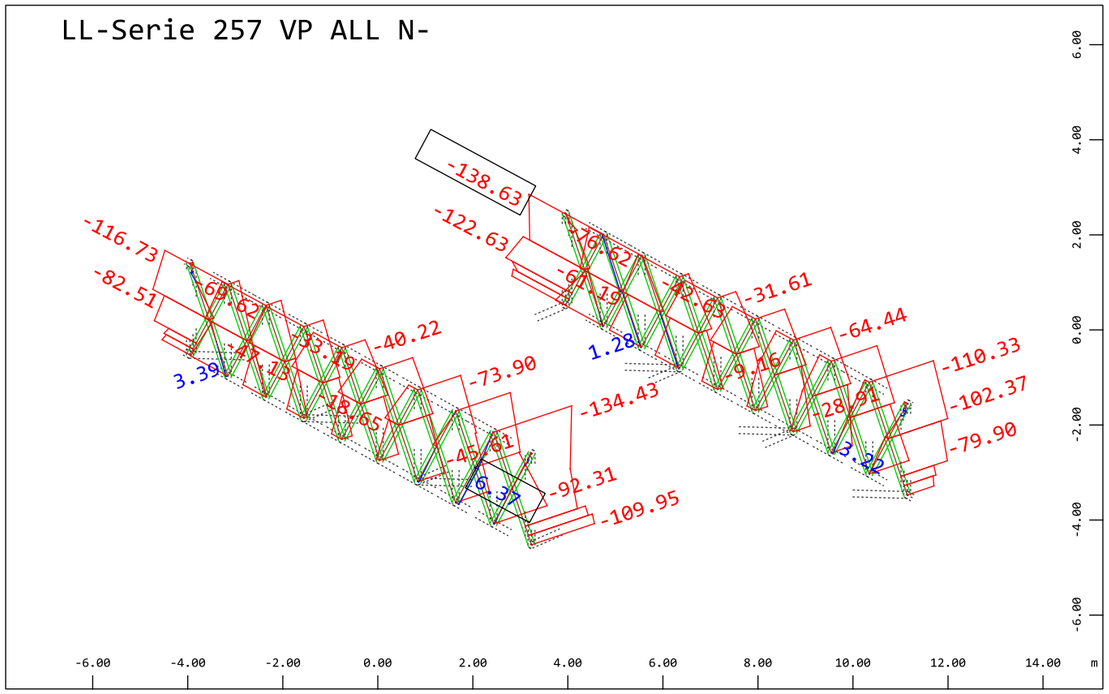

Z
Y
X

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1361 254+Tolva 62000 VP ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-5.99) (Max=139.72)

M 1 : 143
X * 0.502
Y * 0.906
Z * 0.962

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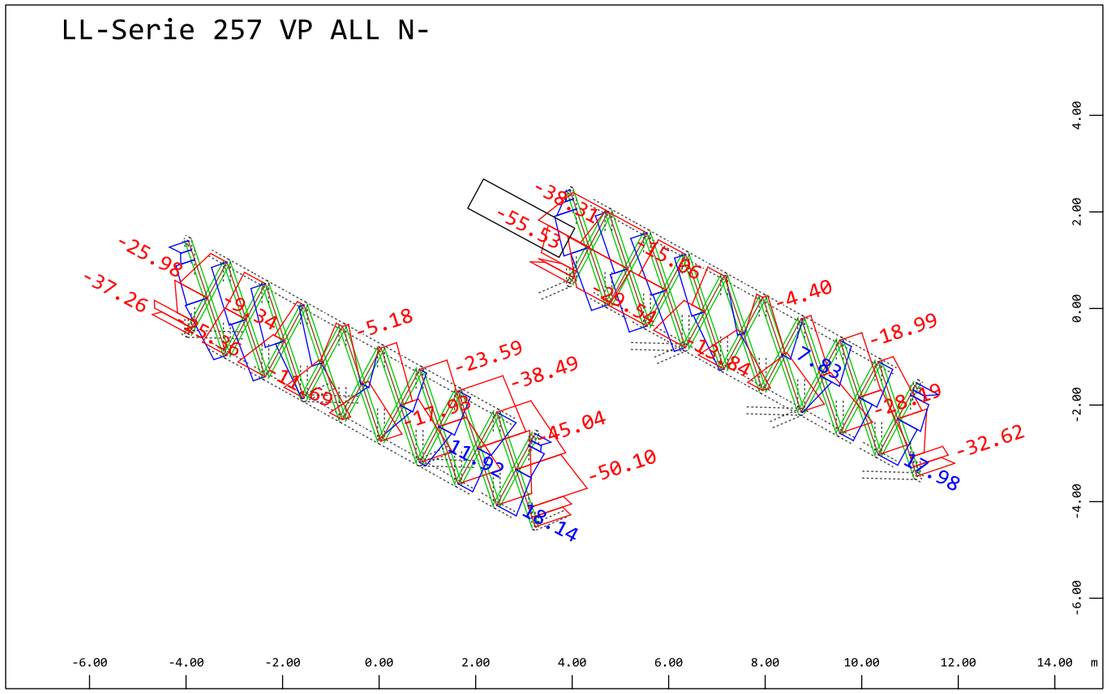
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1312 LL-Serie 257 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-138.63) (Max=6.37)

M 1 : 129
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

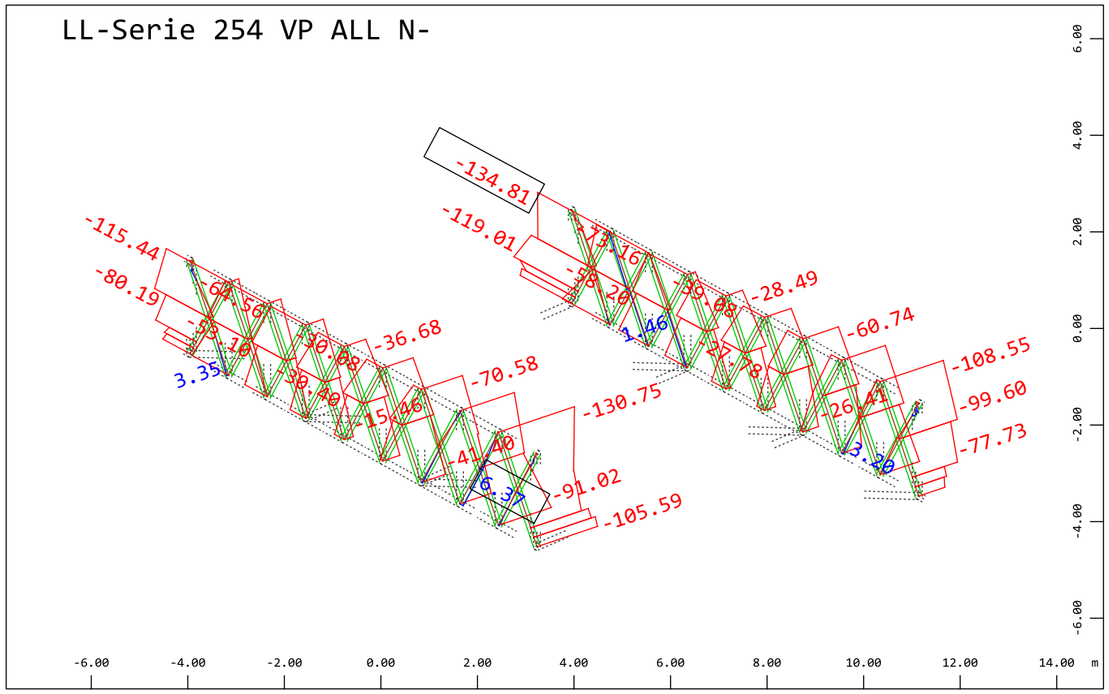
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1312 LL-Serie 257 VP ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-55.53) (Max=21.71)

M 1 : 127
X * 0.502
Y * 0.906
Z * 0.962

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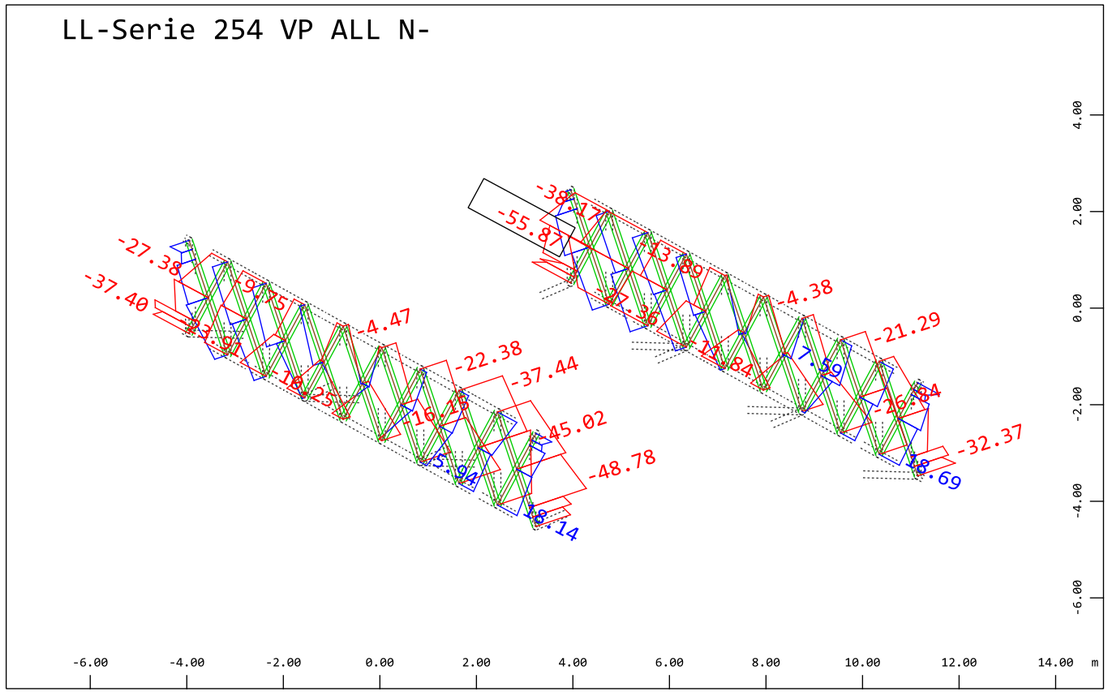
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1302 LL-Serie 254 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-134.81) (Max=6.37)

M 1 : 127
X * 0.502
Y * 0.906
Z * 0.962



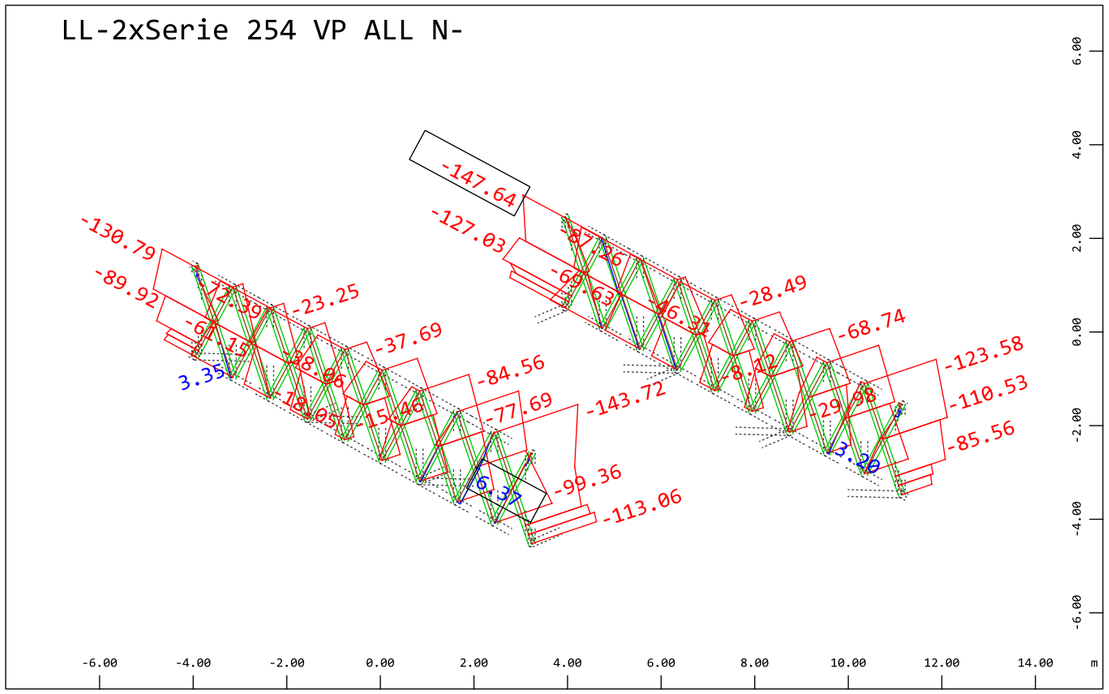

Z
Y
X

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1302 LL-Serie 254 VP ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-55.87) (Max=21.65)

M 1 : 127
X * 0.502
Y * 0.906
Z * 0.962

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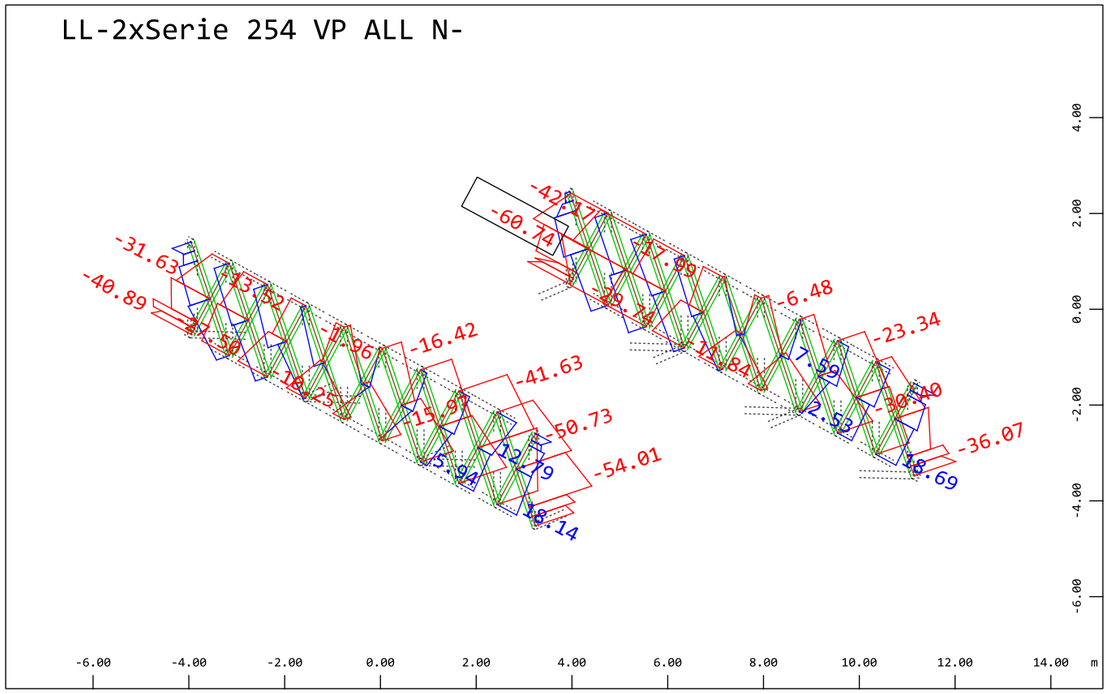
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1332 LL-2xSerie 254 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-147.64) (Max=6.37)

M 1 : 131
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

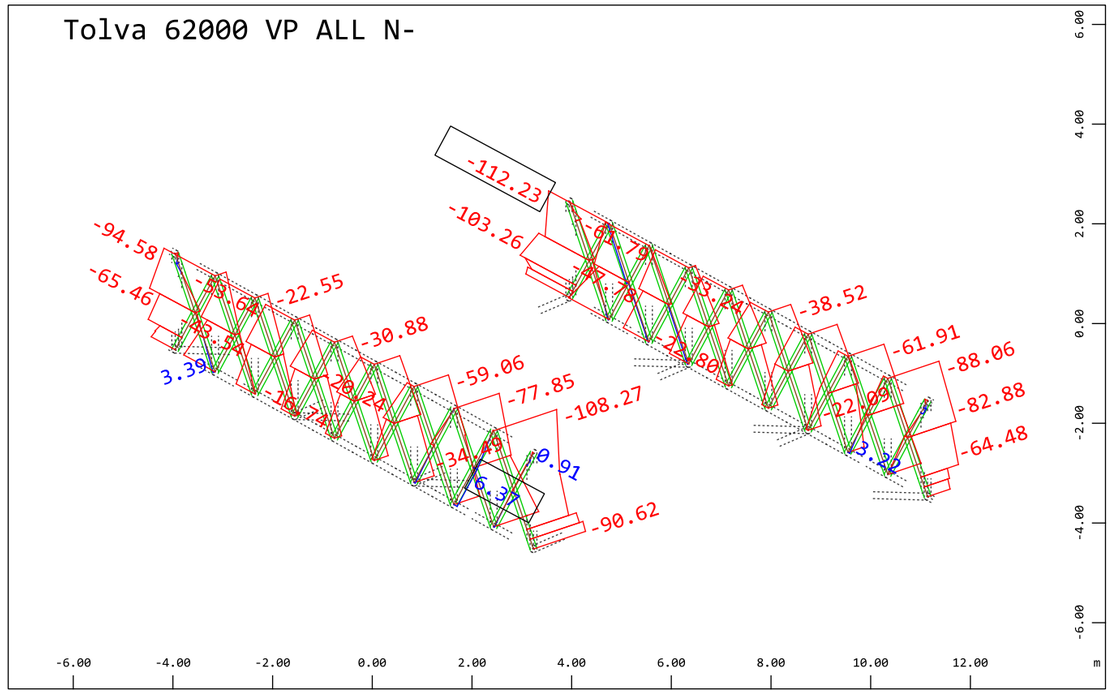
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1332 LL-2xSerie 254 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-60.74) (Max=21.65)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962

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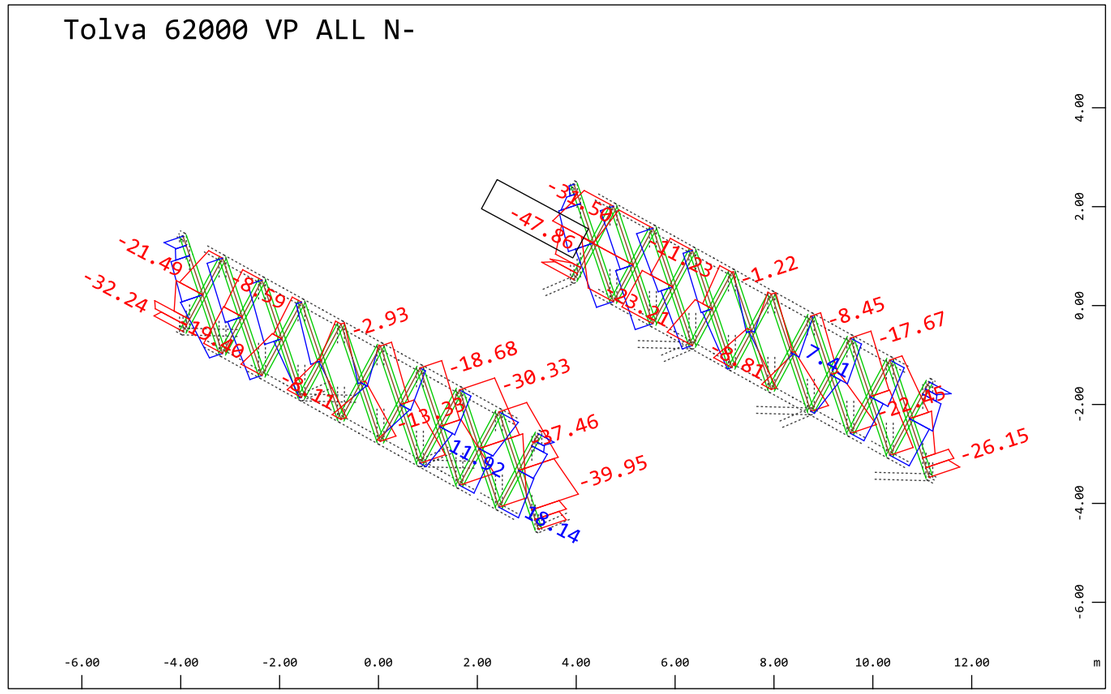
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1322 Tolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-112.23) (Max=6.37)

M 1 : 123
X * 0.502
Y * 0.906
Z * 0.962



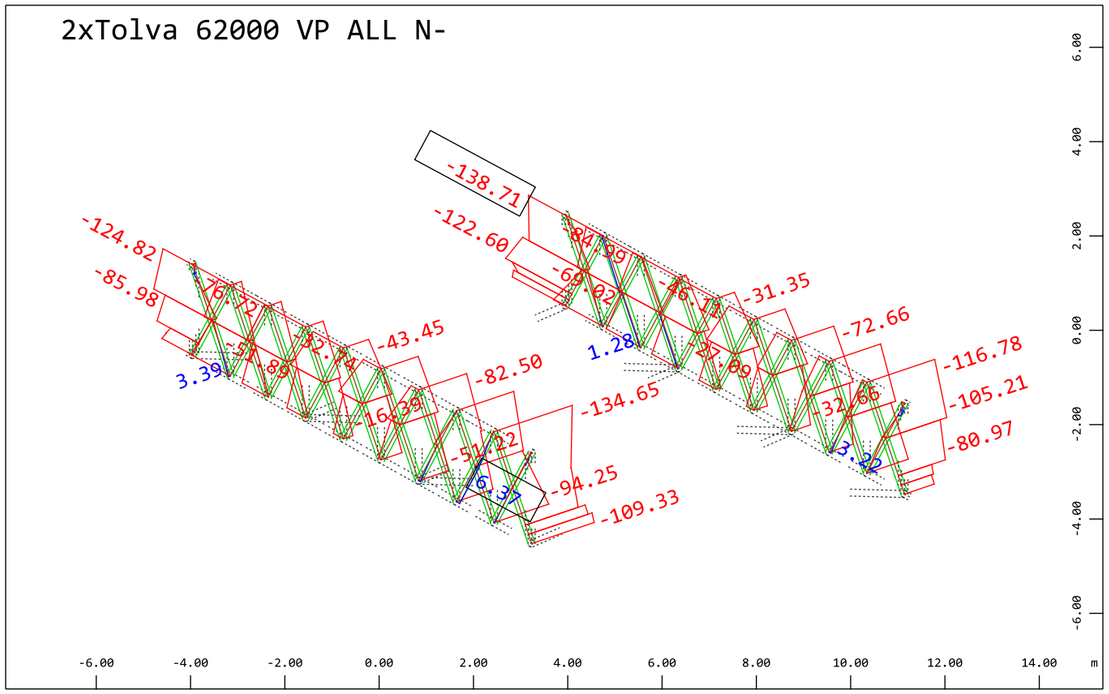

Z
Y
X

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1322 Tolva 62000 VP ALL N-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-47.86) (Max=21.71)

M 1 : 124
X * 0.502
Y * 0.906
Z * 0.962

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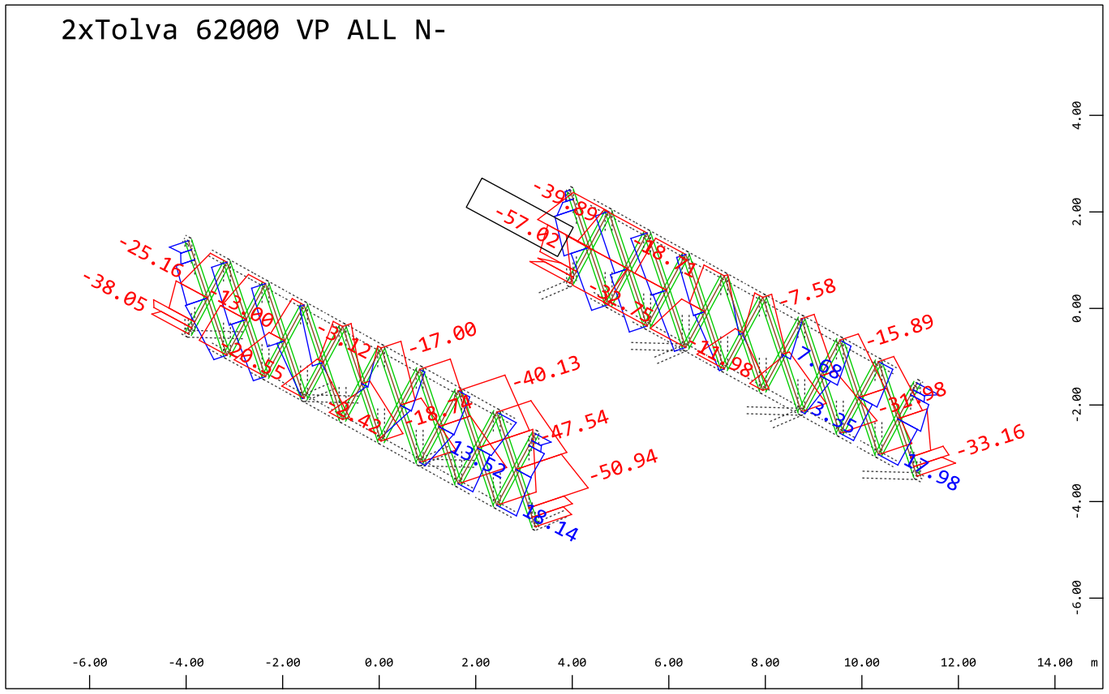
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1352 2xTolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-138.71) (Max=6.37)

M 1 : 130
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

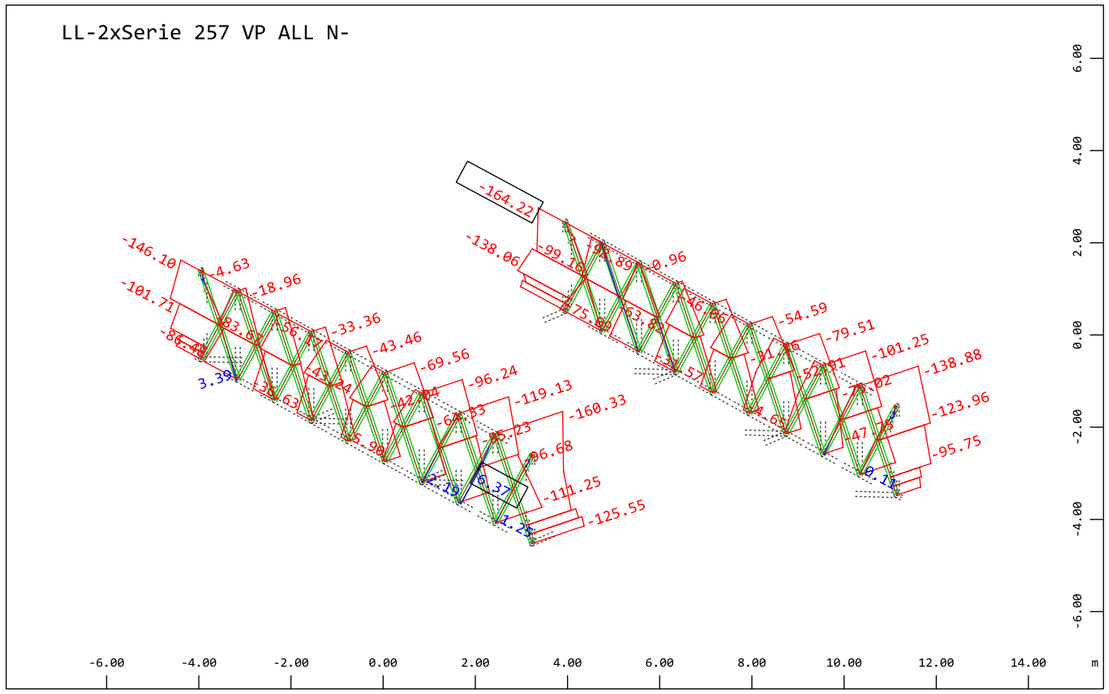
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1352 2xTolva 62000 VP ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-57.02) (Max=21.71)

M 1 : 127
X * 0.502
Y * 0.906
Z * 0.962

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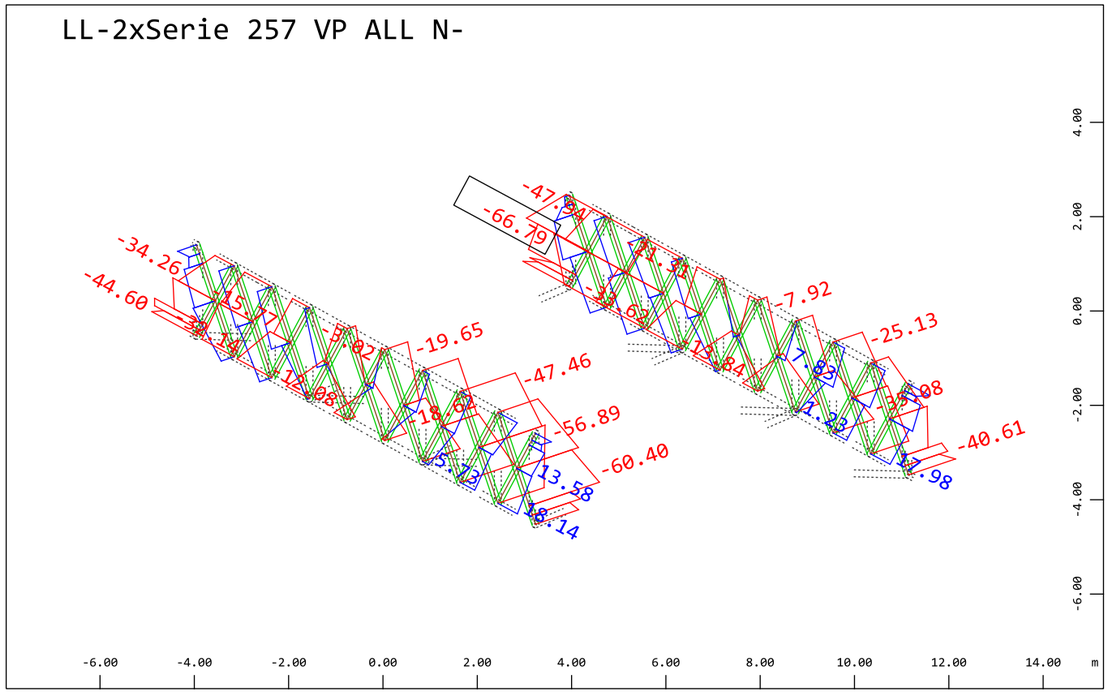
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1342 LL-2xSerie 257 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-164.22) (Max=6.37)

M 1 : 133
X * 0.502
Y * 0.906
Z * 0.962



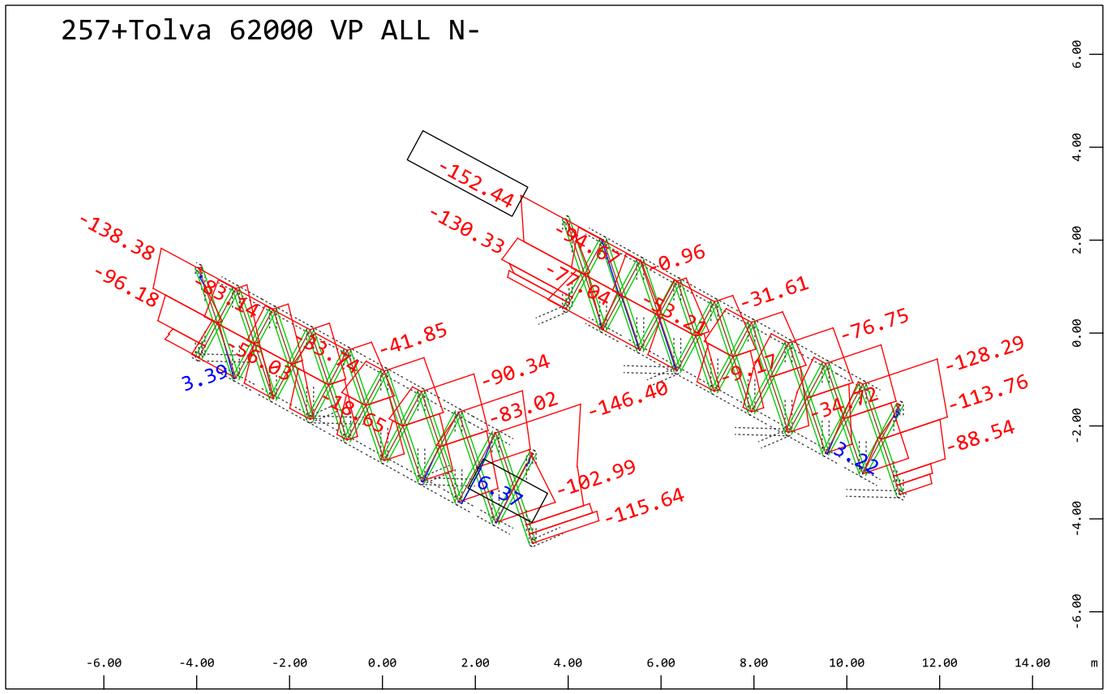

Z
Y
X

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1342 LL-2xSerie 257 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-66.79) (Max=21.71)

M 1 : 130
X * 0.502
Y * 0.906
Z * 0.962

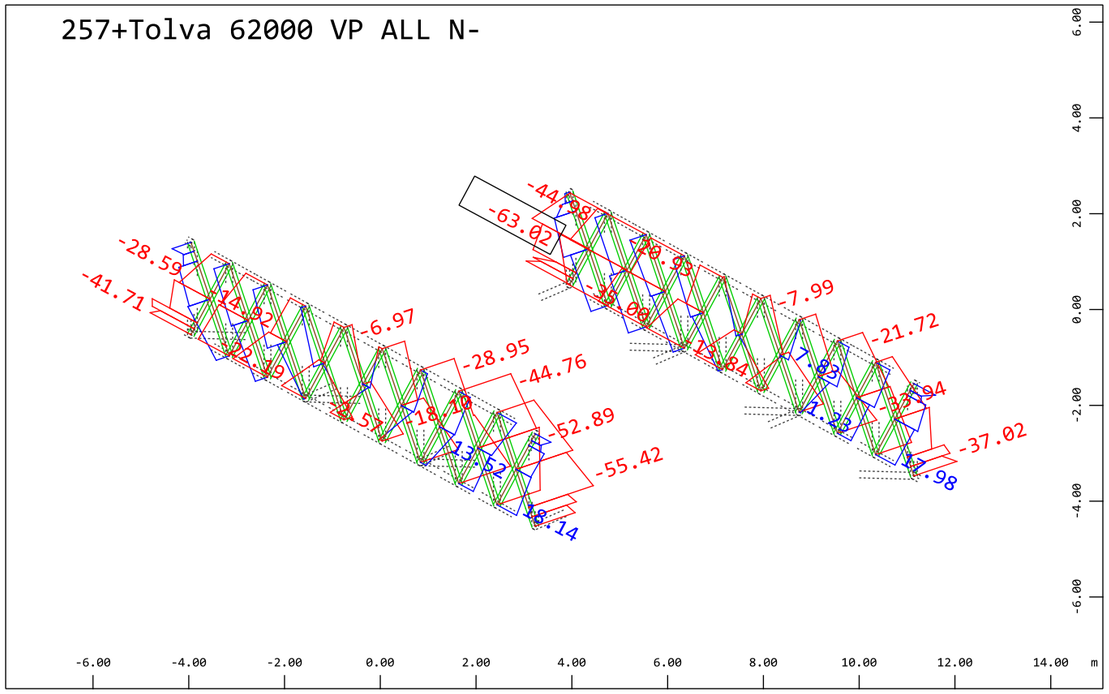
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1372 257+Tolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-152.44) (Max=6.37)

M 1 : 132
X * 0.502
Y * 0.906
Z * 0.962



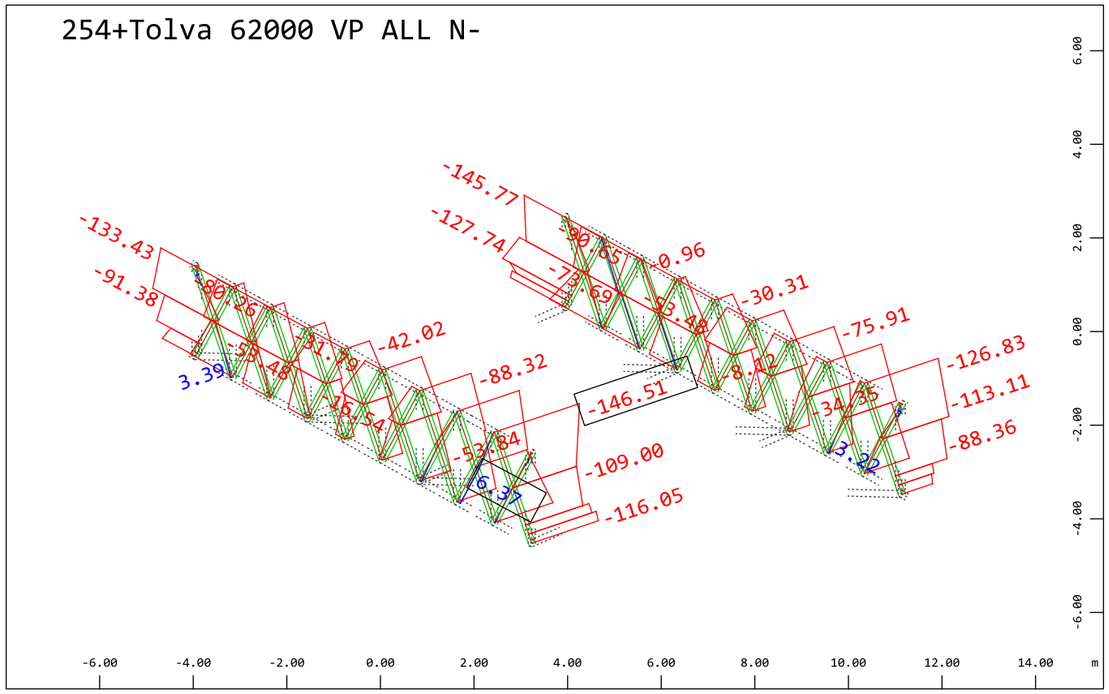

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1372 257+Tolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-63.02) (Max=21.71)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962

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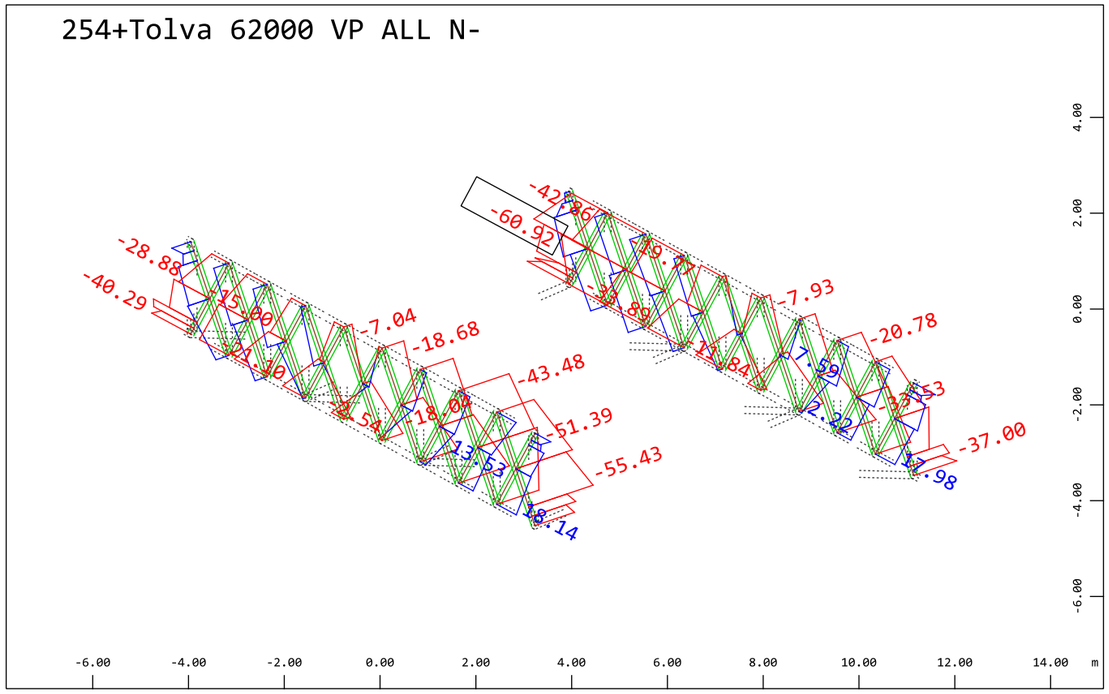


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1362 254+Tolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-146.51) (Max=6.37)

M 1 : 131
X * 0.502
Y * 0.906
Z * 0.962

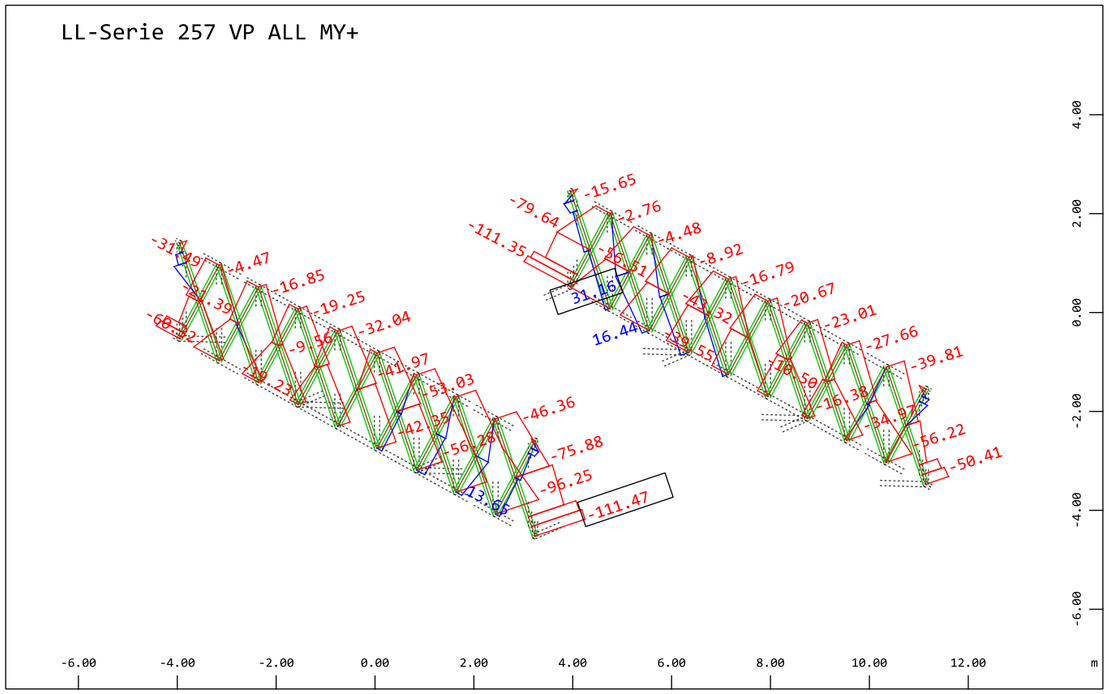



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1362 254+Tolva 62000 VP ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-60.92) (Max=21.71)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962

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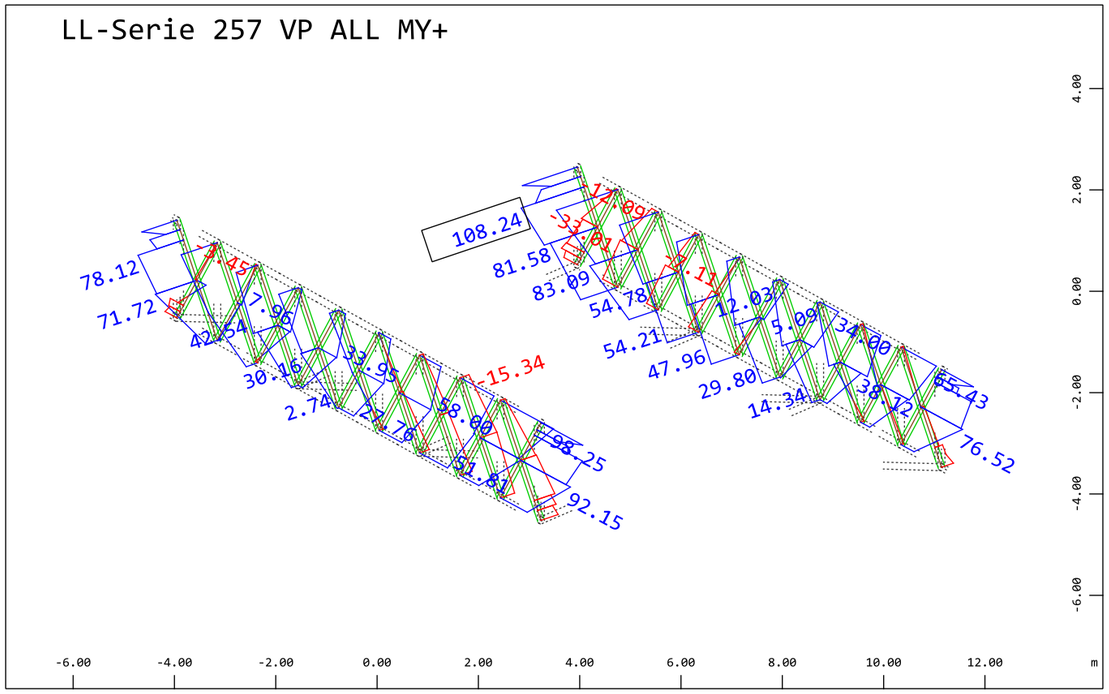
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1313 LL-Serie 257 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-111.47) (Max=31.16)

M 1 : 124
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

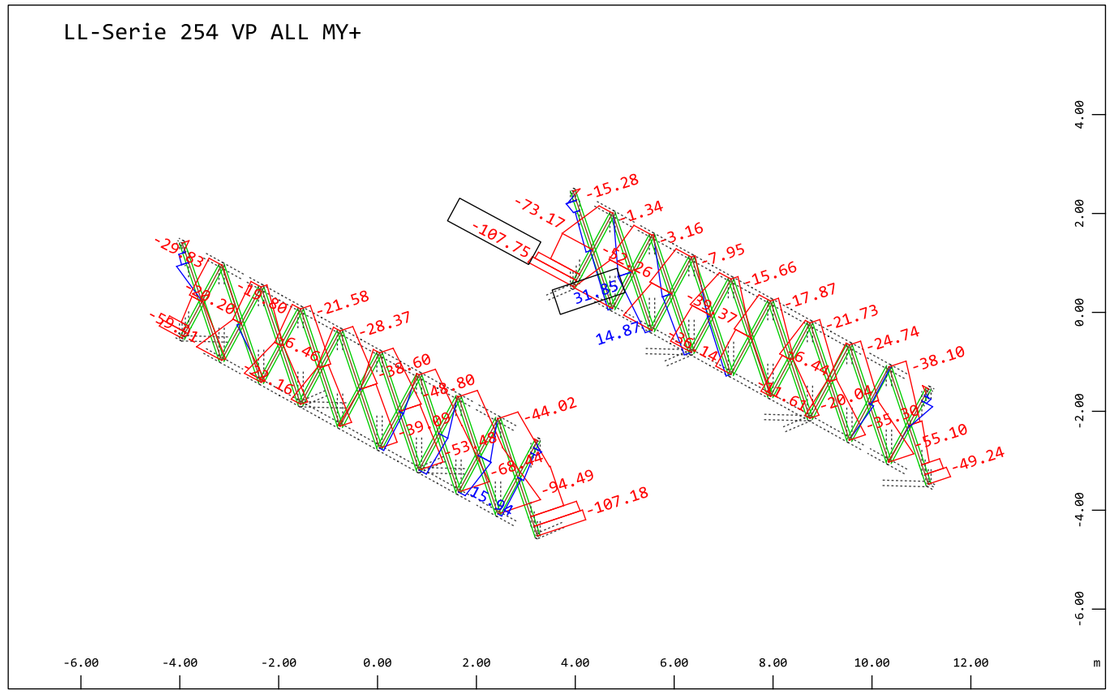
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1313 LL-Serie 257 VP ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-35.57) (Max=108.24)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962

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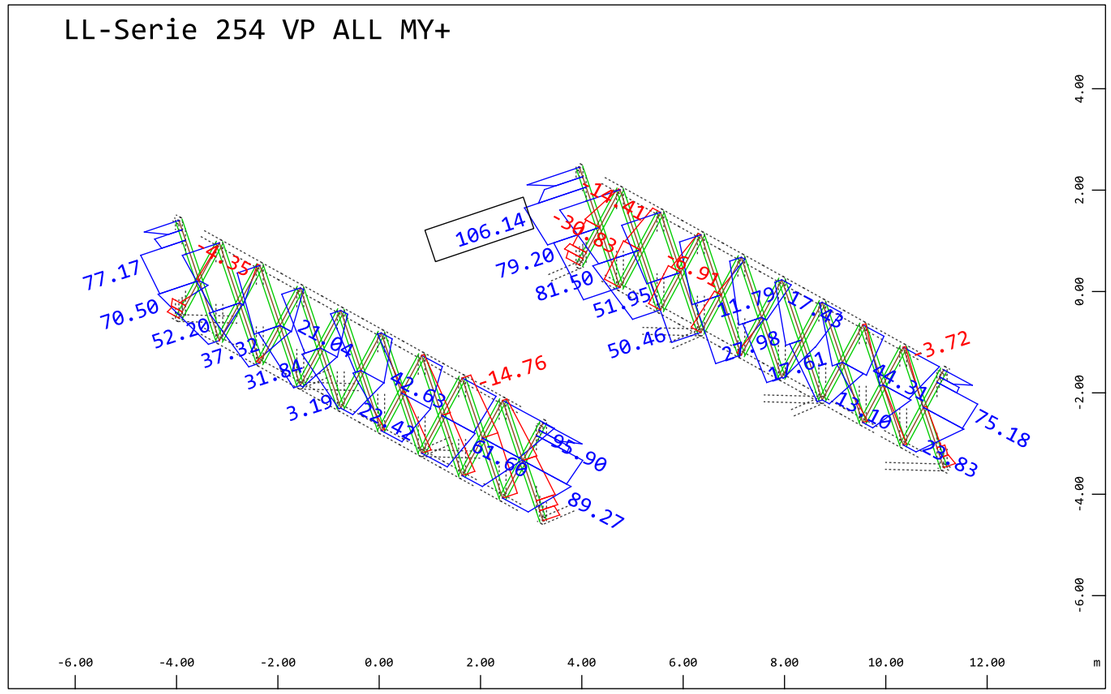
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1303 LL-Serie 254 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-107.75) (Max=31.85)

M 1 : 124
X * 0.502
Y * 0.906
Z * 0.962



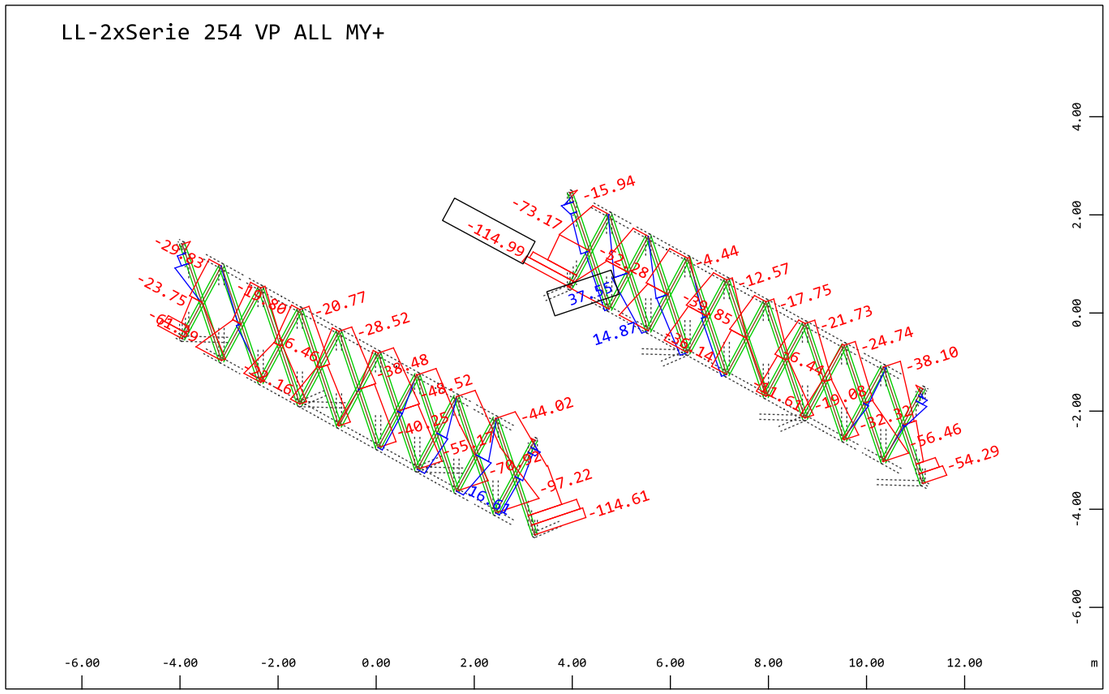

Z
Y
X

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1303 LL-Serie 254 VP ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-33.75) (Max=106.14)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962

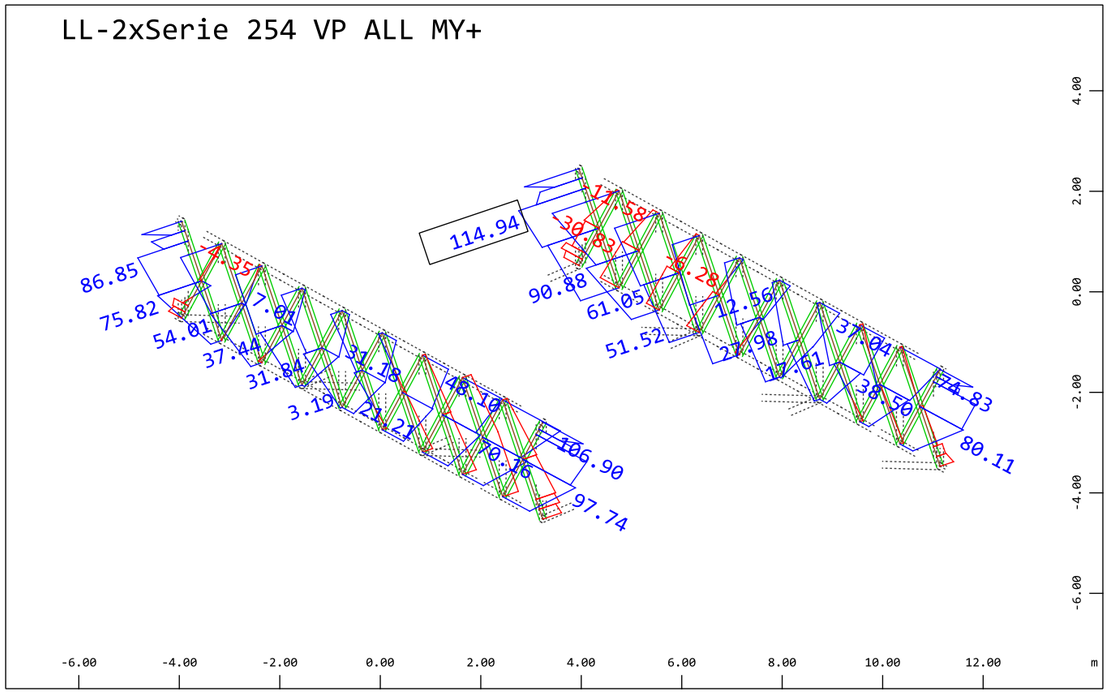
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1333 LL-2xSerie 254 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-114.99) (Max=37.55)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962



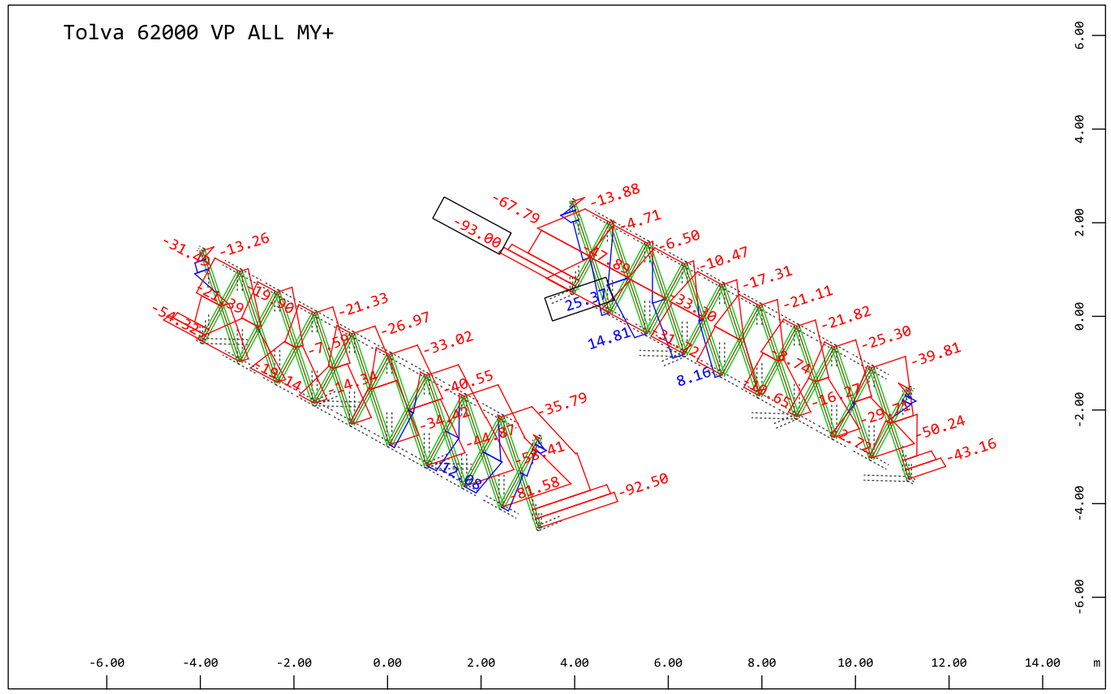

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1333 LL-2xSerie 254 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-38.60) (Max=114.94)

M 1 : 122
X * 0.502
Y * 0.906
Z * 0.962

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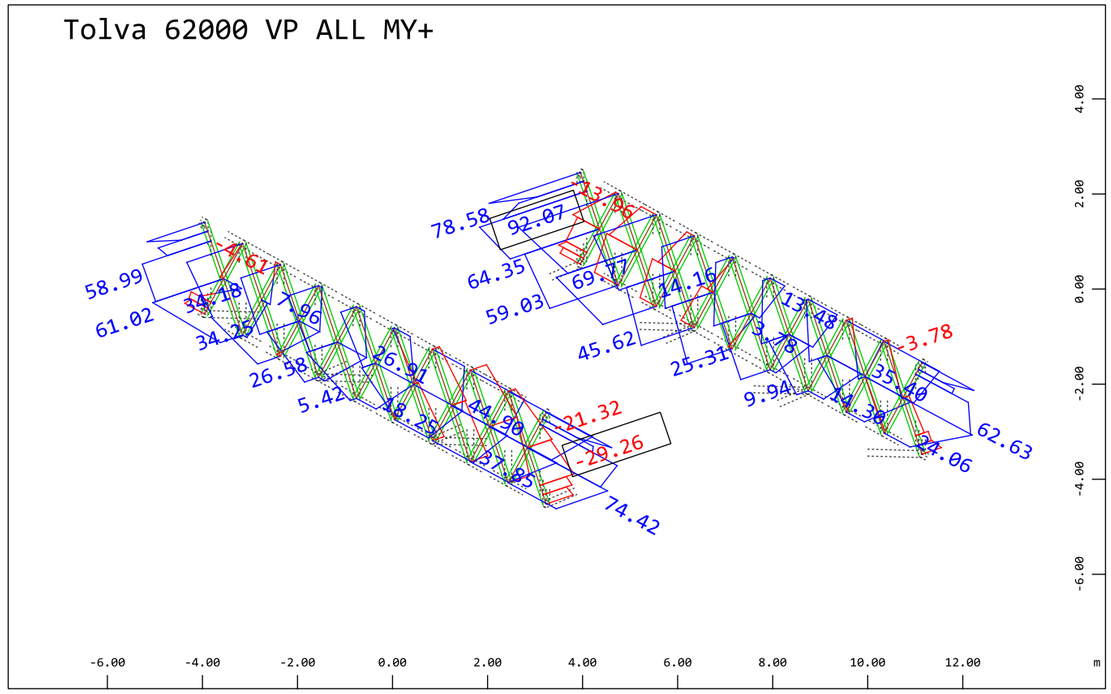


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1323 Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.00) (Max=25.37)

M 1 : 131
X * 0.502
Y * 0.906
Z * 0.962

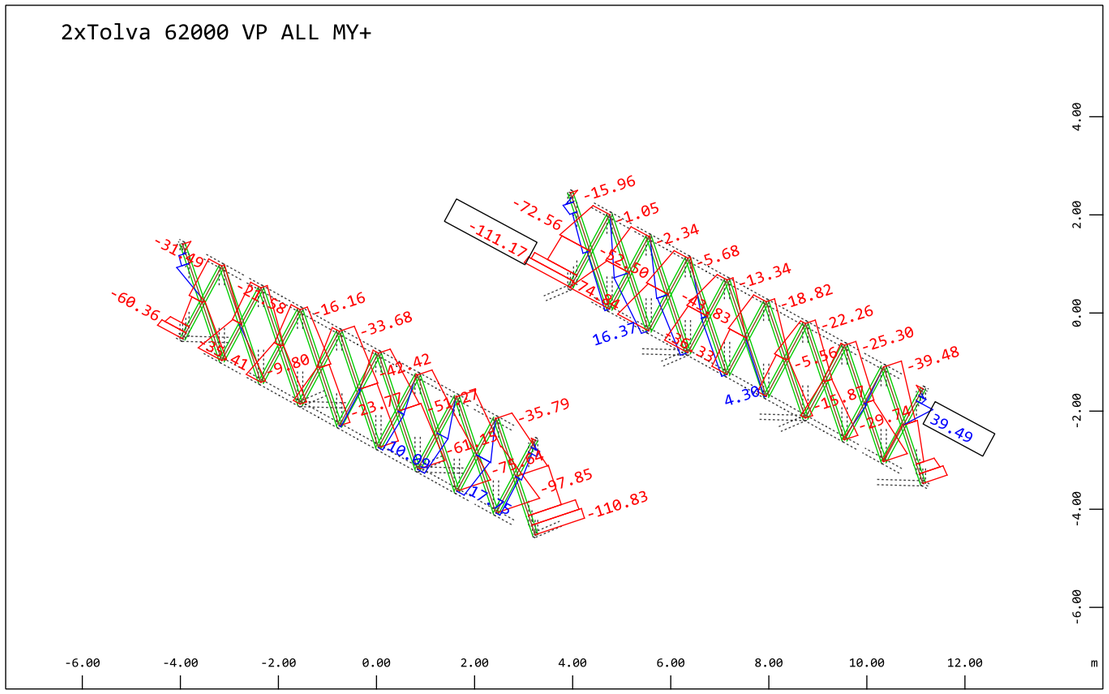



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1323 Tolva 62000 VP ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-29.26) (Max=92.07)

M 1 : 129
X * 0.502
Y * 0.906
Z * 0.962

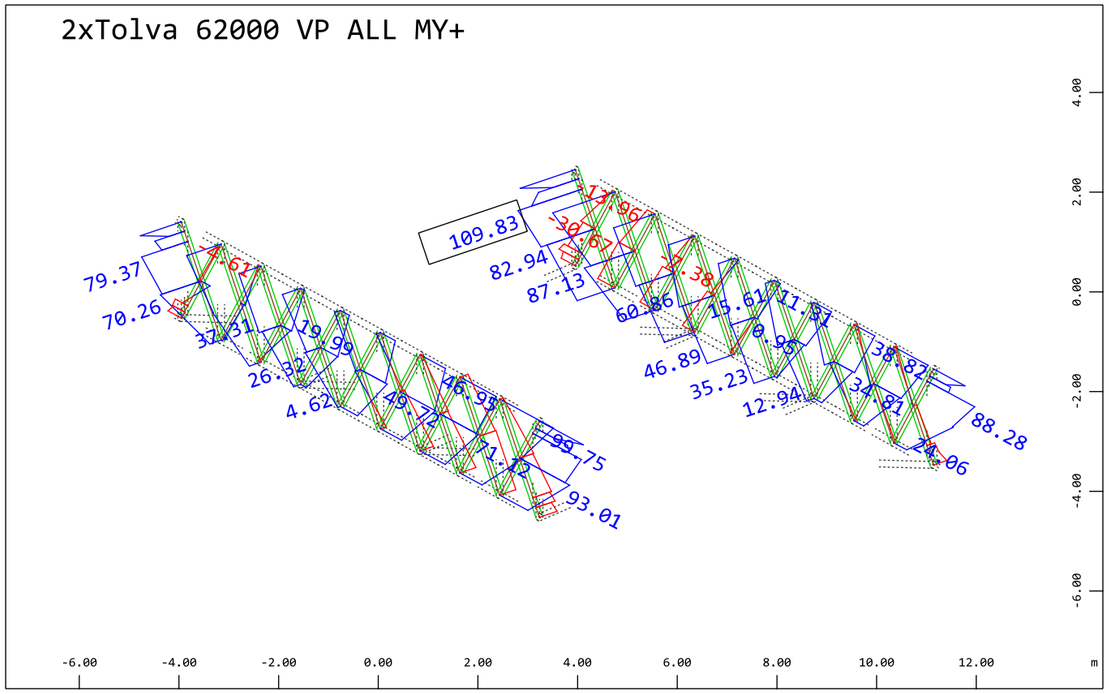
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1353 2xTolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-111.17) (Max=39.49)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962



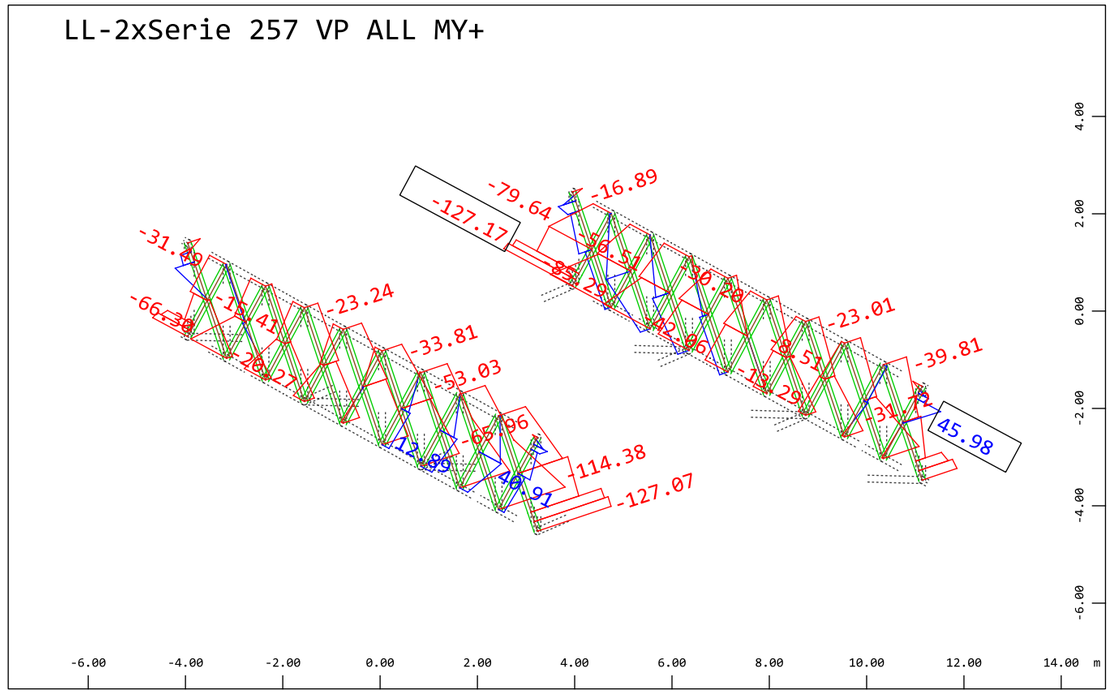

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1353 2xTolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-36.29) (Max=109.83)

M 1 : 123
X * 0.502
Y * 0.906
Z * 0.962

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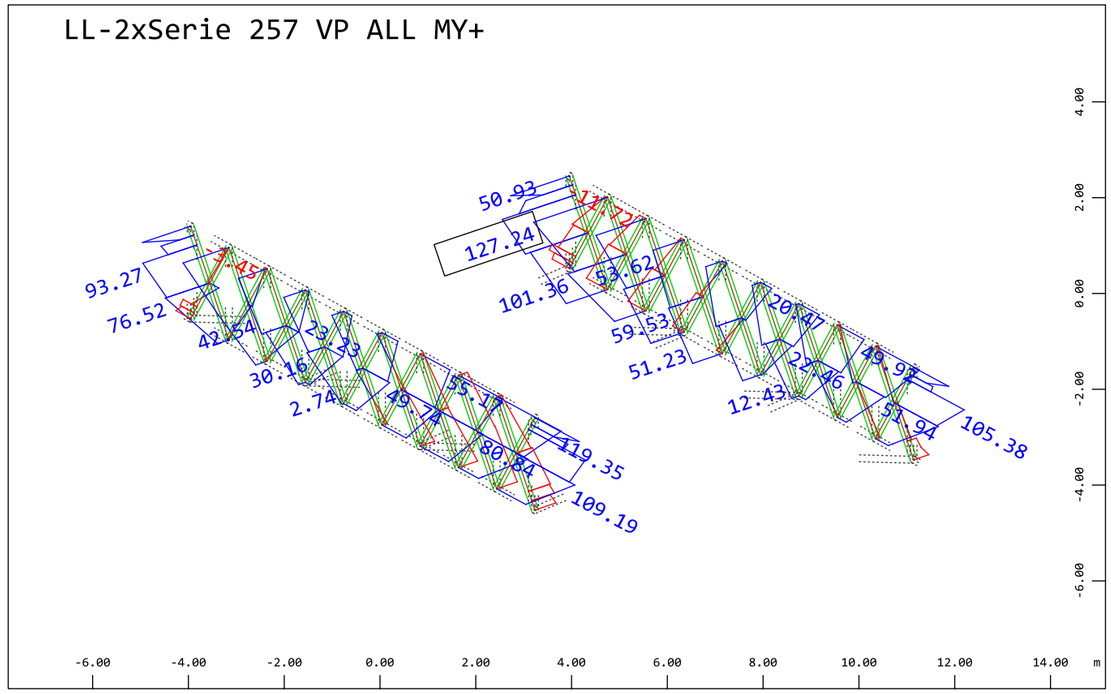


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1343 LL-2xSerie 257 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-127.17) (Max=45.98)

M 1 : 126
X * 0.502
Y * 0.906
Z * 0.962

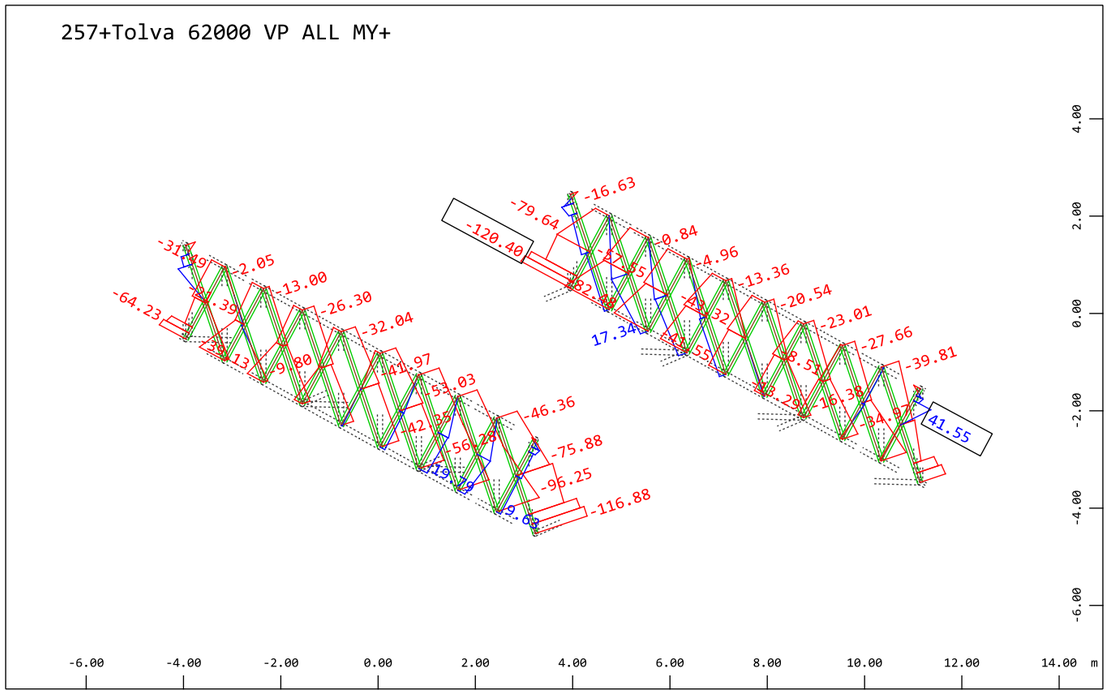



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1343 LL-2xSerie 257 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-43.73) (Max=127.24)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962

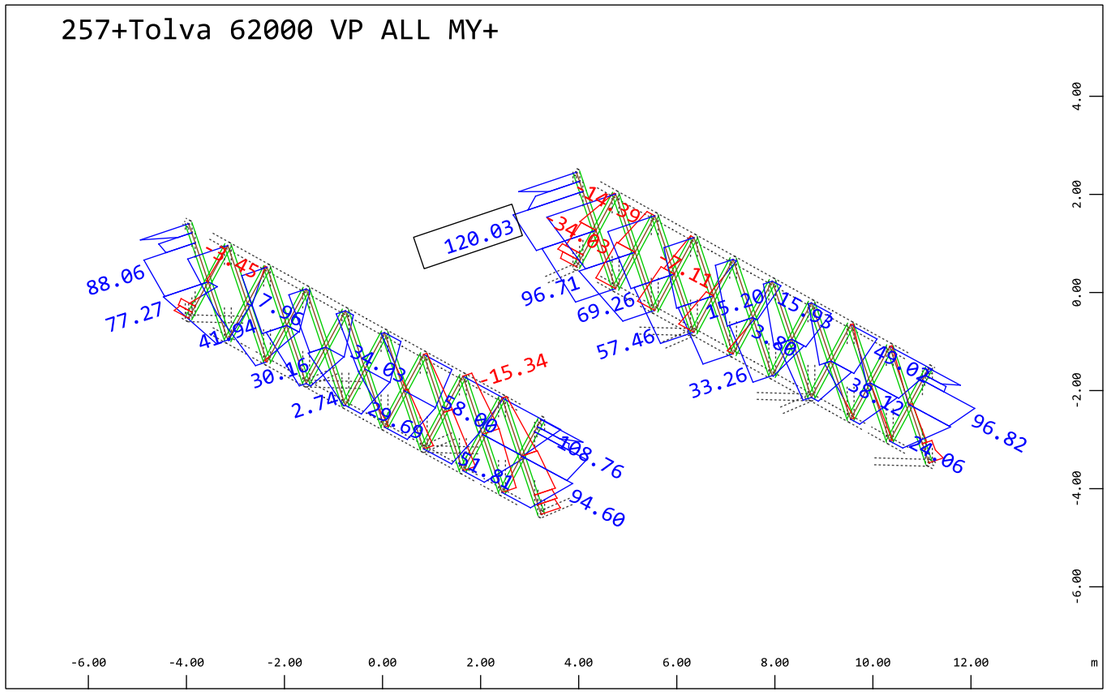
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1373 257+Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-120.40) (Max=41.55)

M 1 : 126
X * 0.502
Y * 0.906
Z * 0.962

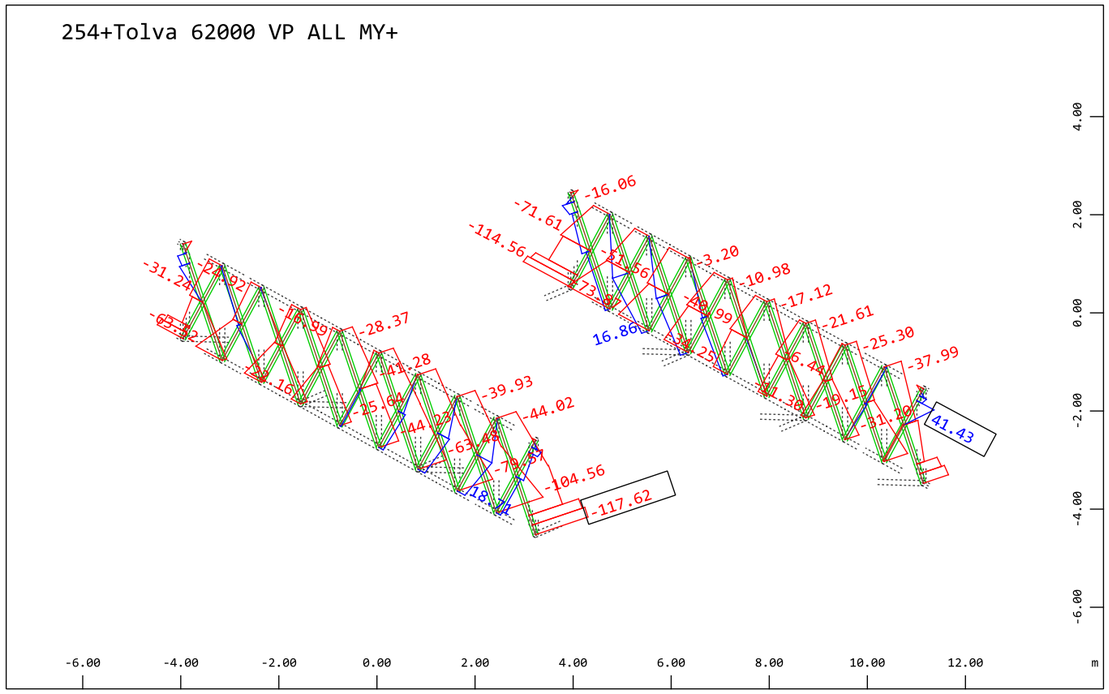



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1373 257+Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-40.29) (Max=120.03)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962

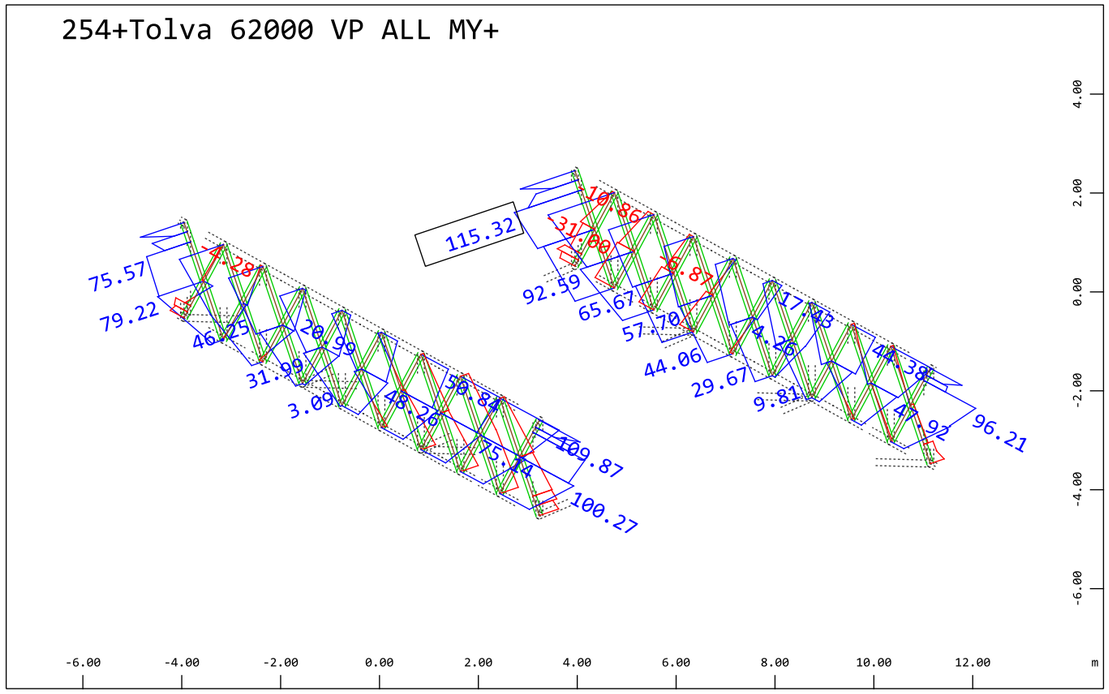


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1363 254+Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-117.62) (Max=41.43)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962

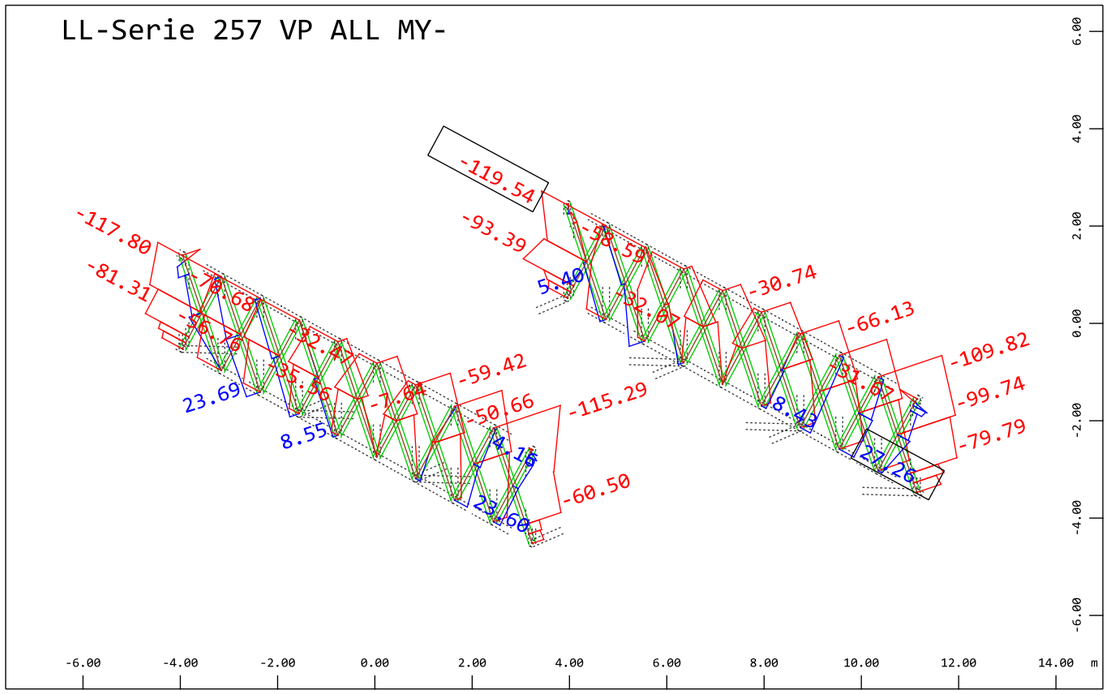



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1363 254+Tolva 62000 VP ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-38.70) (Max=115.32)

M 1 : 124
X * 0.502
Y * 0.906
Z * 0.962

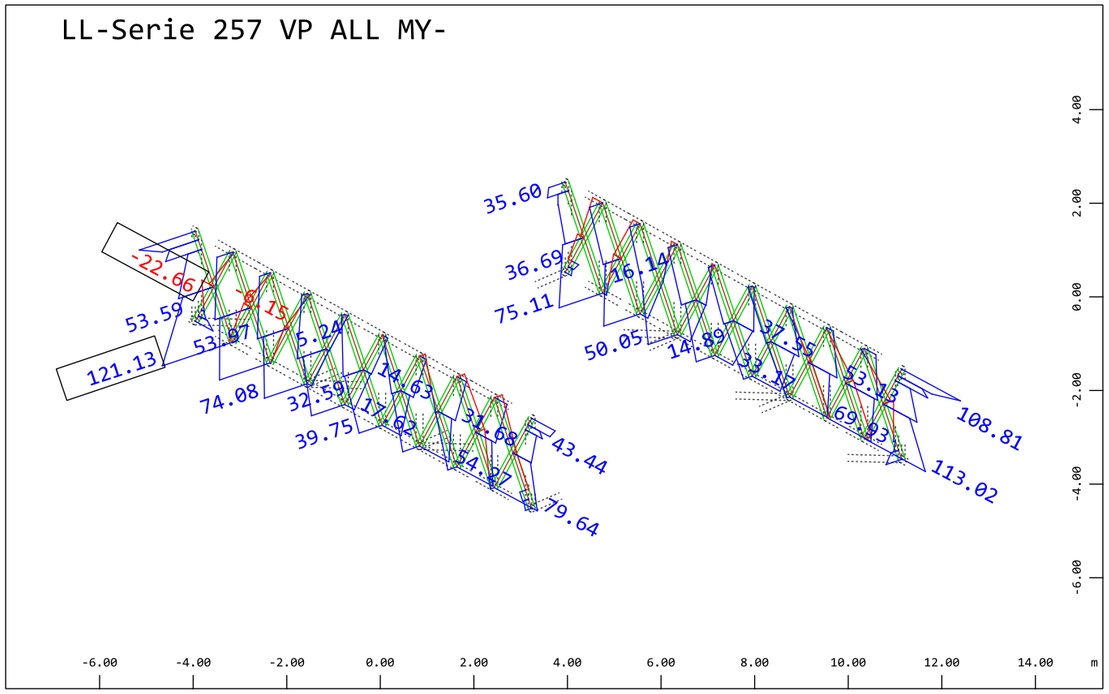
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1314 LL-Serie 257 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-119.54) (Max=27.26)

M 1 : 126
X * 0.502
Y * 0.906
Z * 0.962

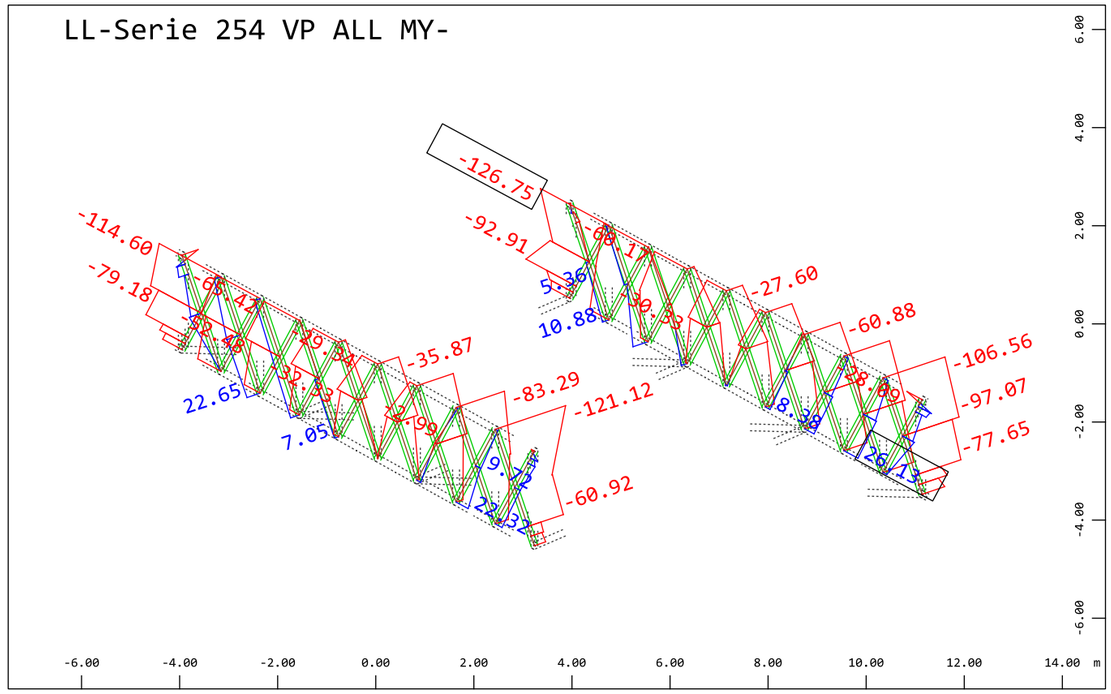



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1314 LL-Serie 257 VP ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-22.66) (Max=121.13)

M 1 : 131
X * 0.502
Y * 0.906
Z * 0.962

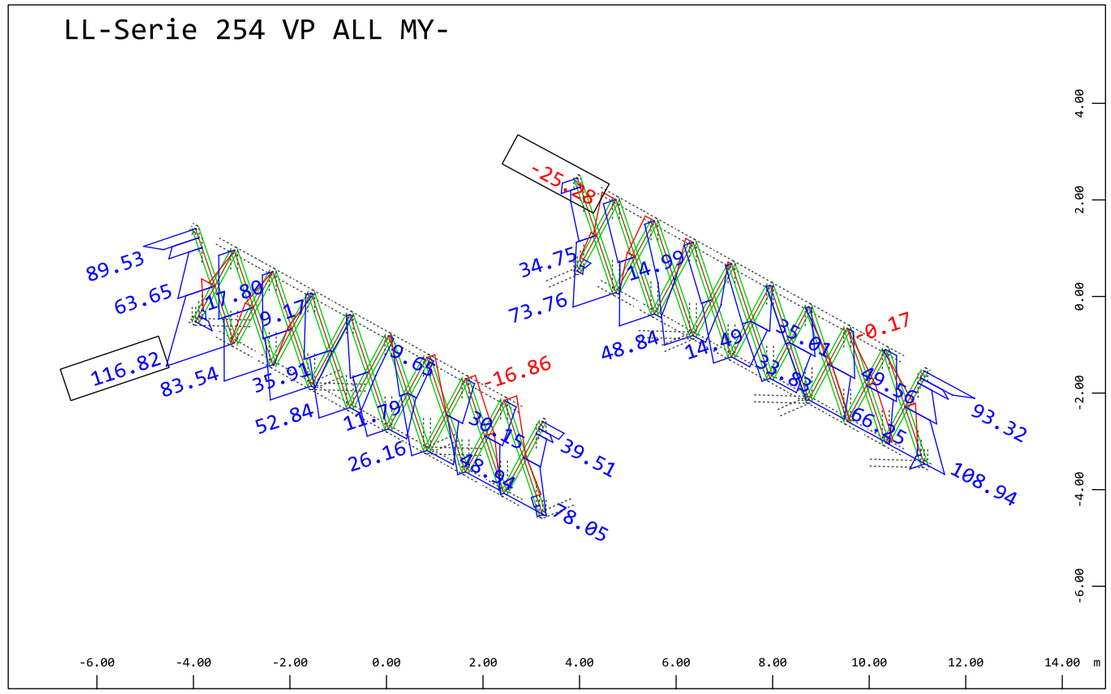


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1304 LL-Serie 254 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-126.75) (Max=26.13)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962

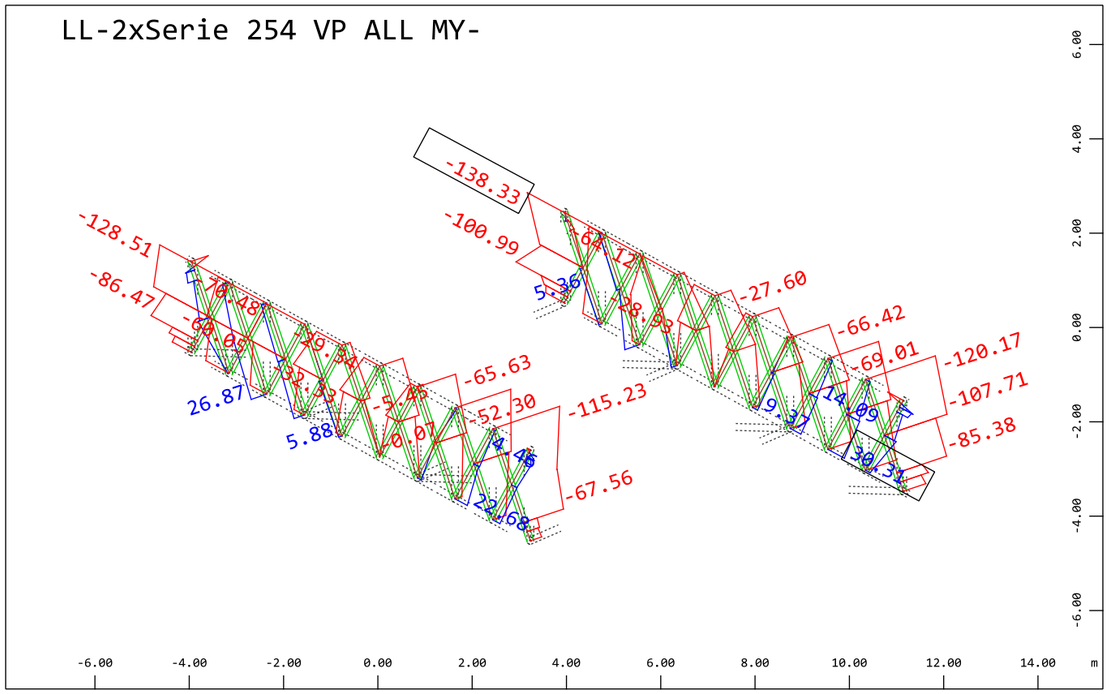



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1304 LL-Serie 254 VP ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-25.28) (Max=116.82)

M 1 : 127
X * 0.502
Y * 0.906
Z * 0.962

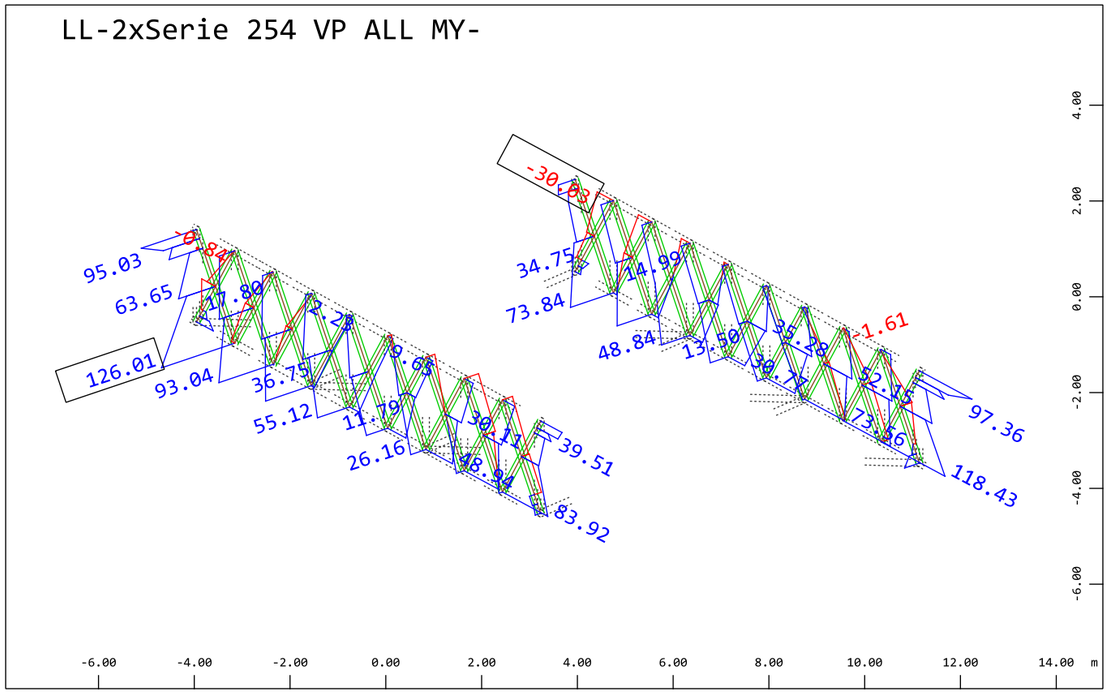
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1334 LL-2xSerie 254 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-138.33) (Max=30.31)

M 1 : 130
X * 0.502
Y * 0.906
Z * 0.962



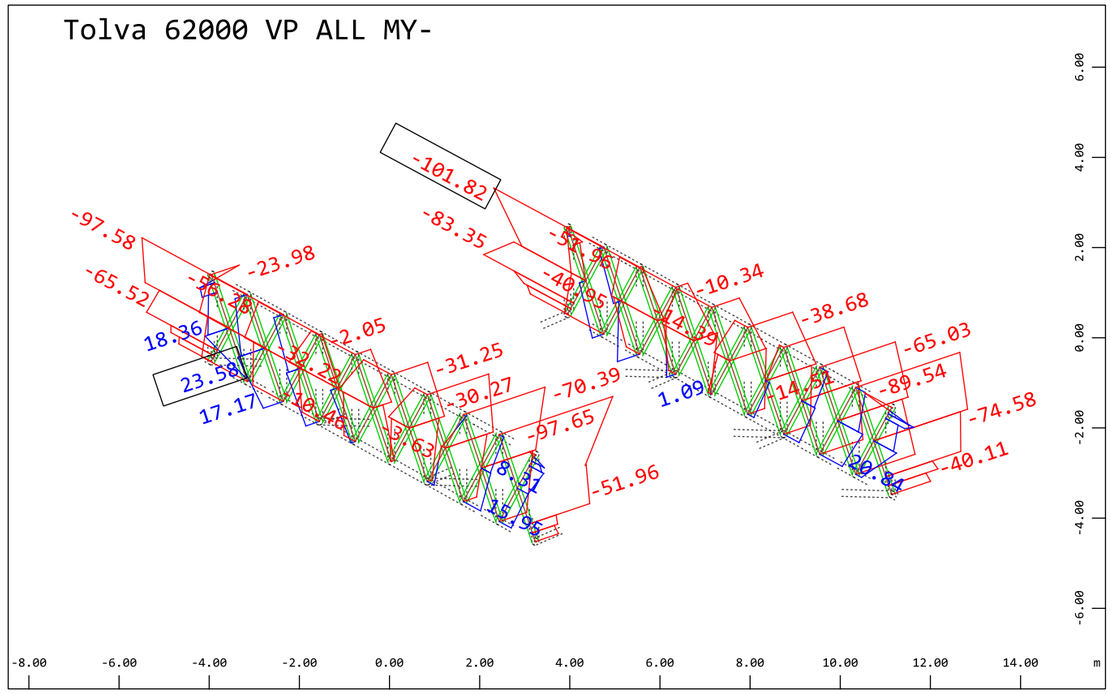

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1334 LL-2xSerie 254 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-30.03) (Max=126.01)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962

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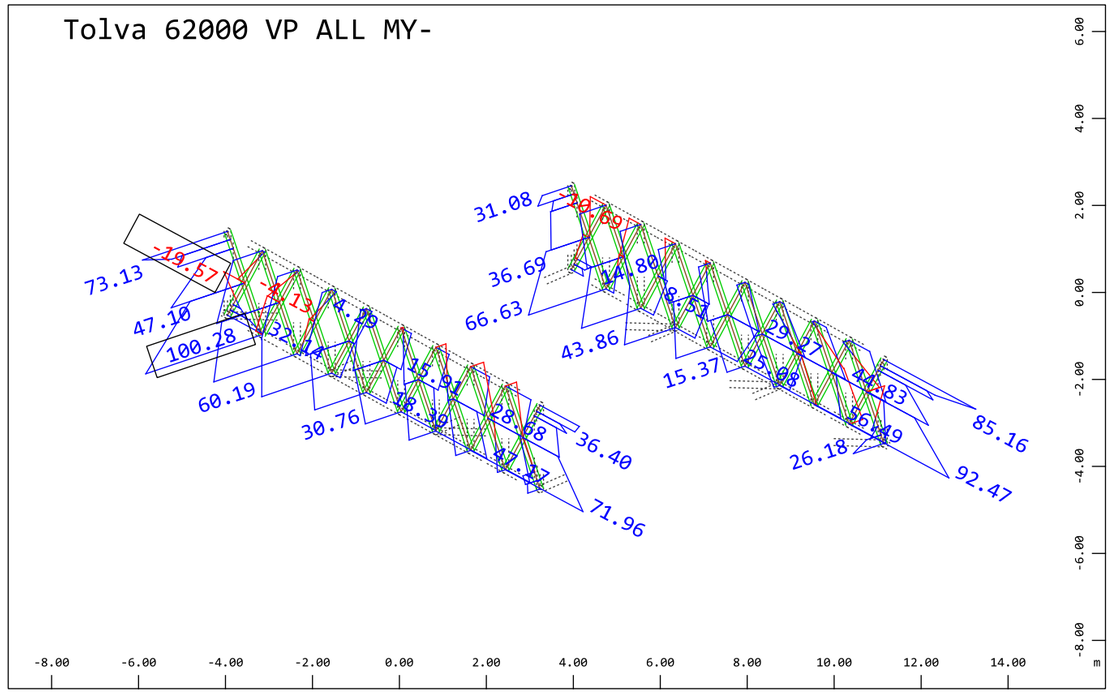


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1324 Tolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-101.82) (Max=23.58)

M 1 : 136
X * 0.502
Y * 0.906
Z * 0.962

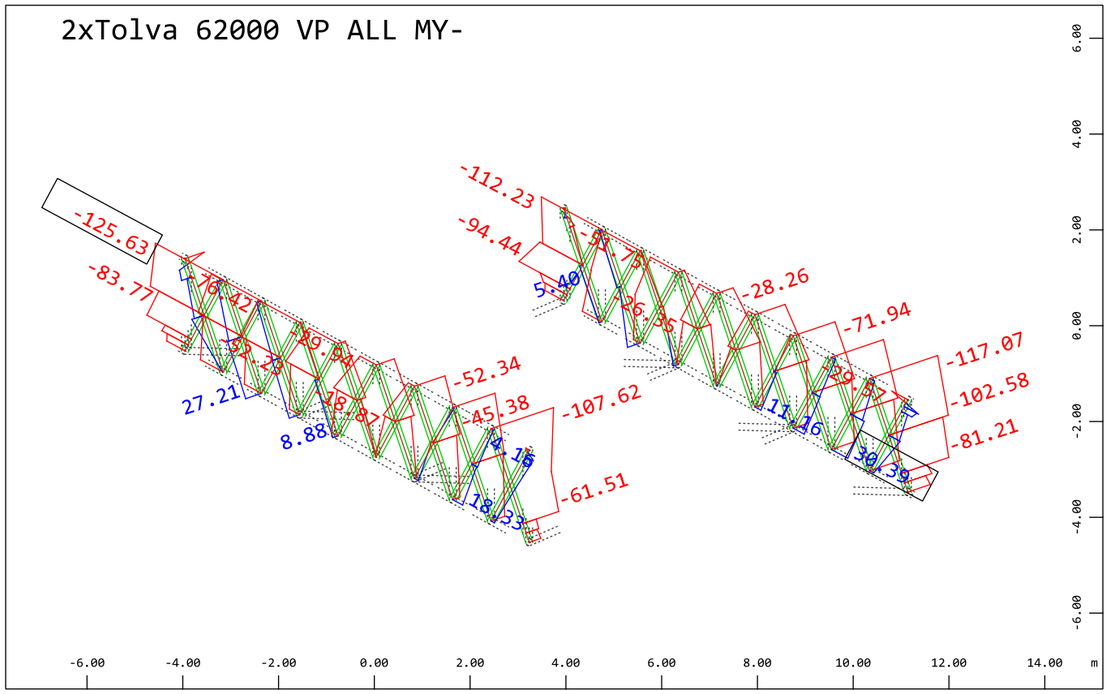



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1324 Tolva 62000 VP ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-19.57) (Max=100.28)

M 1 : 141
X * 0.502
Y * 0.906
Z * 0.962

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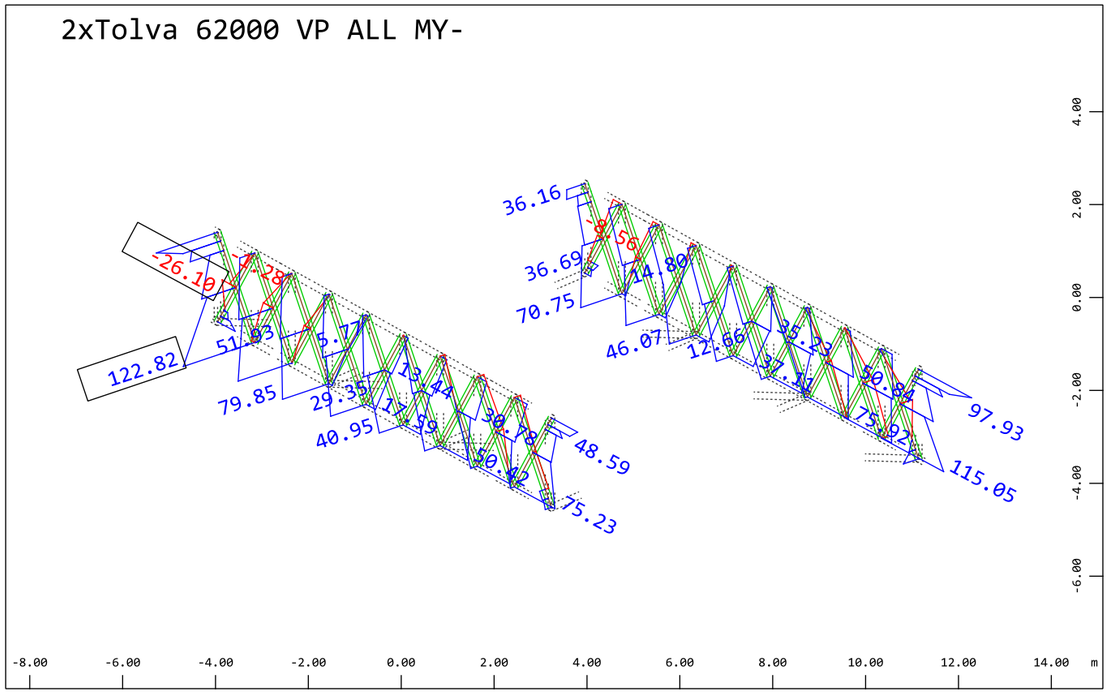
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1354 2xTolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-125.63) (Max=30.39)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

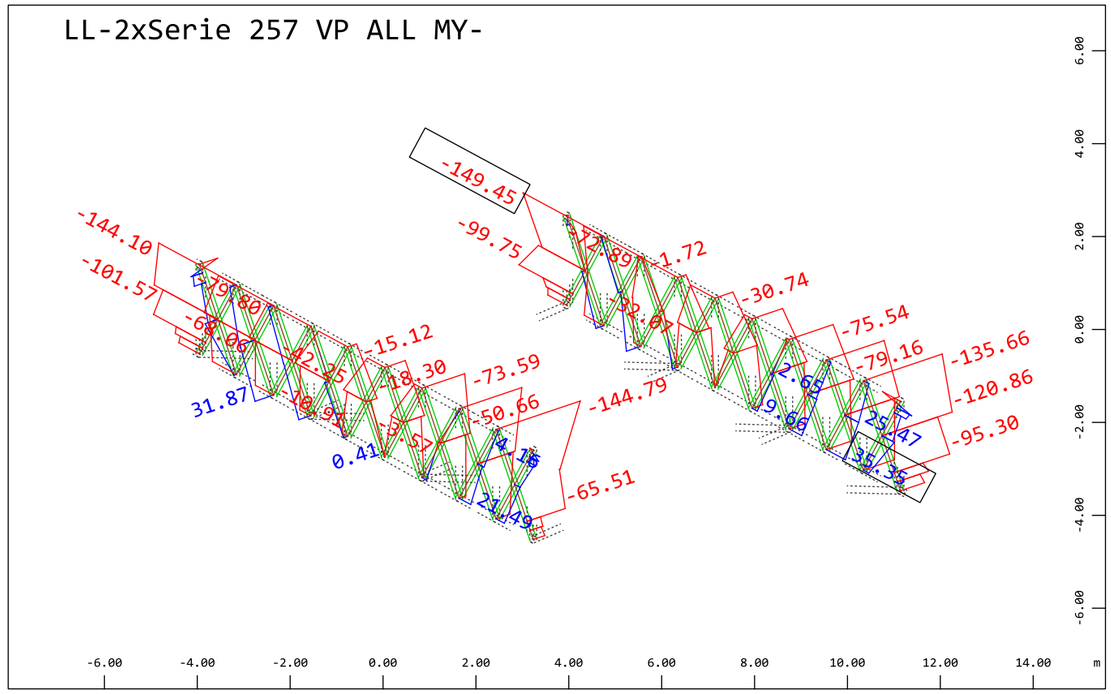
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1354 2xTolva 62000 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-26.10) (Max=122.82)

M 1 : 132
X * 0.502
Y * 0.906
Z * 0.962

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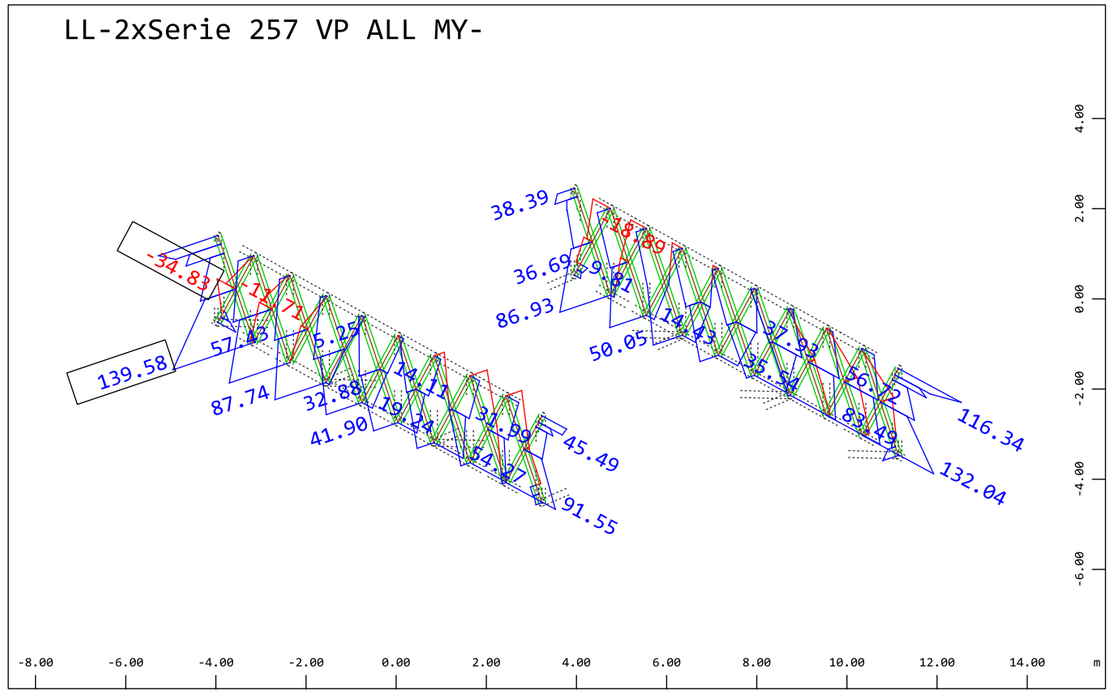
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1344 LL-2xSerie 257 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-149.45) (Max=35.35)

M 1 : 132
X * 0.502
Y * 0.906
Z * 0.962



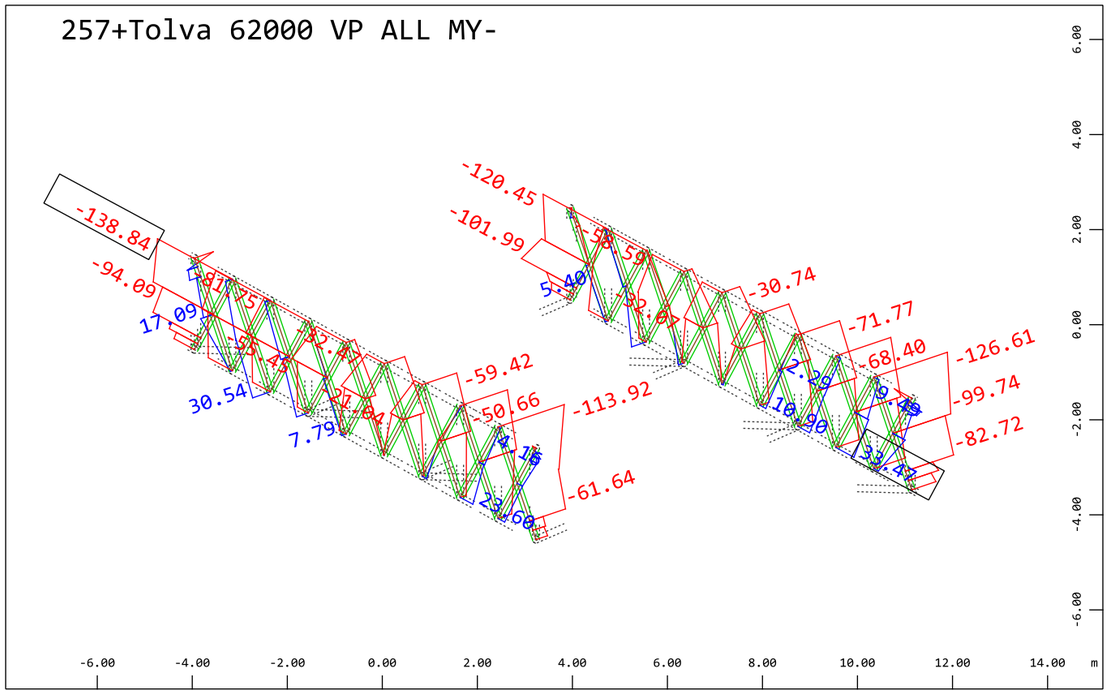

Z
Y
X

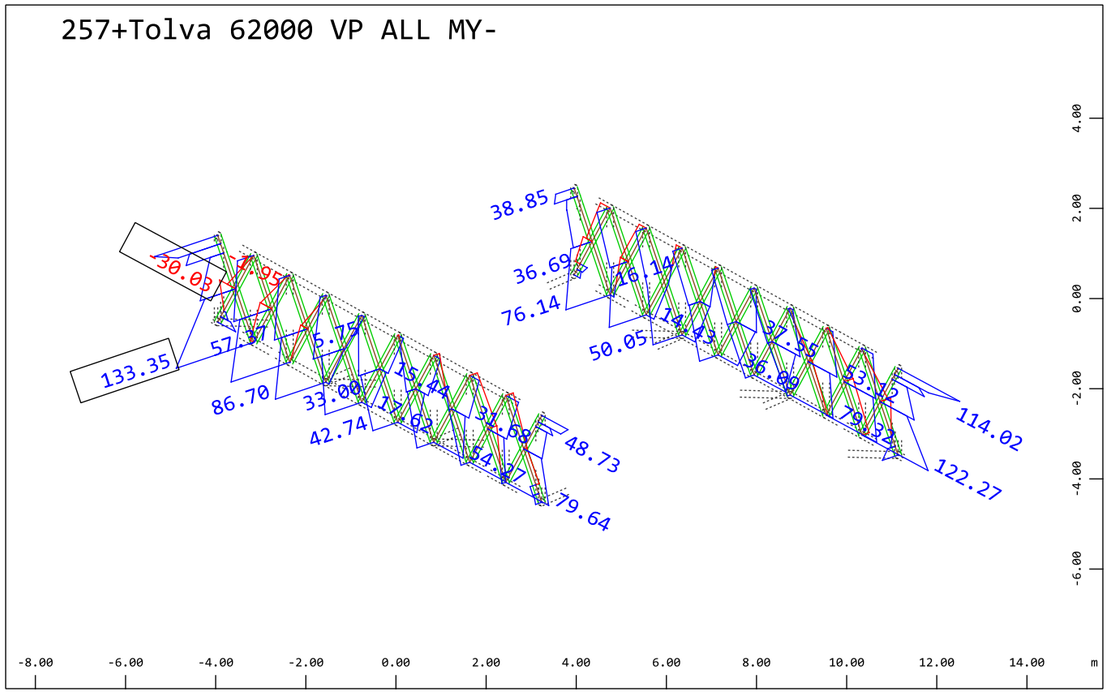
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1344 LL-2xSerie 257 VP ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-34.83) (Max=139.58)

M 1 : 136
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones

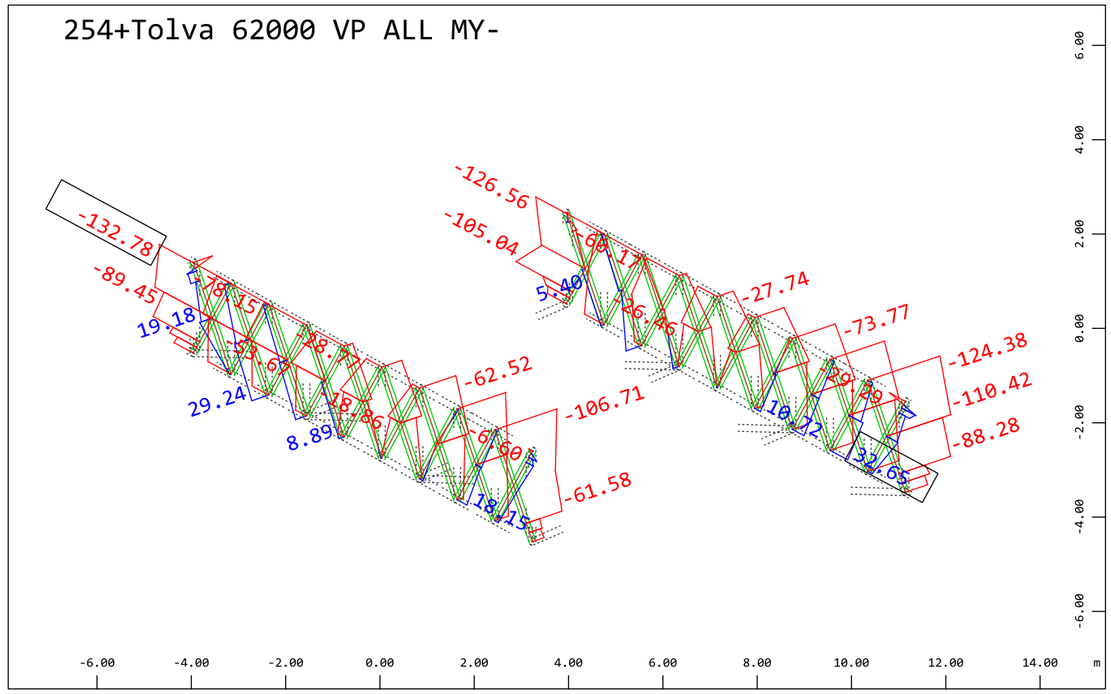


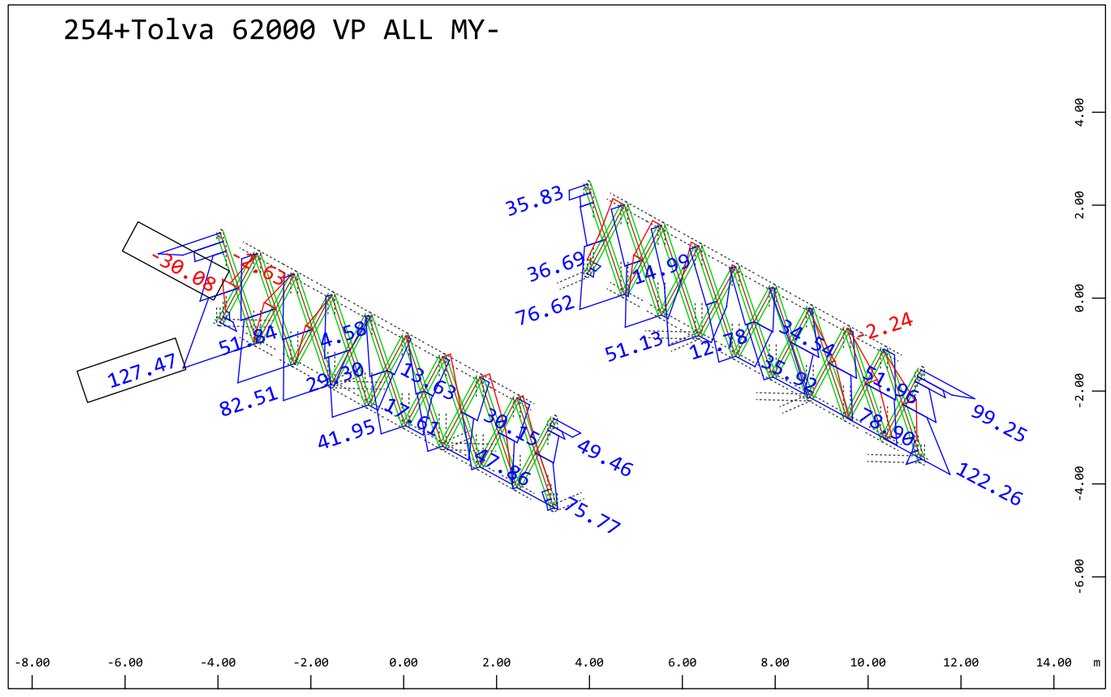




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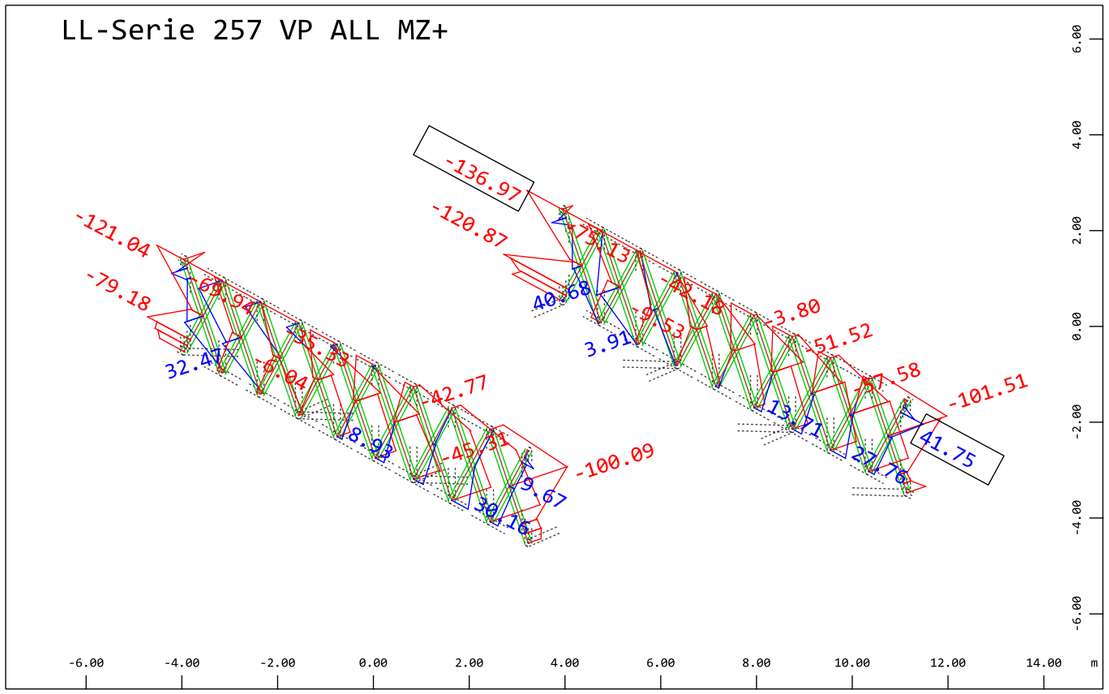
Pont Carretera Vic
Tensiones



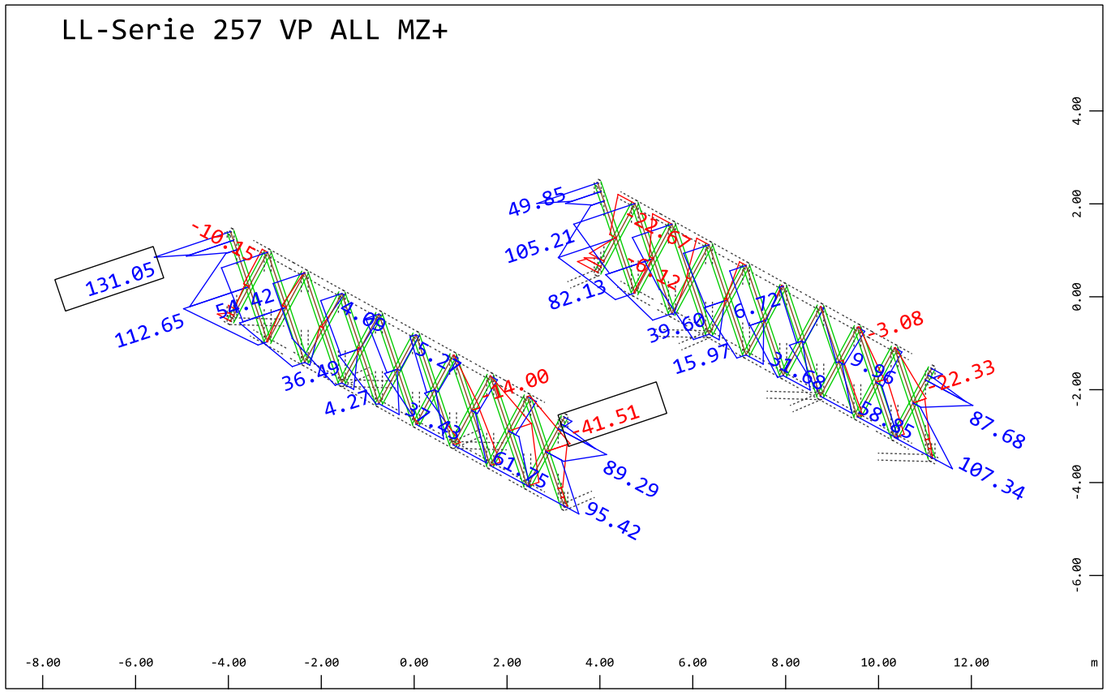

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Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1315 LL-Serie 257 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-136.97) (Max=41.75)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962



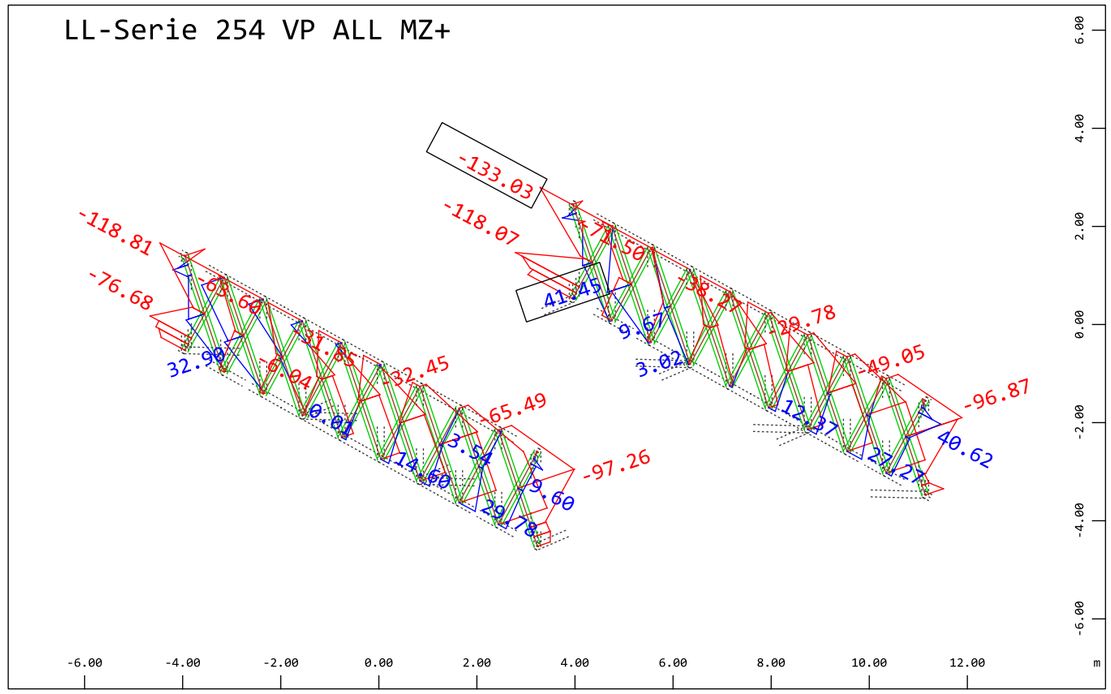

Z
Y X
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1315 LL-Serie 257 VP ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-41.51) (Max=131.05)

M 1 : 132
X * 0.502
Y * 0.906
Z * 0.962

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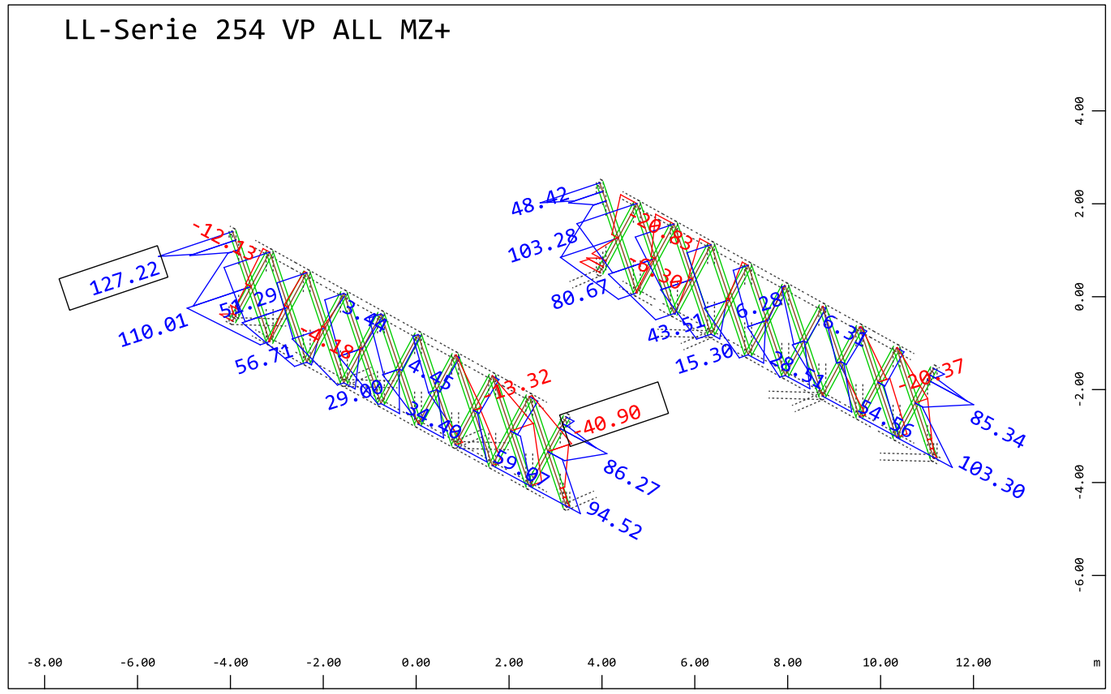


Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1305 LL-Serie 254 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-133.03) (Max=41.45)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962

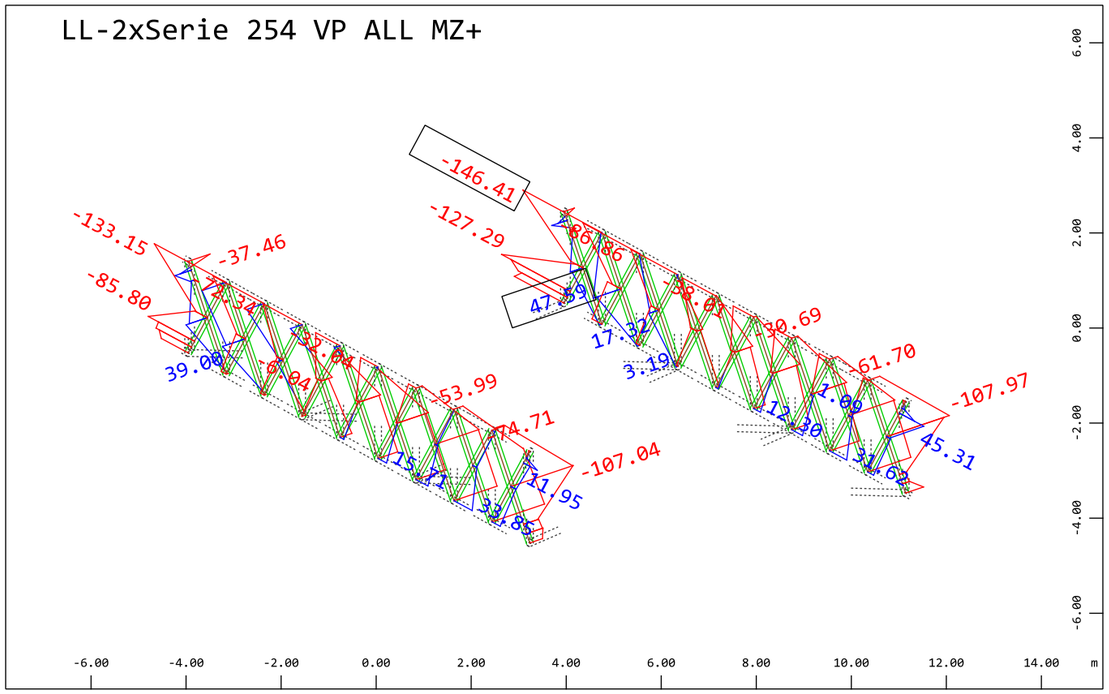



Z
Y X
Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1305 LL-Serie 254 VP ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-40.90) (Max=127.22)

M 1 : 132
X * 0.502
Y * 0.906
Z * 0.962

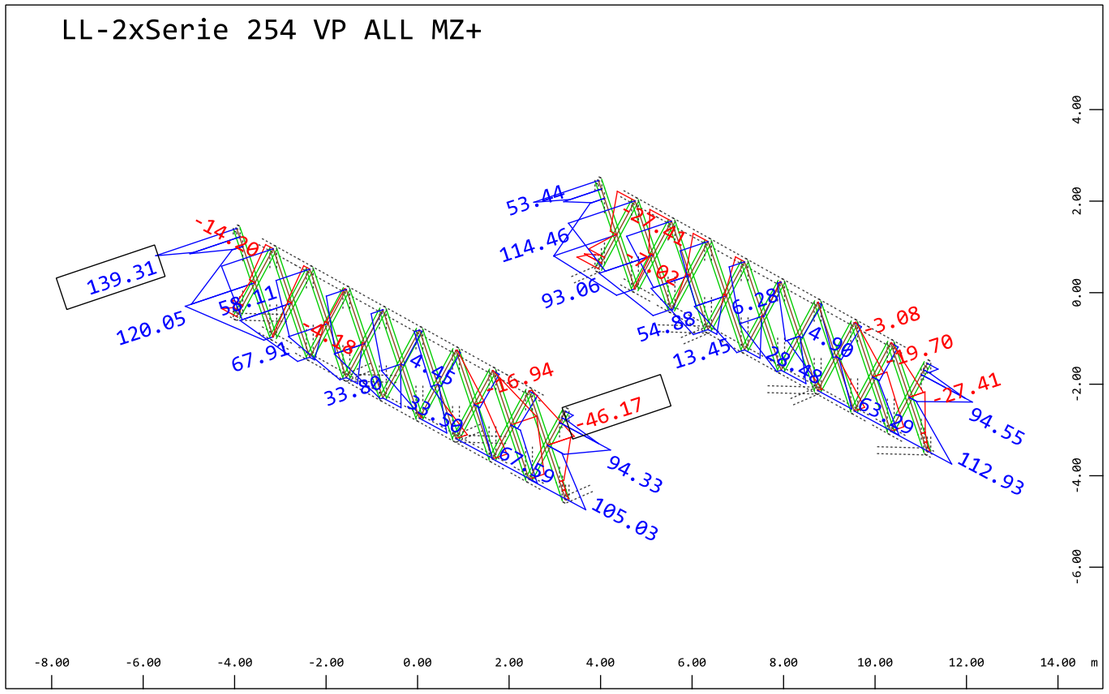
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1335 LL-2xSerie 254 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-146.41) (Max=47.59)

M 1 : 129
X * 0.502
Y * 0.906
Z * 0.962



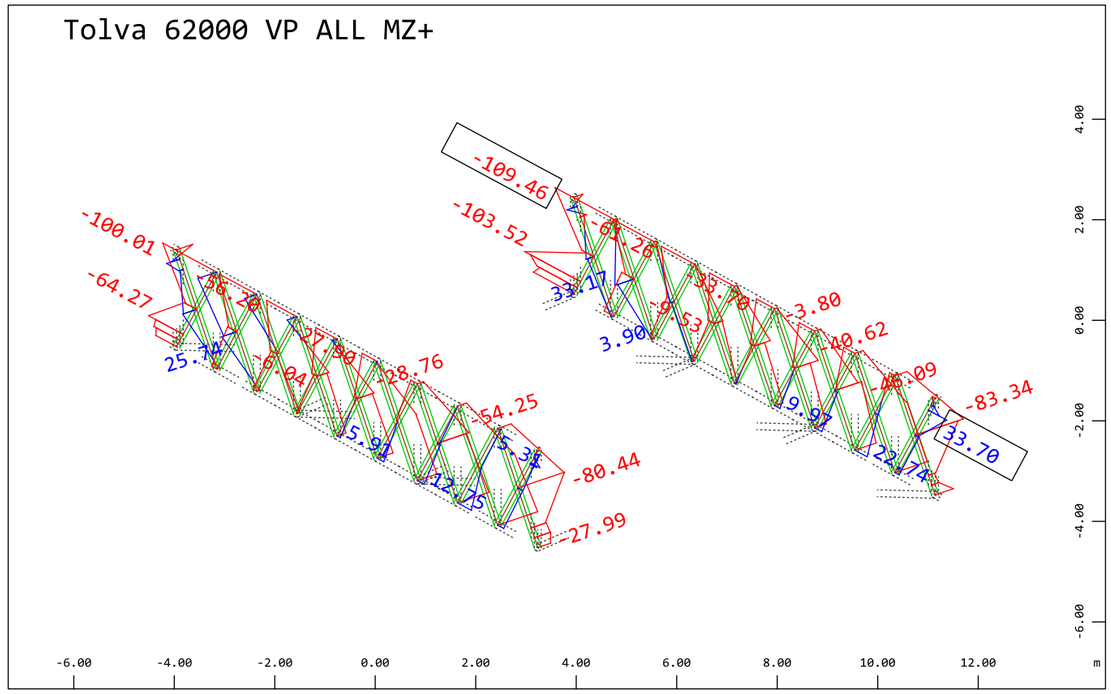

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1335 LL-2xSerie 254 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-46.17) (Max=139.31)

M 1 : 134
X * 0.502
Y * 0.906
Z * 0.962

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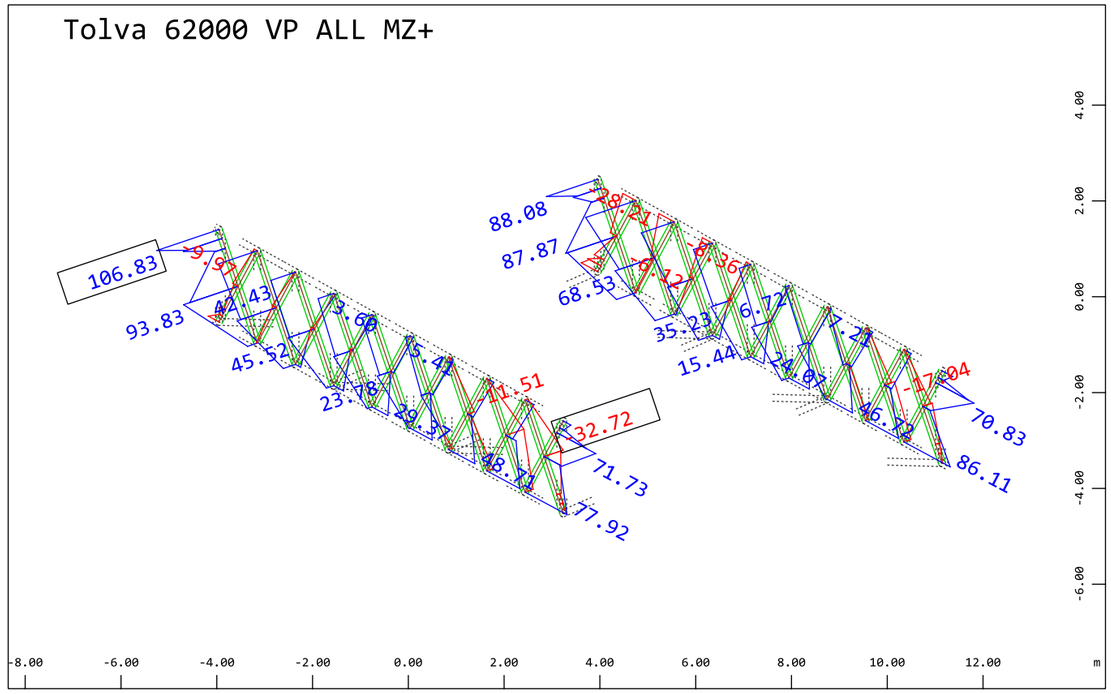


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1325 Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-109.46) (Max=33.70)

M 1 : 122
X * 0.502
Y * 0.906
Z * 0.962

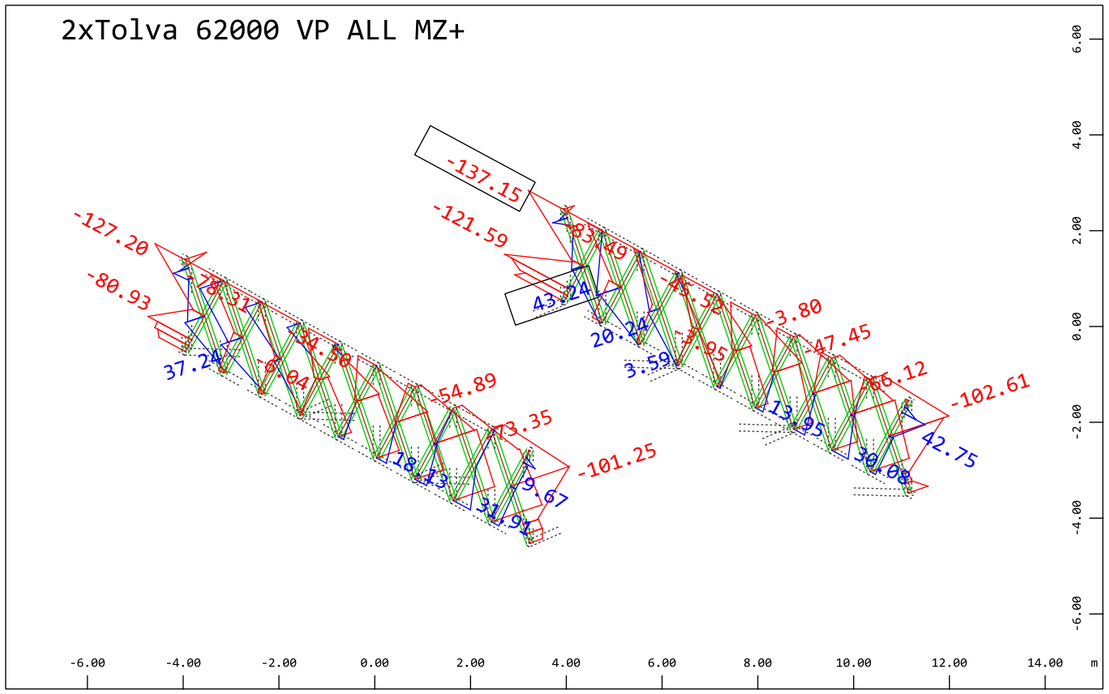



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1325 Tolva 62000 VP ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-32.72) (Max=106.83)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962

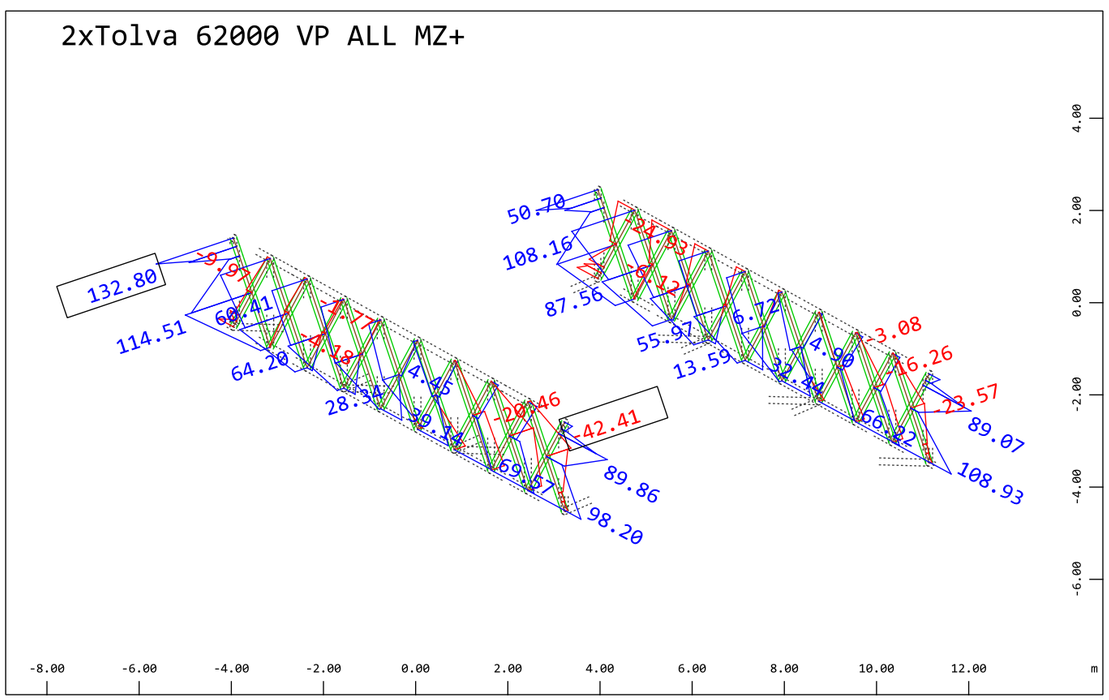
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1355 2xTolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-137.15) (Max=43.24)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962

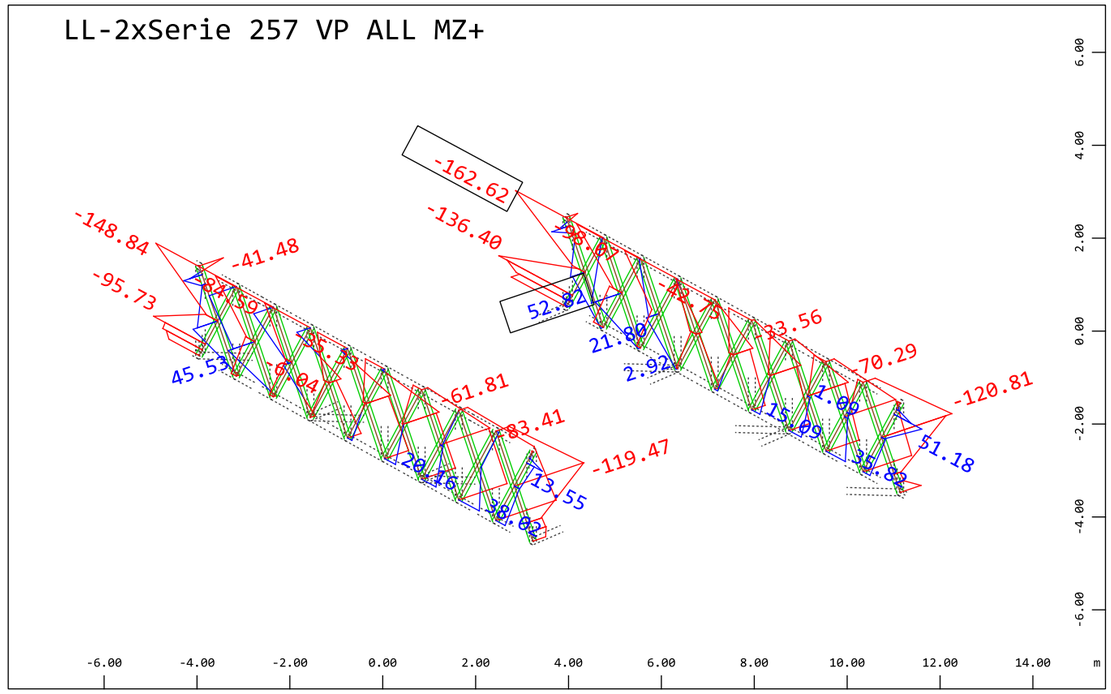



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1355 2xTolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-42.41) (Max=132.80)

M 1 : 133
X * 0.502
Y * 0.906
Z * 0.962

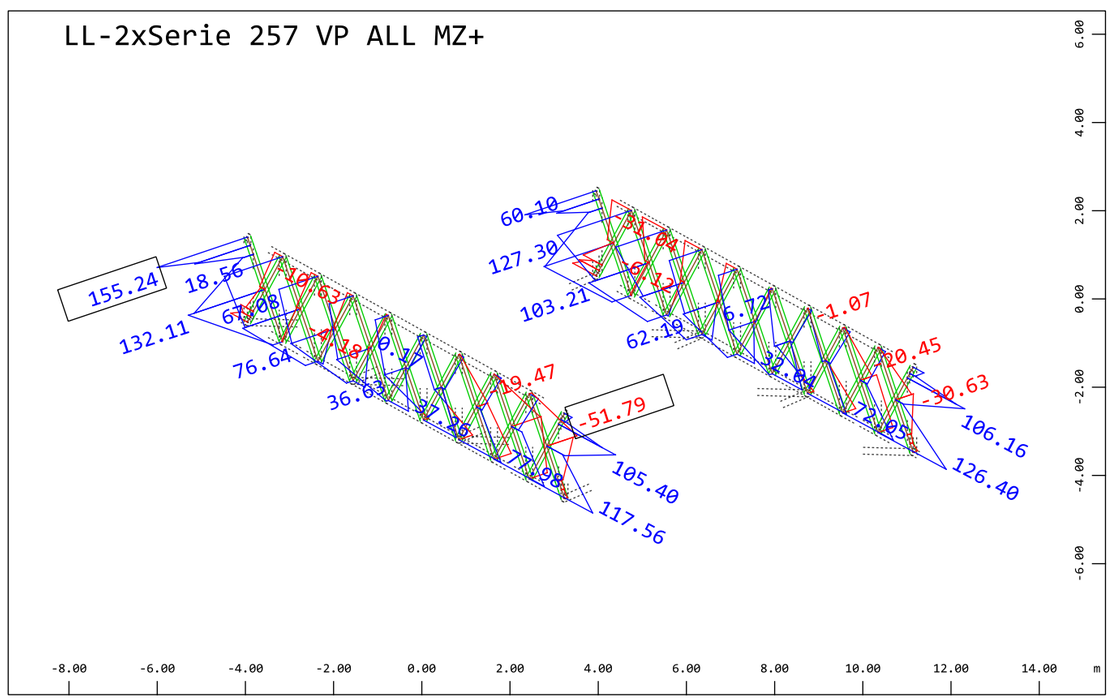


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1345 LL-2xSerie 257 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-162.62) (Max=52.82)

M 1 : 132
X * 0.502
Y * 0.906
Z * 0.962

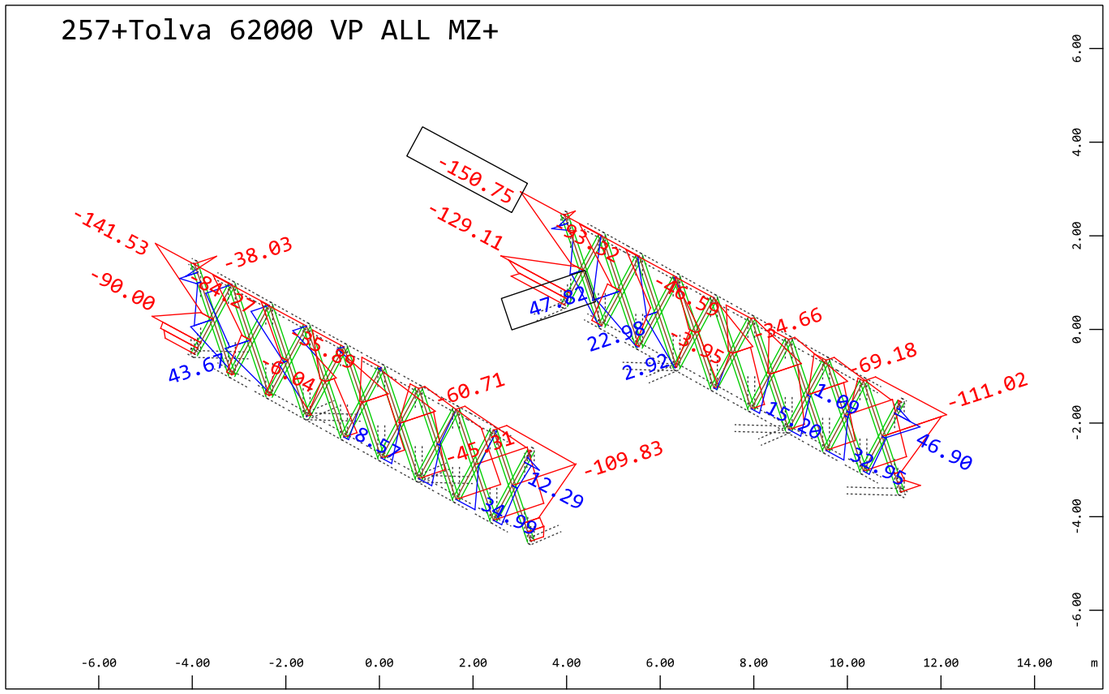



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1345 LL-2xSerie 257 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-51.79) (Max=155.24)

M 1 : 139
X * 0.502
Y * 0.906
Z * 0.962

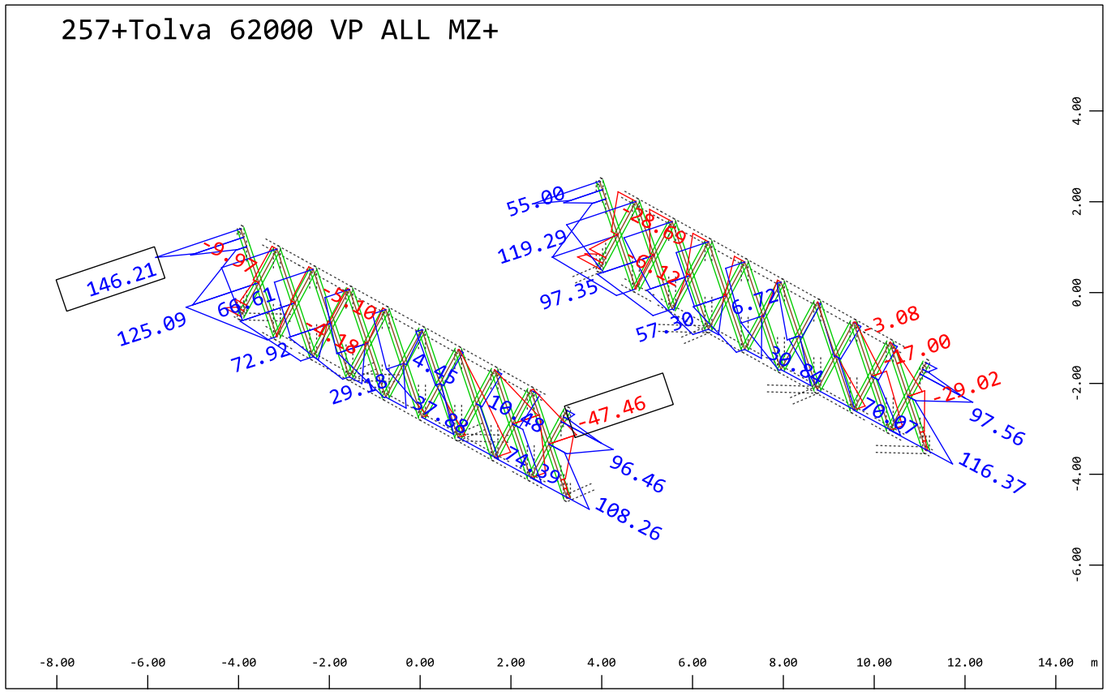
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1375 257+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-150.75) (Max=47.82)

M 1 : 131
X * 0.502
Y * 0.906
Z * 0.962



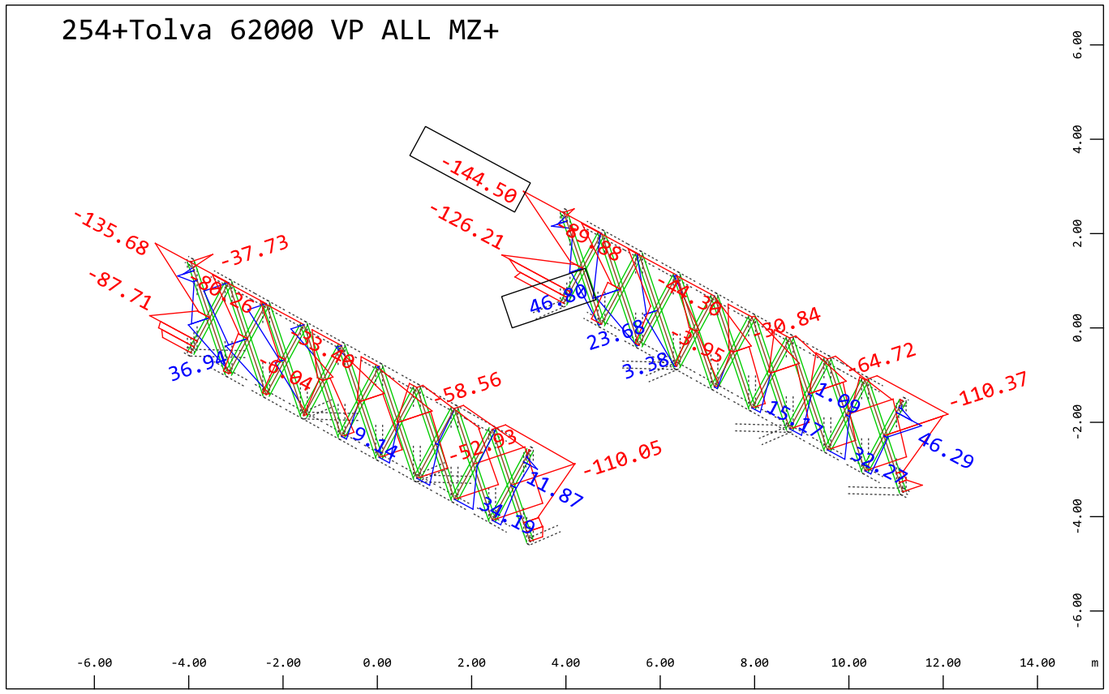

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1375 257+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-47.46) (Max=146.21)

M 1 : 135
X * 0.502
Y * 0.906
Z * 0.962

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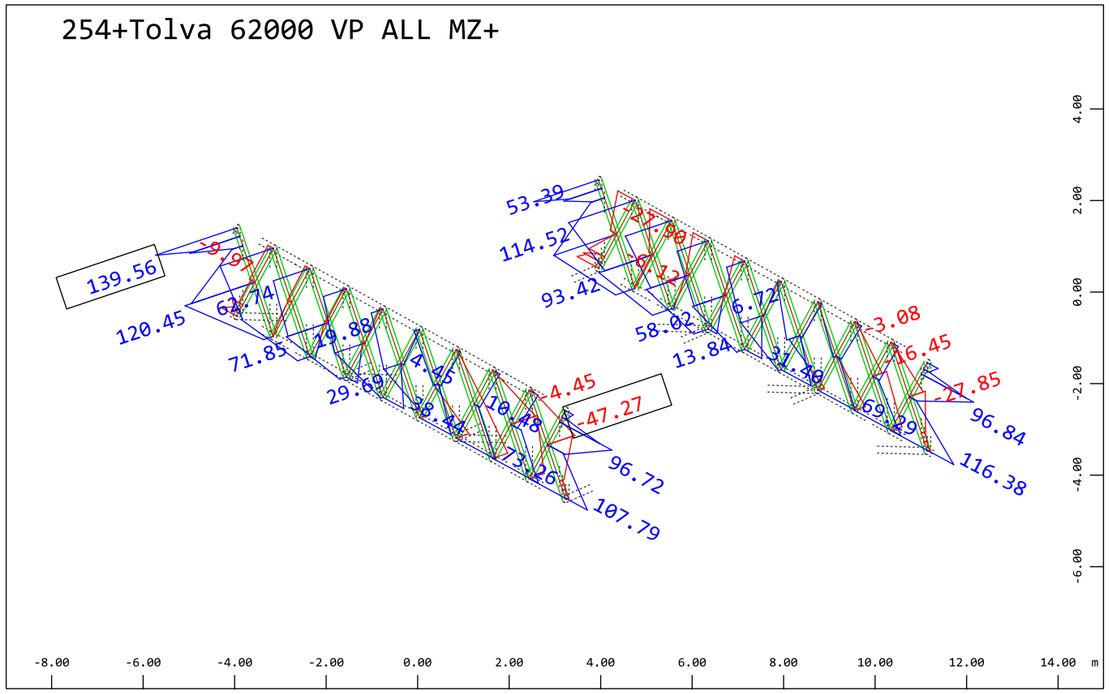


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1365 254+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-144.50) (Max=46.80)

M 1 : 130
X * 0.502
Y * 0.906
Z * 0.962

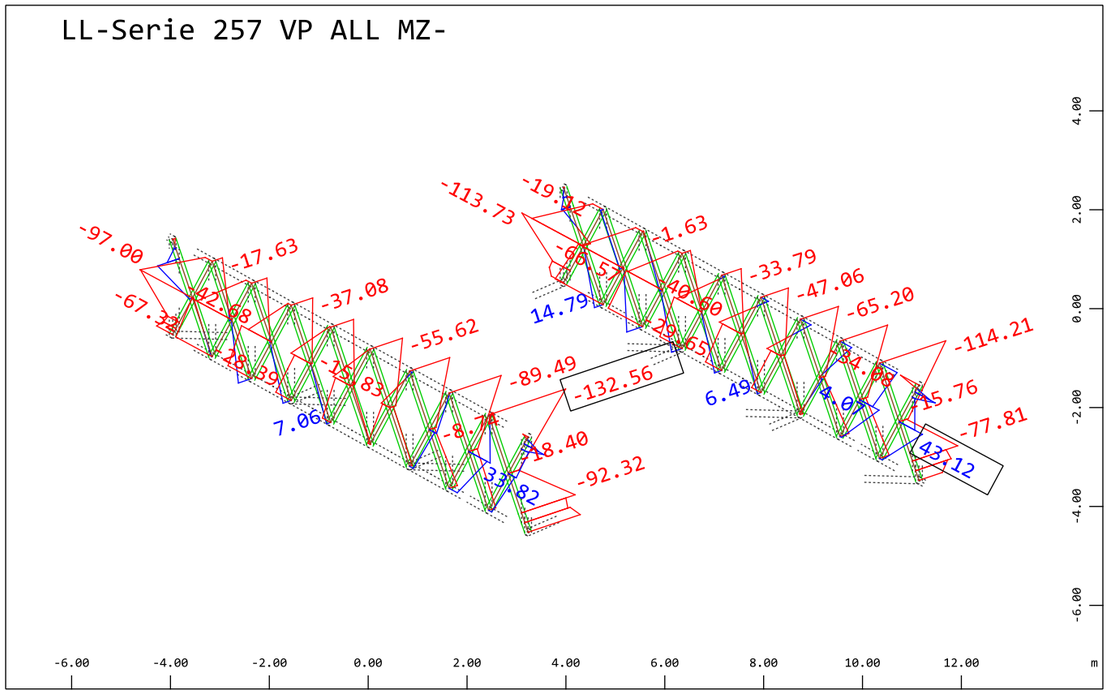



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1365 254+Tolva 62000 VP ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-47.27) (Max=139.56)

M 1 : 134
X * 0.502
Y * 0.906
Z * 0.962

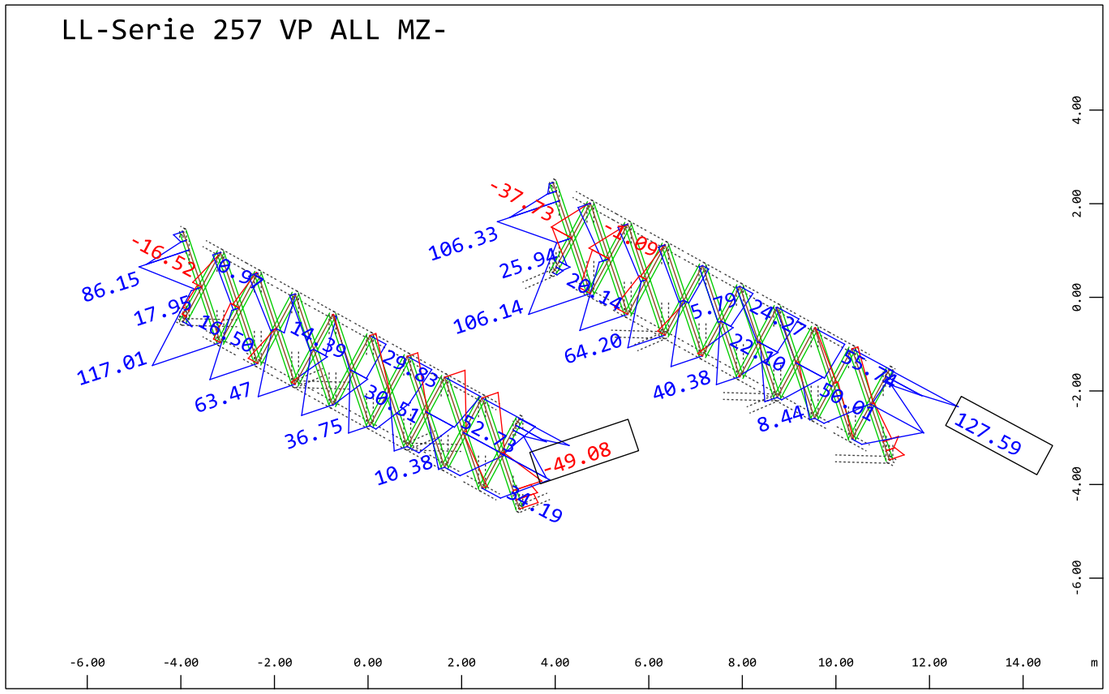
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1316 LL-Serie 257 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-132.56) (Max=43.12)

M 1 : 124
X * 0.502
Y * 0.906
Z * 0.962

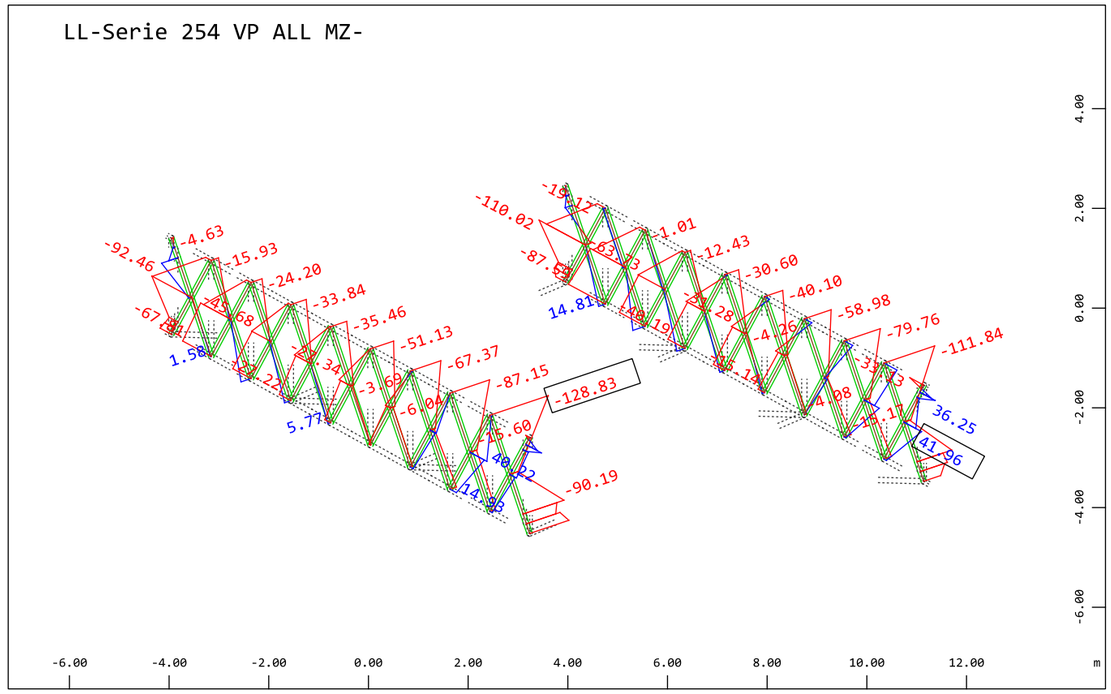



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1316 LL-Serie 257 VP ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-49.08) (Max=127.59)

M 1 : 131
X * 0.502
Y * 0.906
Z * 0.962

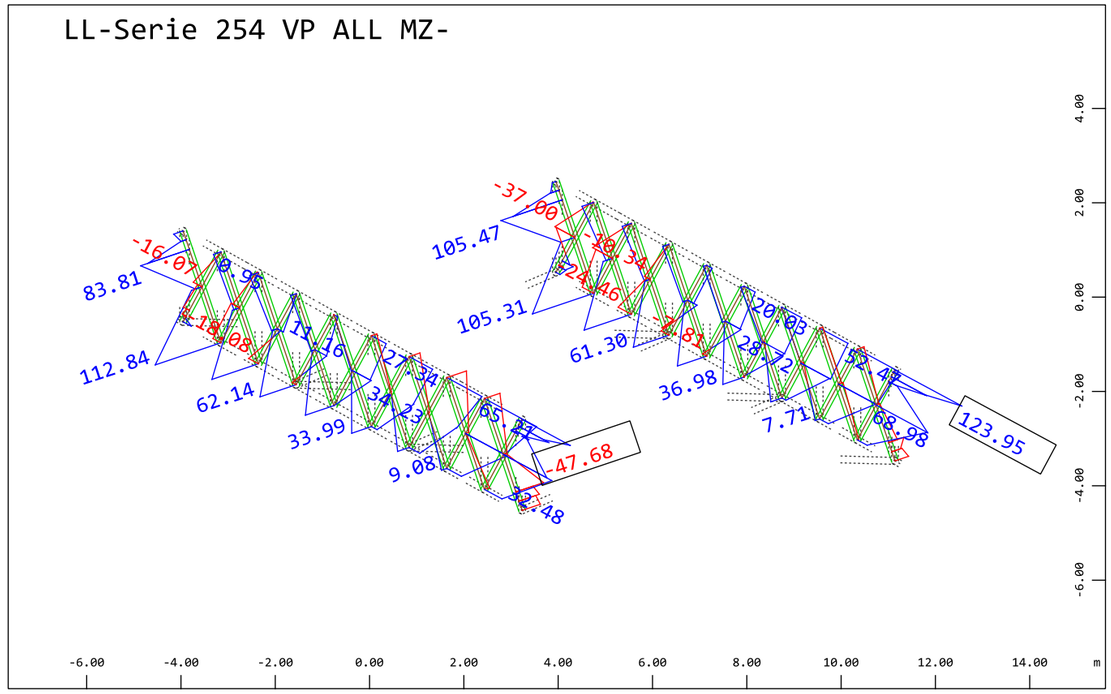


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1306 LL-Serie 254 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-128.83) (Max=41.96)

M 1 : 123
X * 0.502
Y * 0.906
Z * 0.962

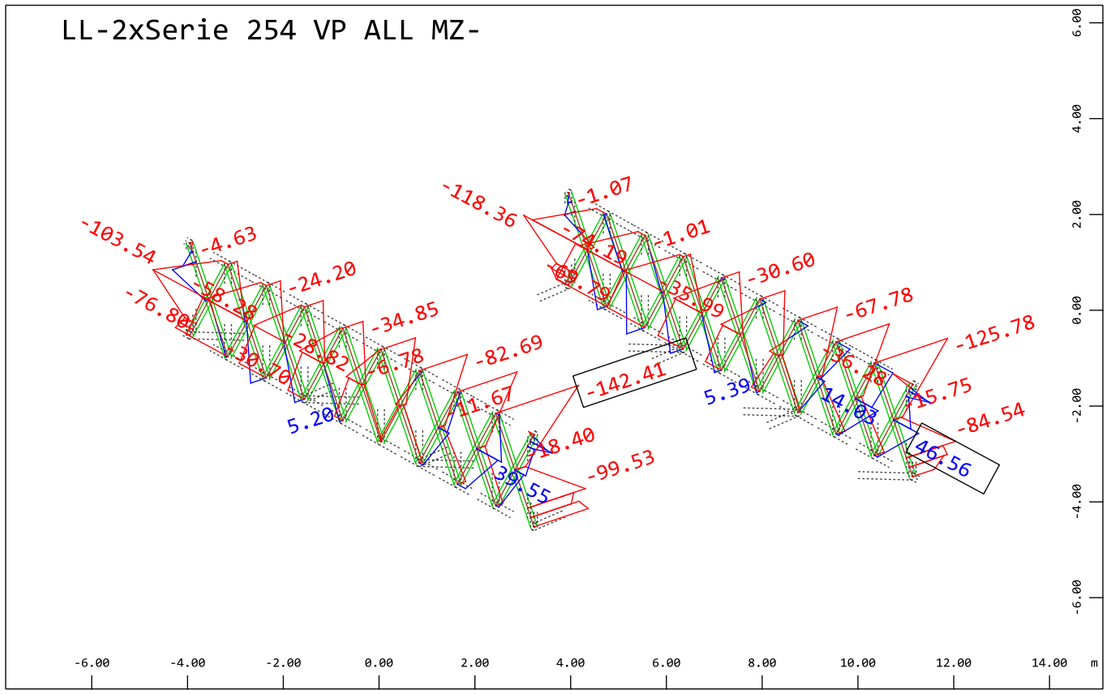



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1306 LL-Serie 254 VP ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-47.68) (Max=123.95)

M 1 : 130
X * 0.502
Y * 0.906
Z * 0.962

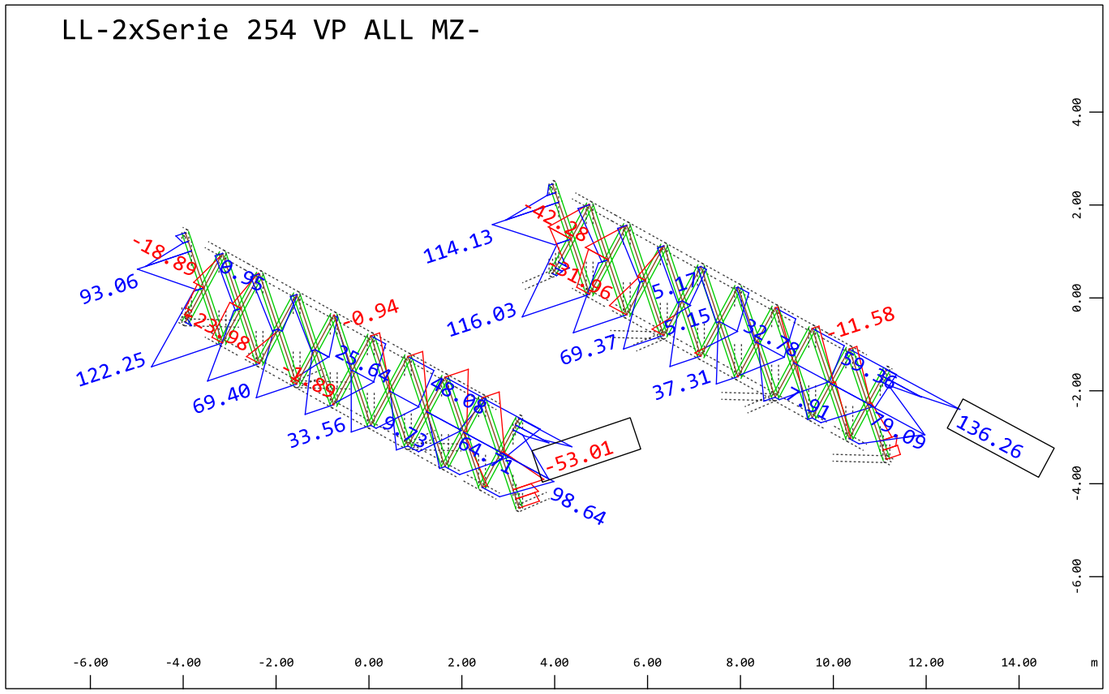
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1336 LL-2xSerie 254 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-142.41) (Max=46.56)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962



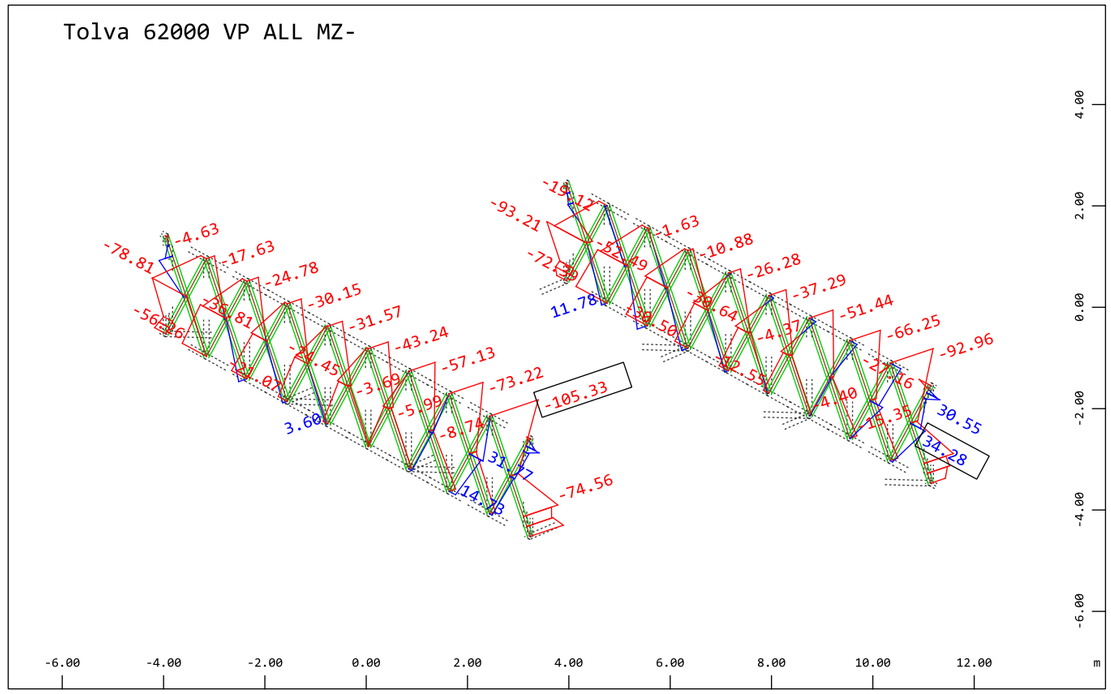

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1336 LL-2xSerie 254 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-53.01) (Max=136.26)

M 1 : 132
X * 0.502
Y * 0.906
Z * 0.962

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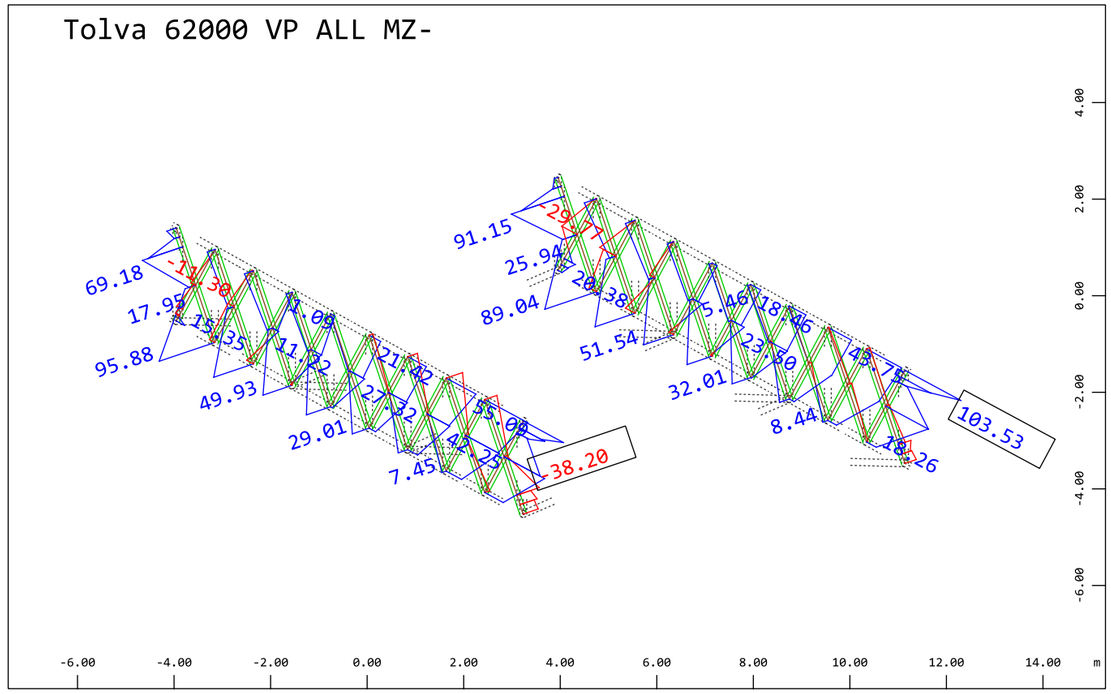


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1326 Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-105.33) (Max=34.28)

M 1 : 121
X * 0.502
Y * 0.906
Z * 0.962

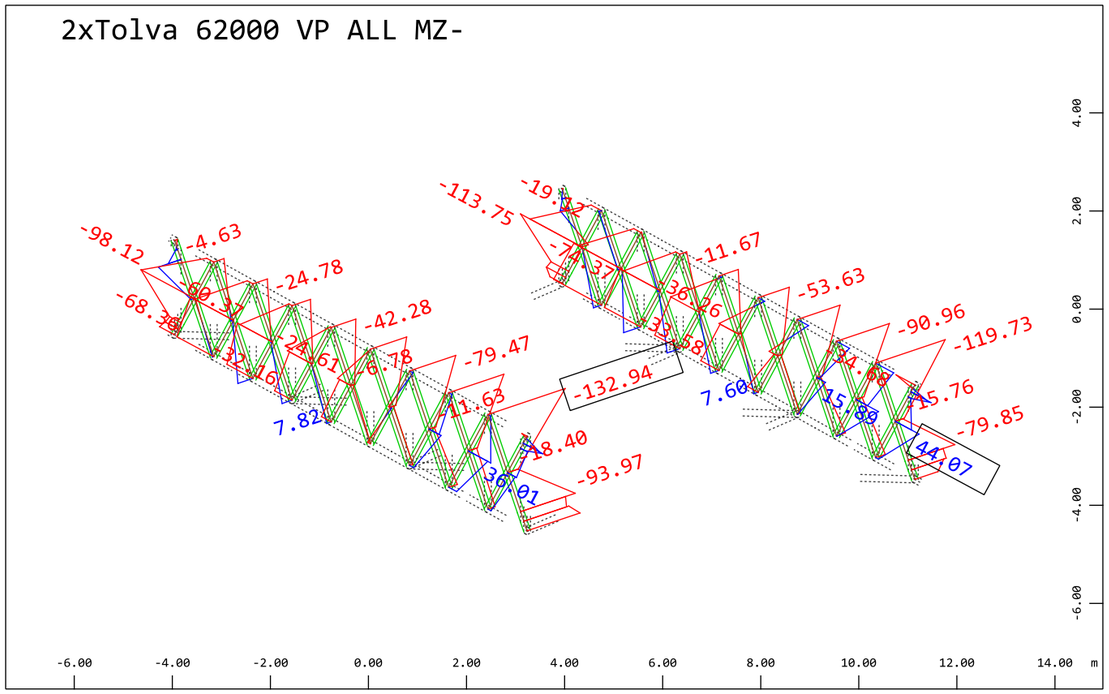



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1326 Tolva 62000 VP ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-38.20) (Max=103.53)

M 1 : 127
X * 0.502
Y * 0.906
Z * 0.962

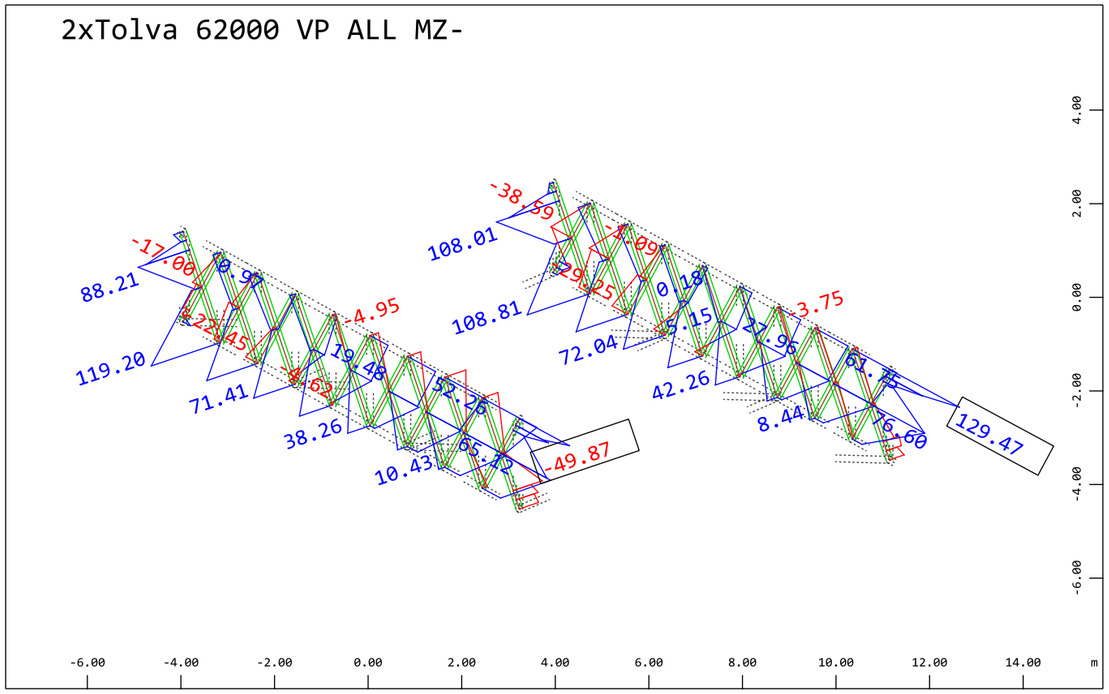
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1356 2xTolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-132.94) (Max=44.07)

M 1 : 125
X * 0.502
Y * 0.906
Z * 0.962



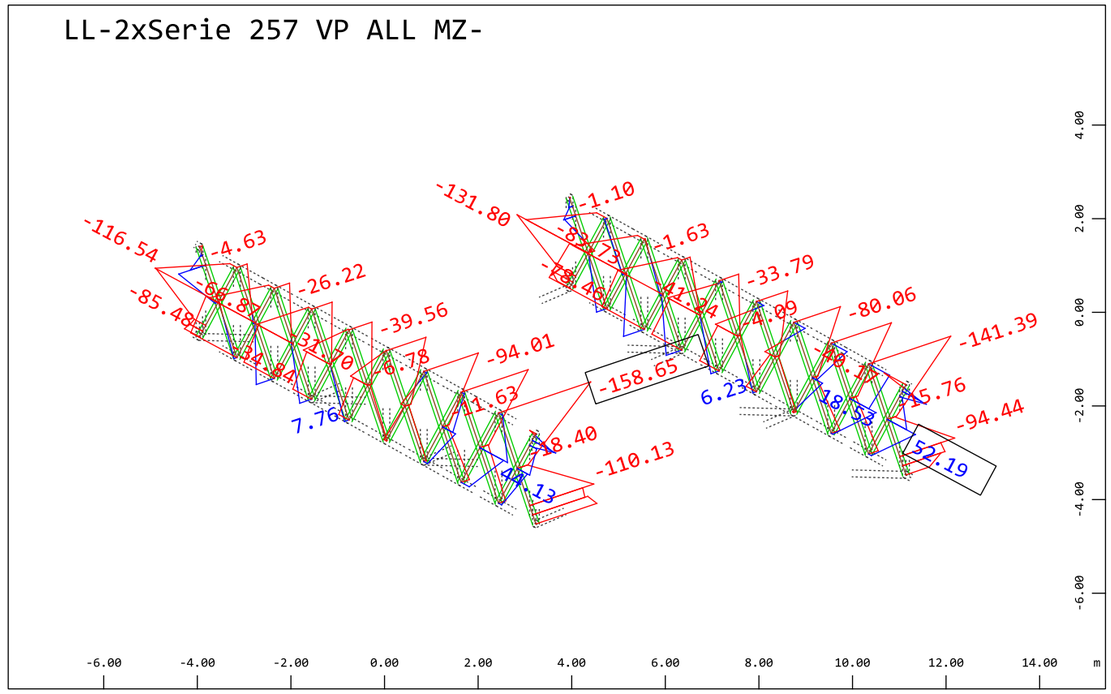

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1356 2xTolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-49.87) (Max=129.47)

M 1 : 131
X * 0.502
Y * 0.906
Z * 0.962

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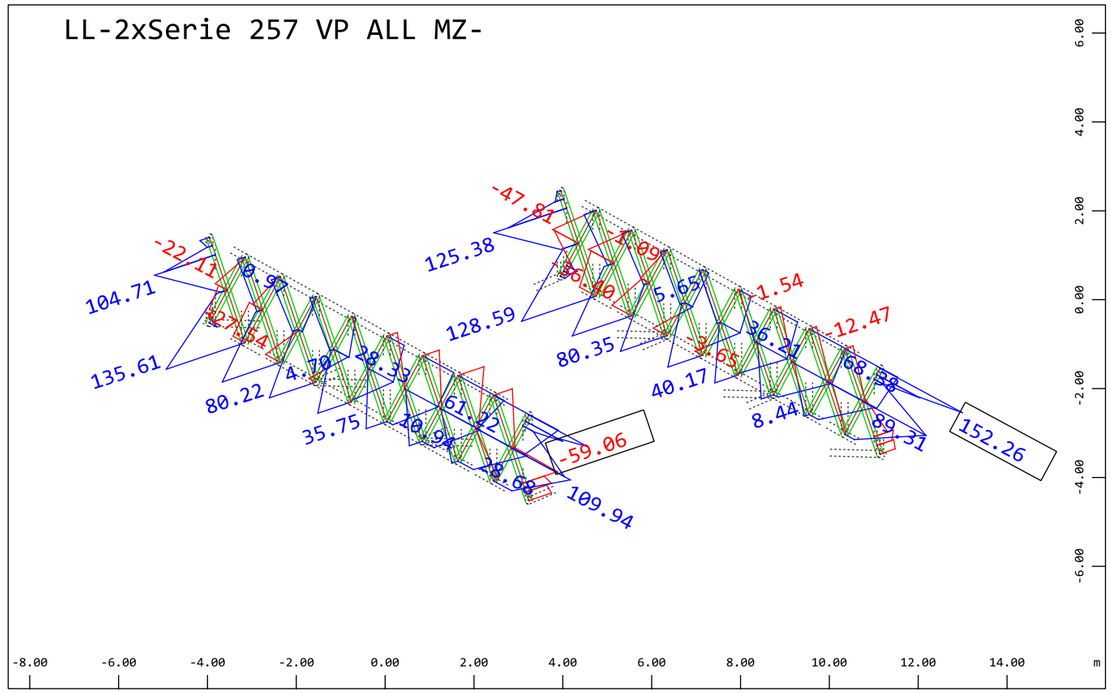


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1346 LL-2xSerie 257 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-158.65) (Max=52.19)

M 1 : 131
X * 0.502
Y * 0.906
Z * 0.962

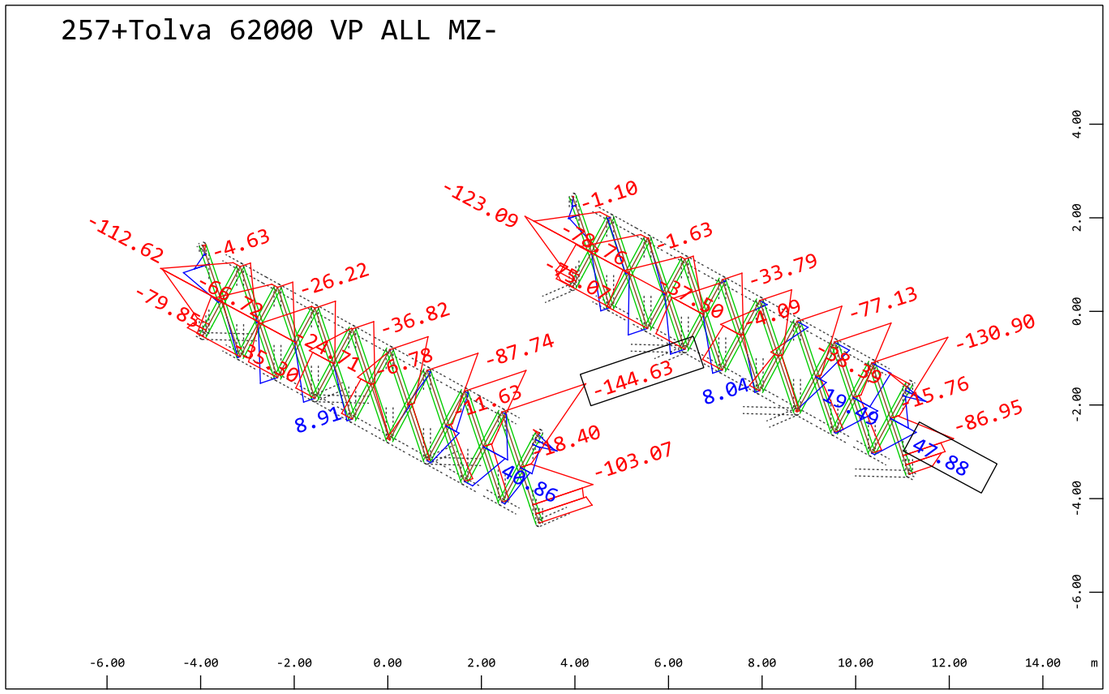



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1346 LL-2xSerie 257 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-59.06) (Max=152.26)

M 1 : 138
X * 0.502
Y * 0.906
Z * 0.962

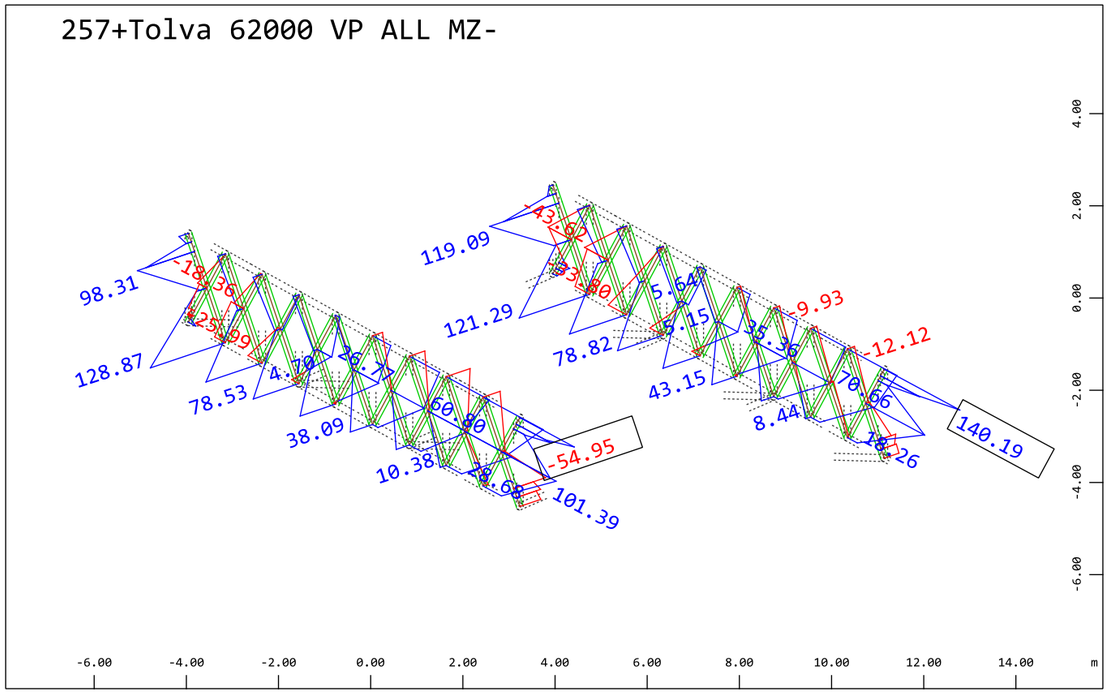
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Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1376 257+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-144.63) (Max=47.88)

M 1 : 131
X * 0.502
Y * 0.906
Z * 0.962



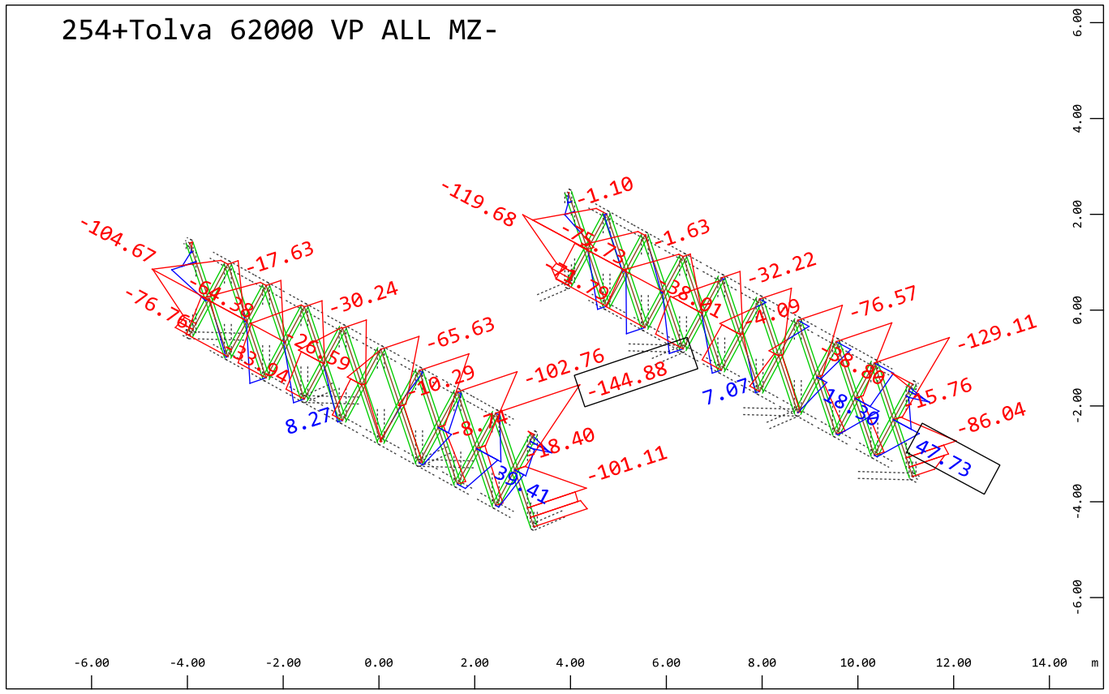

Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1376 257+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-54.95) (Max=140.19)

M 1 : 133
X * 0.502
Y * 0.906
Z * 0.962

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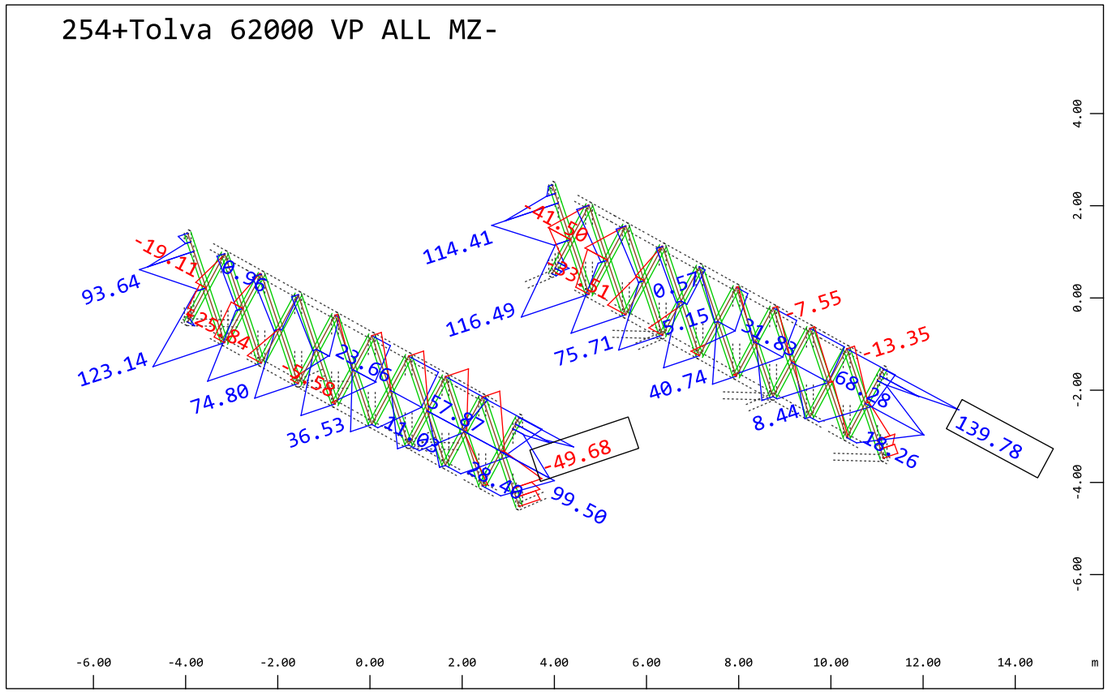


Pont Carretera Vic
Tensiones




Sector of system Group 8
Beam Elements , Maximum compression stress, Design Case 1366 254+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-144.88) (Max=47.73)

M 1 : 128
X * 0.502
Y * 0.906
Z * 0.962

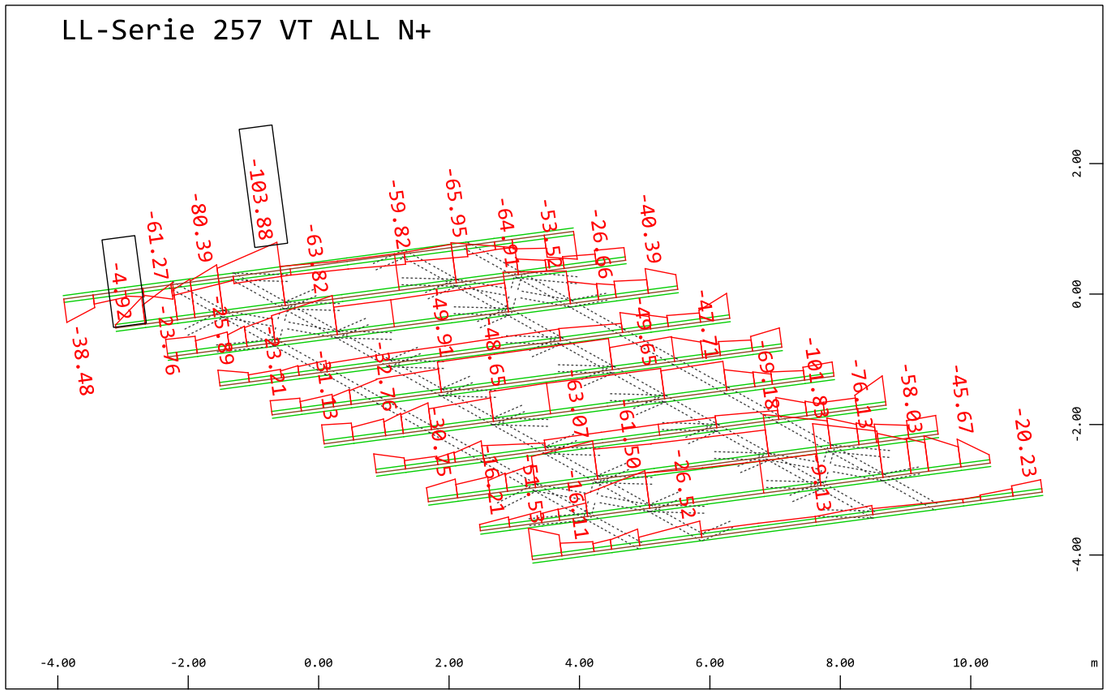



Sector of system Group 8
Beam Elements , Maximum tensile stress, Design Case 1366 254+Tolva 62000 VP ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-49.68) (Max=139.78)

M 1 : 133
X * 0.502
Y * 0.906
Z * 0.962

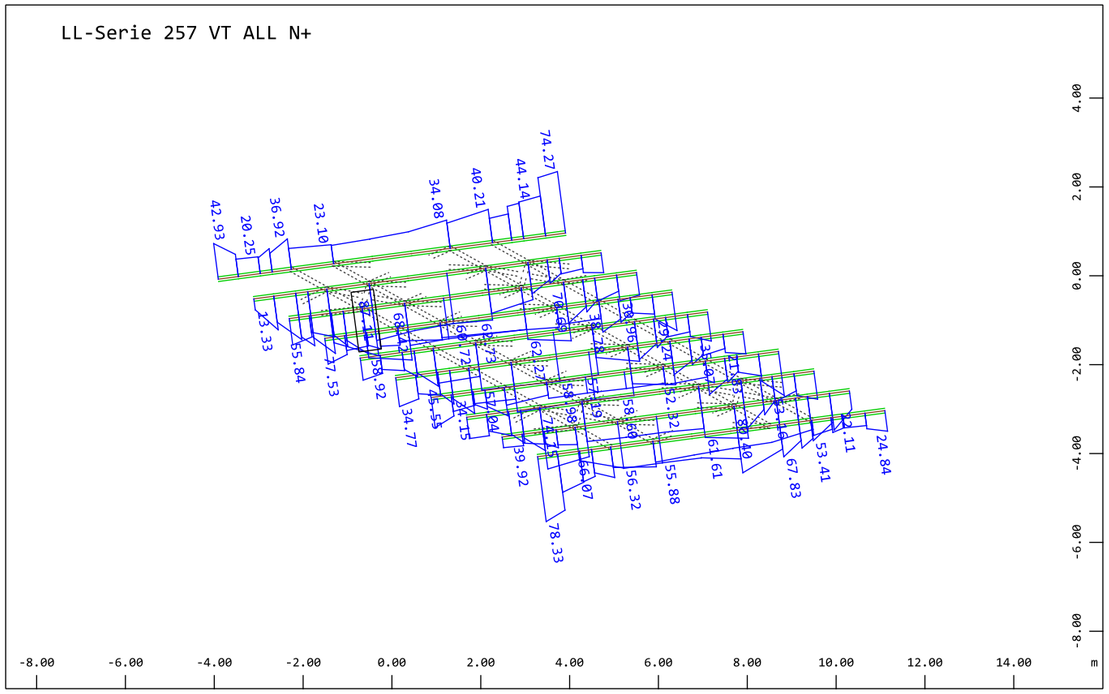
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1611 LL-Serie 257 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-103.88) (Max=-4.92)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962

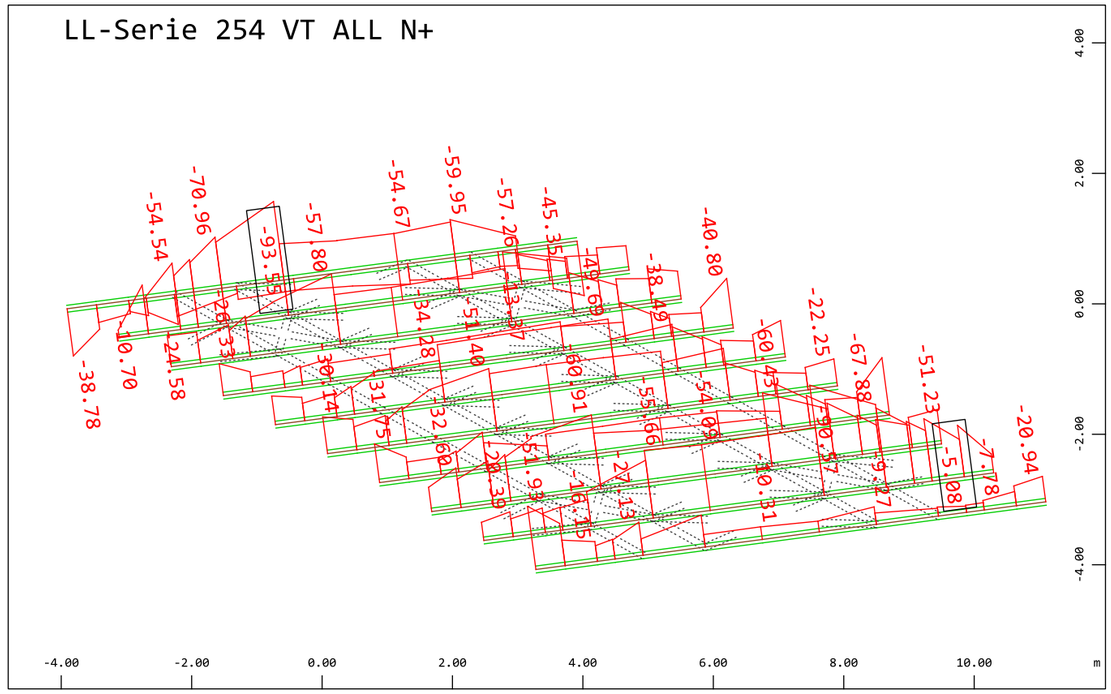



Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1611 LL-Serie 257 VT ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=87.11)

M 1 : 138
X * 0.502
Y * 0.906
Z * 0.962

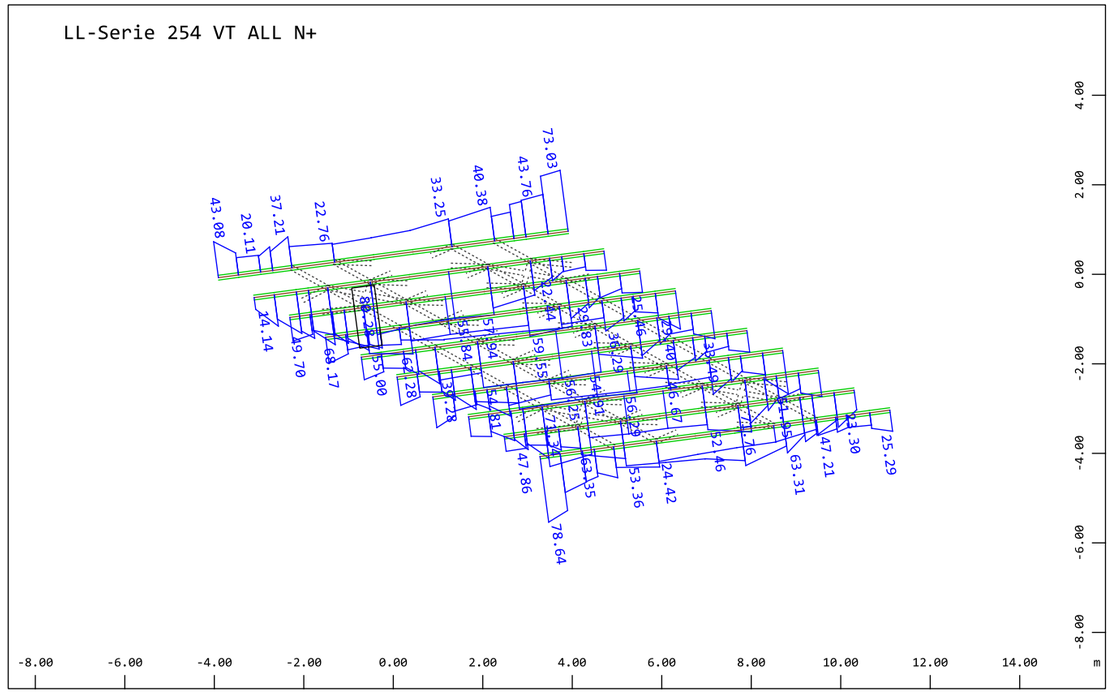


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1601 LL-Serie 254 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.55) (Max=-5.08)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962

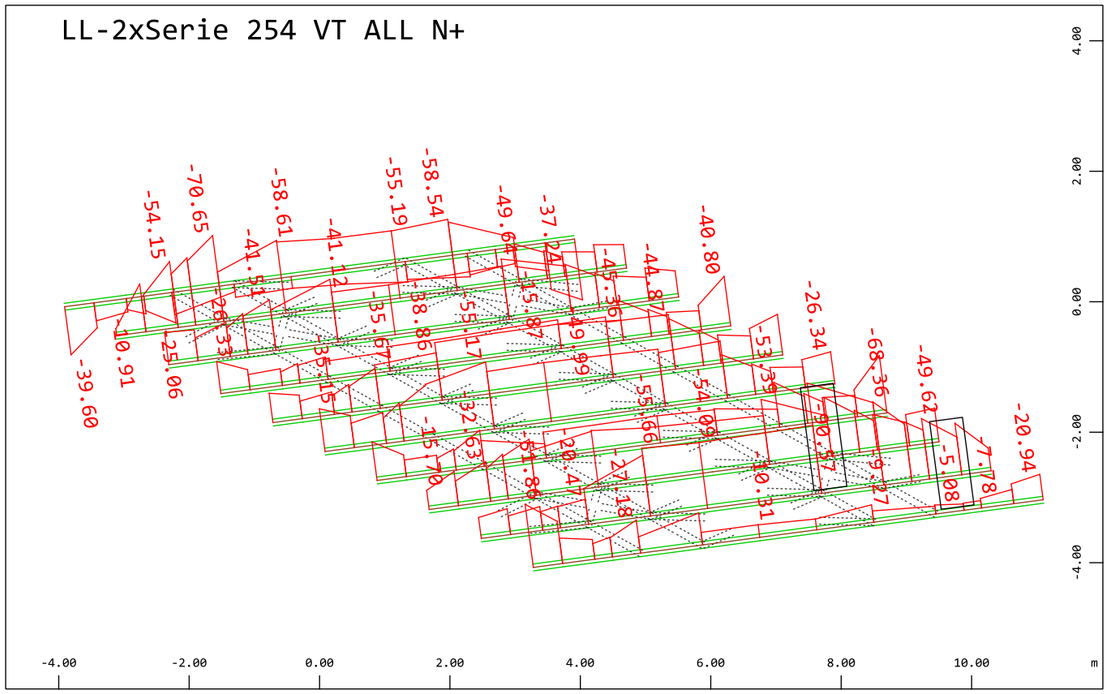



Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1601 LL-Serie 254 VT ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=80.28)

M 1 : 137
X * 0.502
Y * 0.906
Z * 0.962

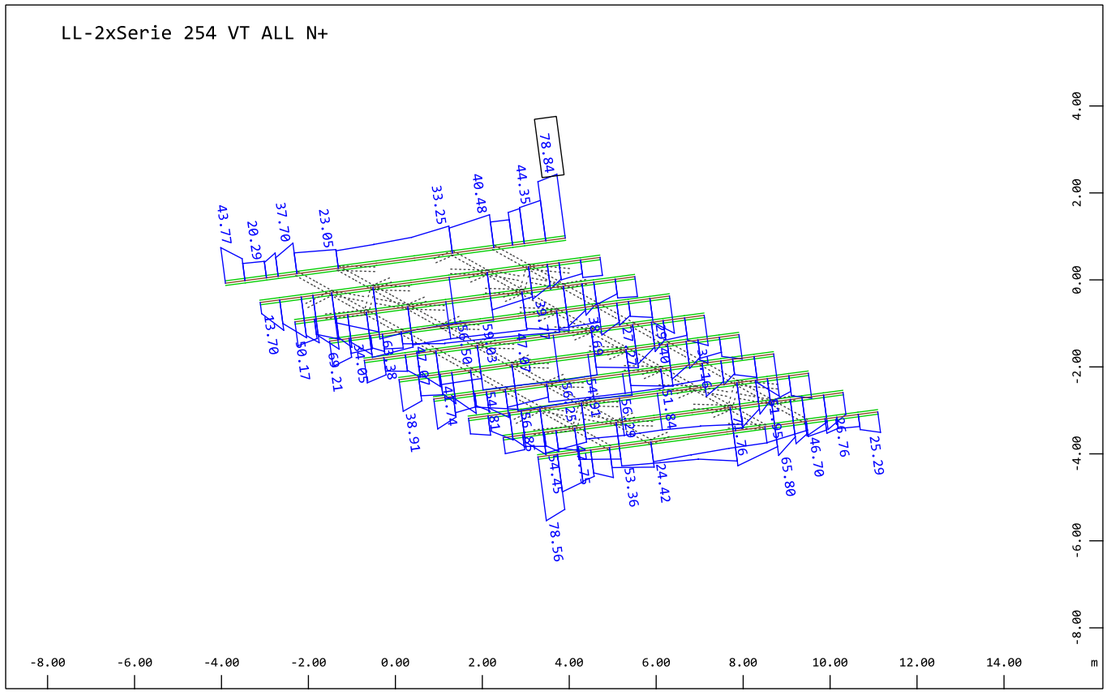
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Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1631 LL-2xSerie 254 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-90.57) (Max=-5.08)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



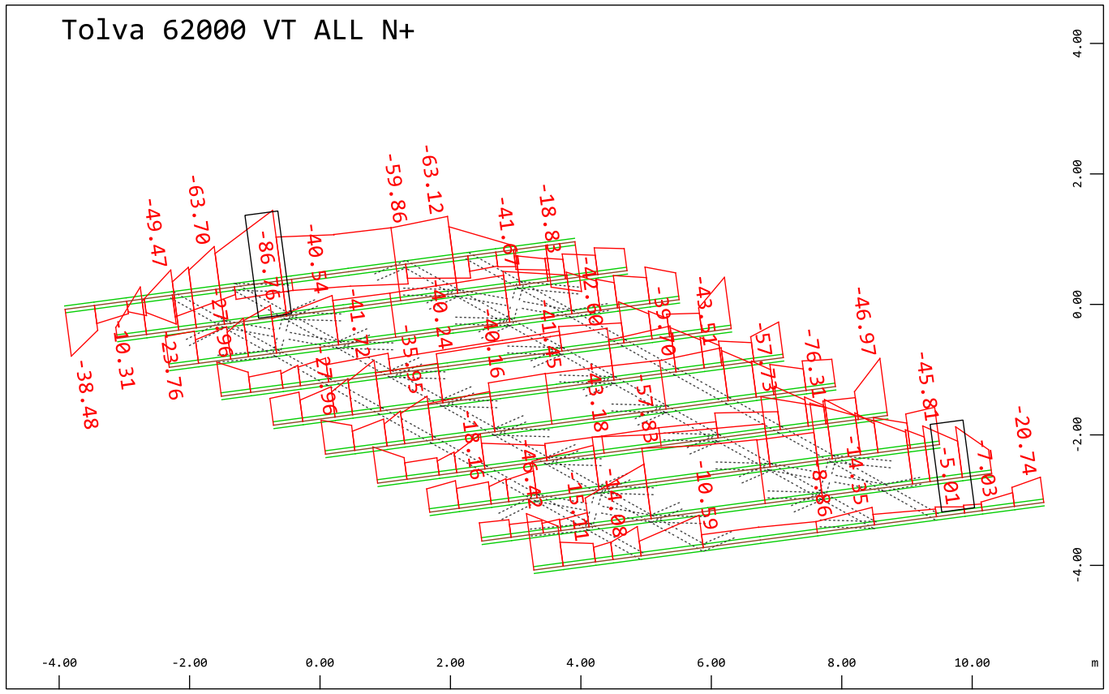

Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1631 LL-2xSerie 254 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=78.84)

M 1 : 141
X * 0.502
Y * 0.906
Z * 0.962

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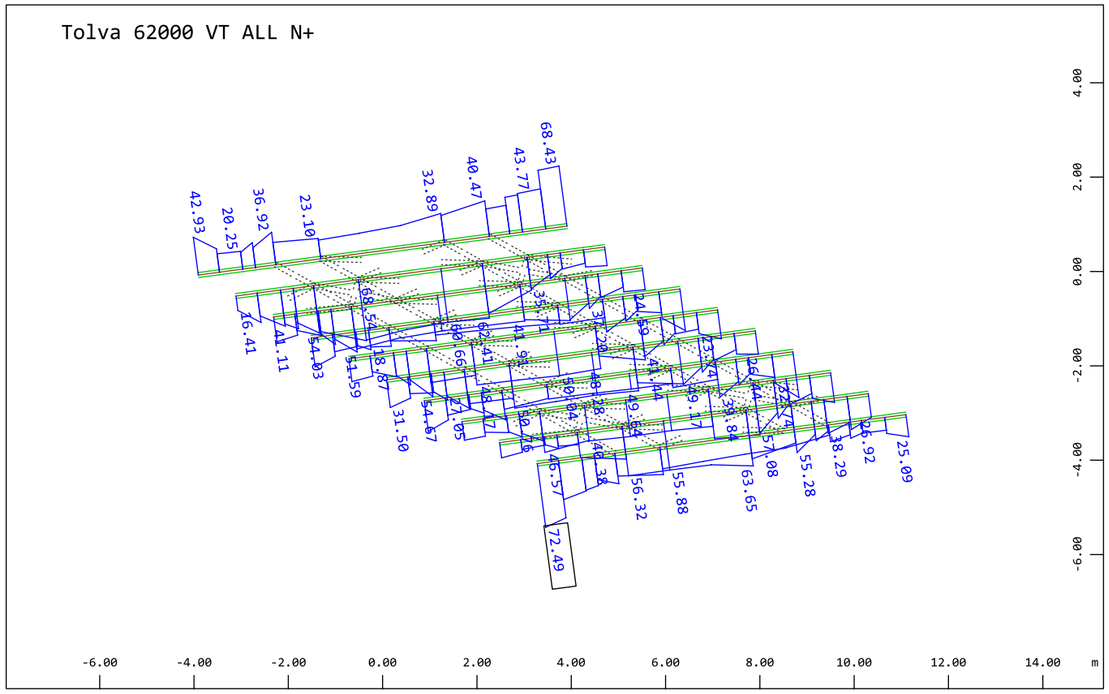


Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1621 Tolva 62000 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-86.76) (Max=-5.01)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962

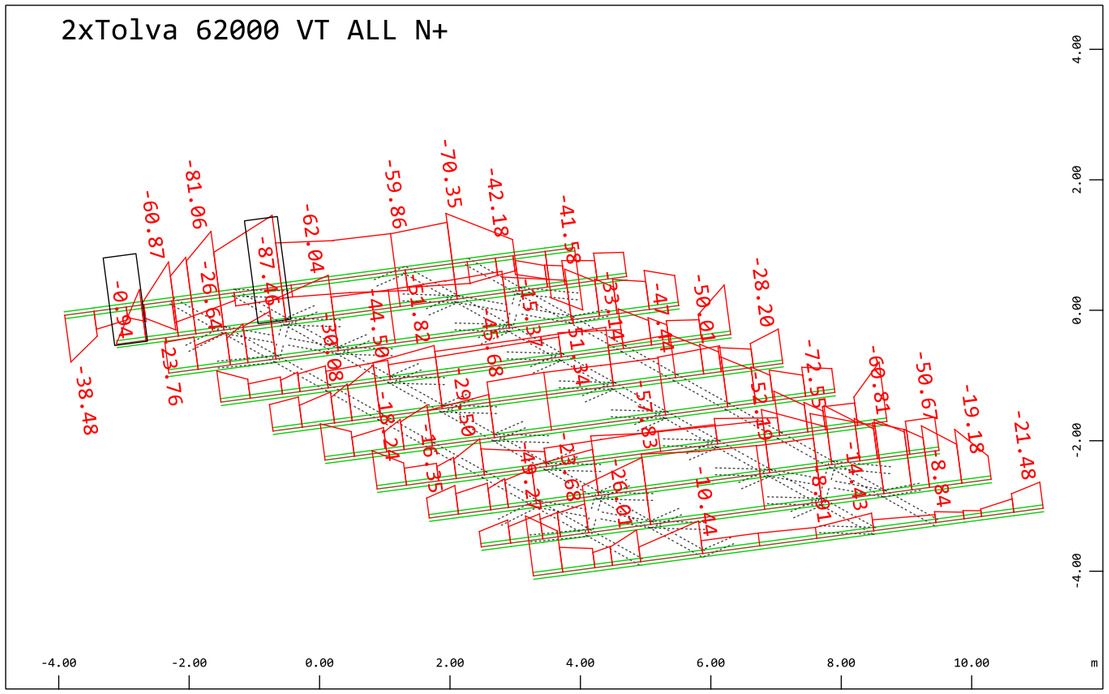



Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1621 Tolva 62000 VT ALL N+, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=72.49)

M 1 : 130
X * 0.502
Y * 0.906
Z * 0.962

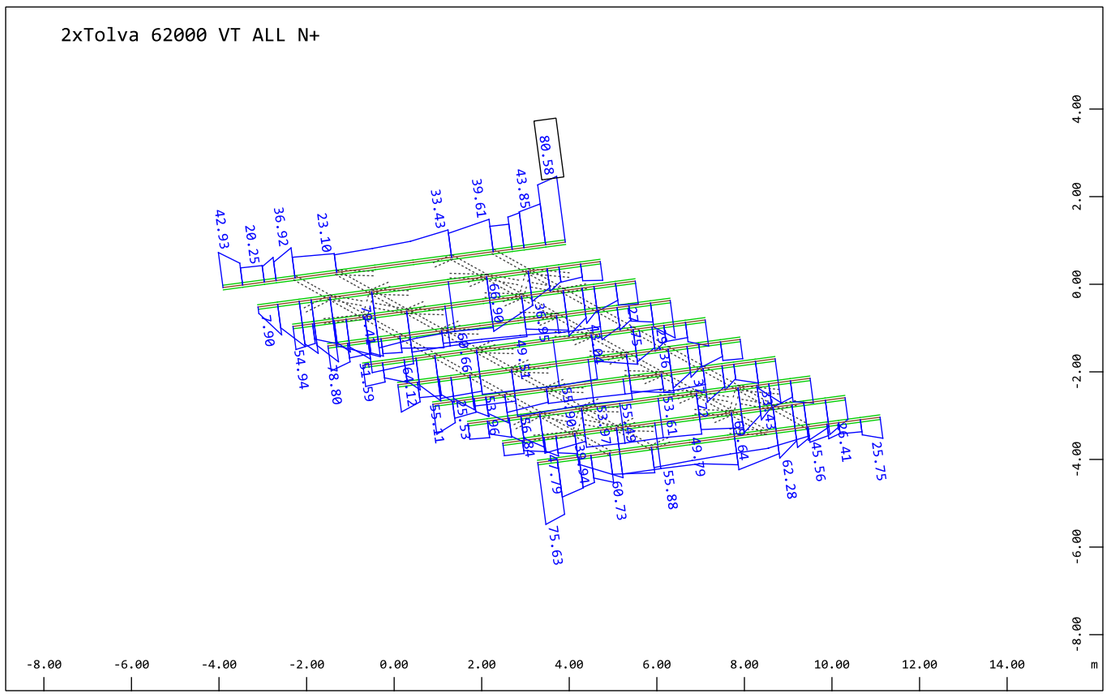
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Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1651 2xTolva 62000 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-87.46) (Max=-0.94)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



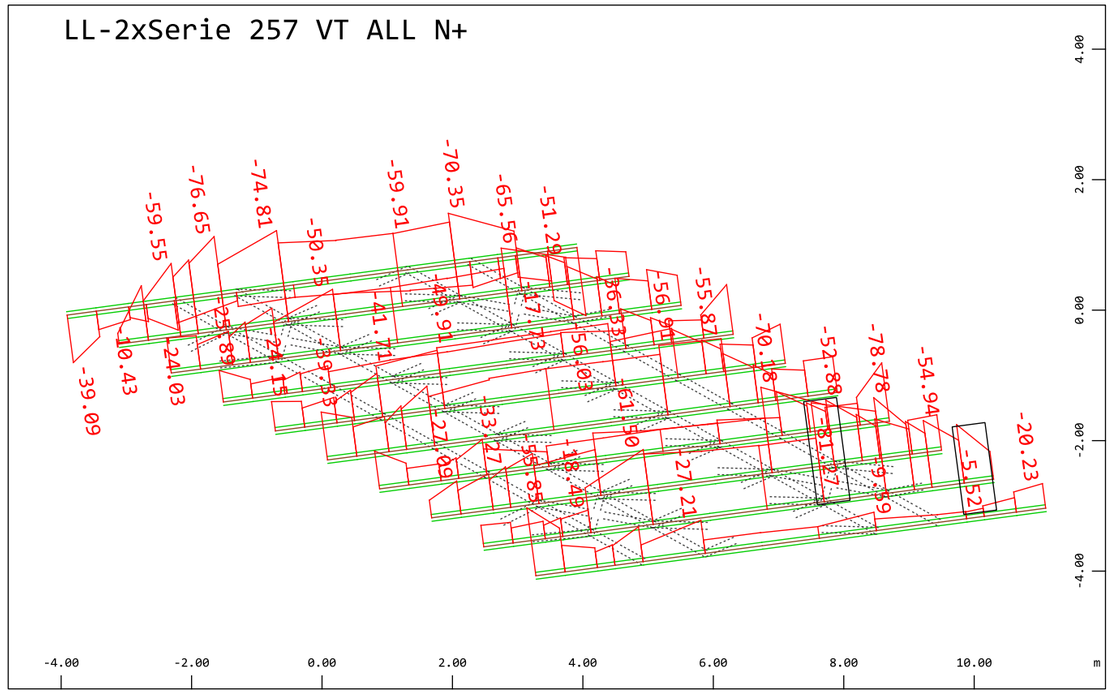

Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1651 2xTolva 62000 VT ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=80.58)

M 1 : 140
X * 0.502
Y * 0.906
Z * 0.962

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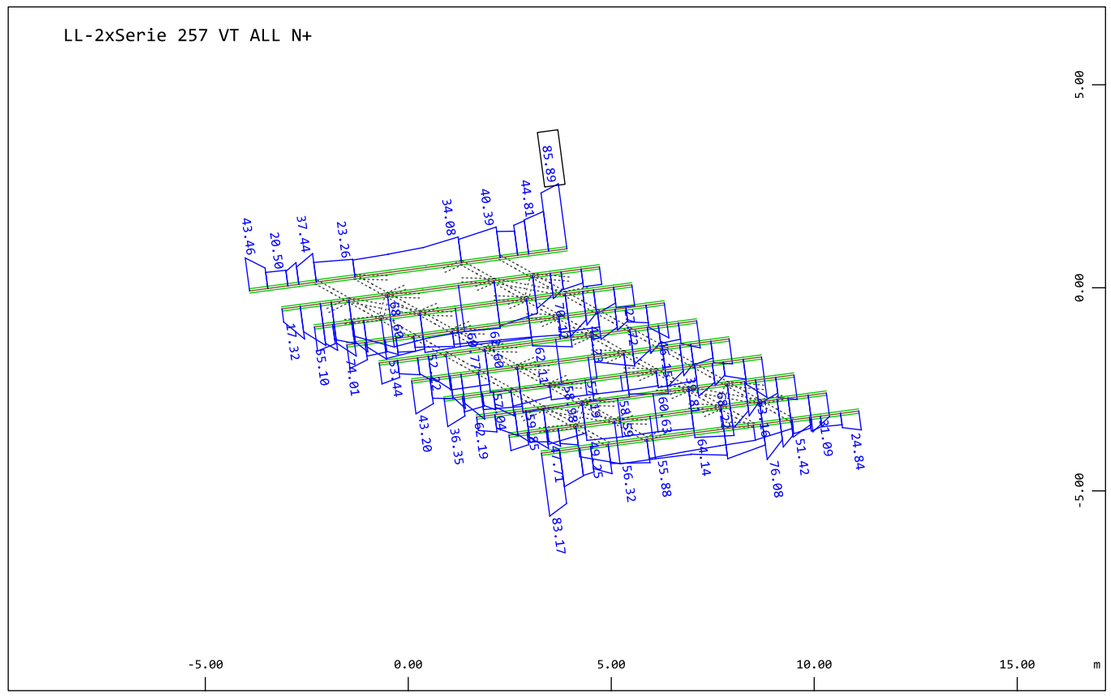


Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1641 LL-2xSerie 257 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-81.27) (Max=-5.52)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962

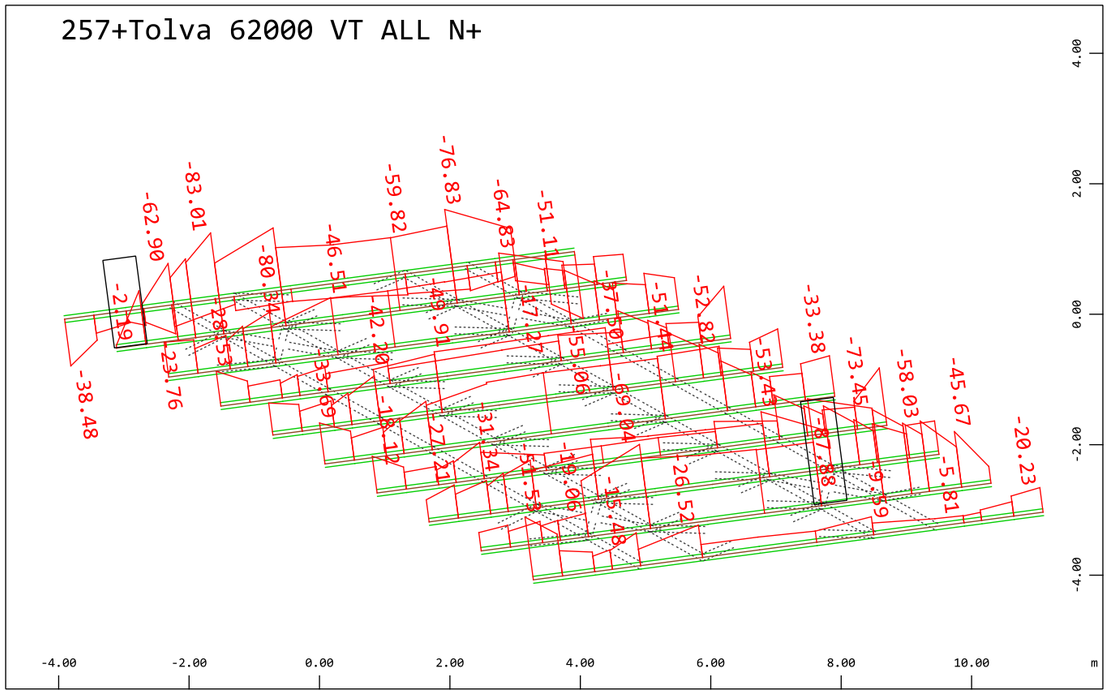



Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1641 LL-2xSerie 257 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=85.89)

M 1 : 151
X * 0.502
Y * 0.906
Z * 0.962

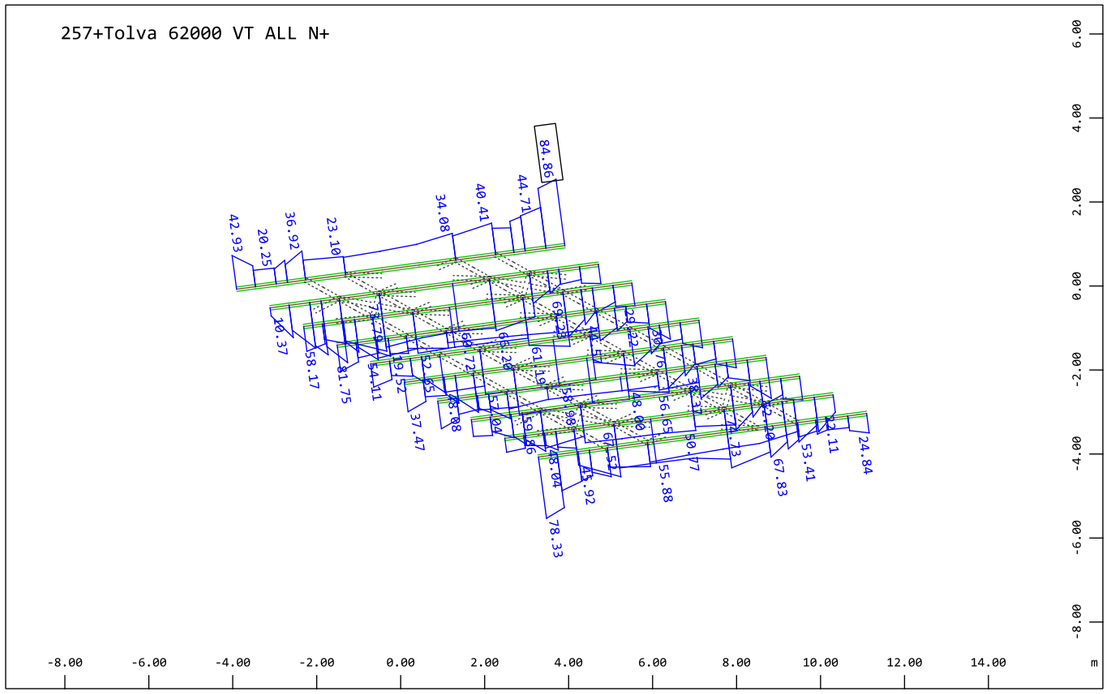
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1671 257+Tolva 62000 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-87.88) (Max=-2.19)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



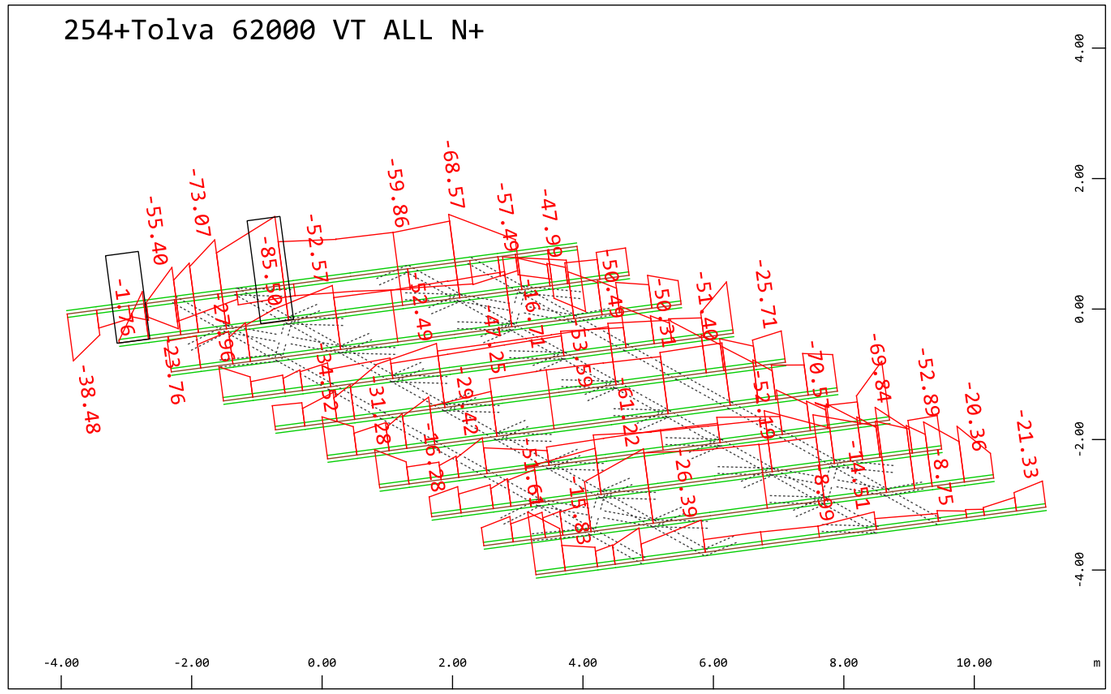

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1671 257+Tolva 62000 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=84.86)

M 1 : 146
X * 0.502
Y * 0.906
Z * 0.962

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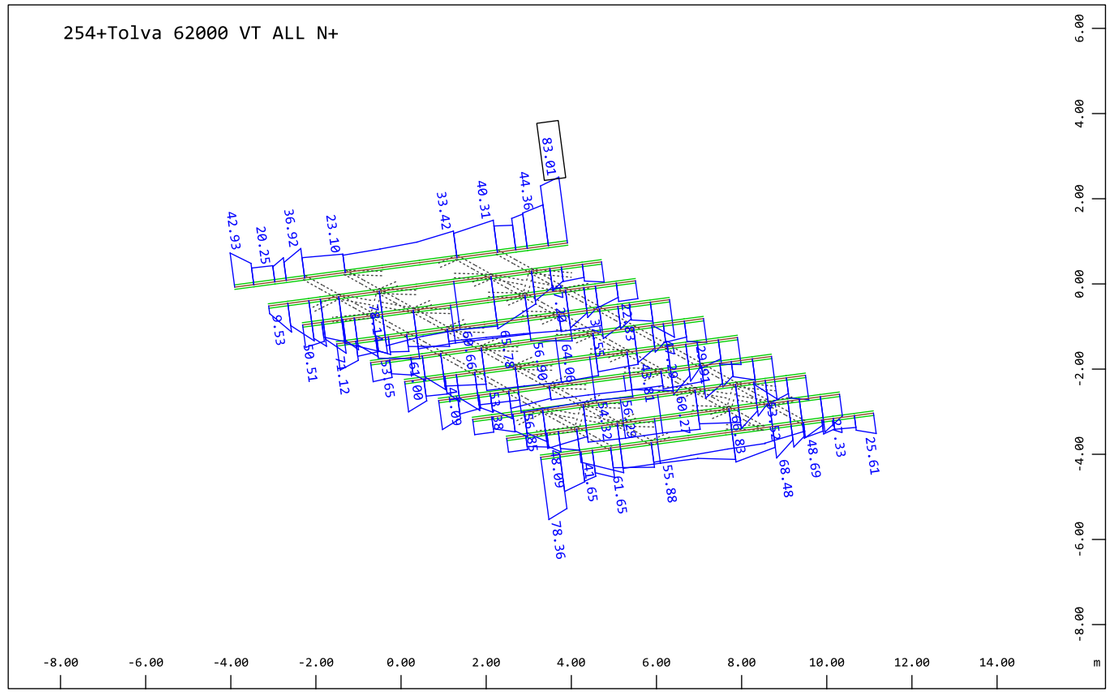


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1661 254+Tolva 62000 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-85.50) (Max=-1.76)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962

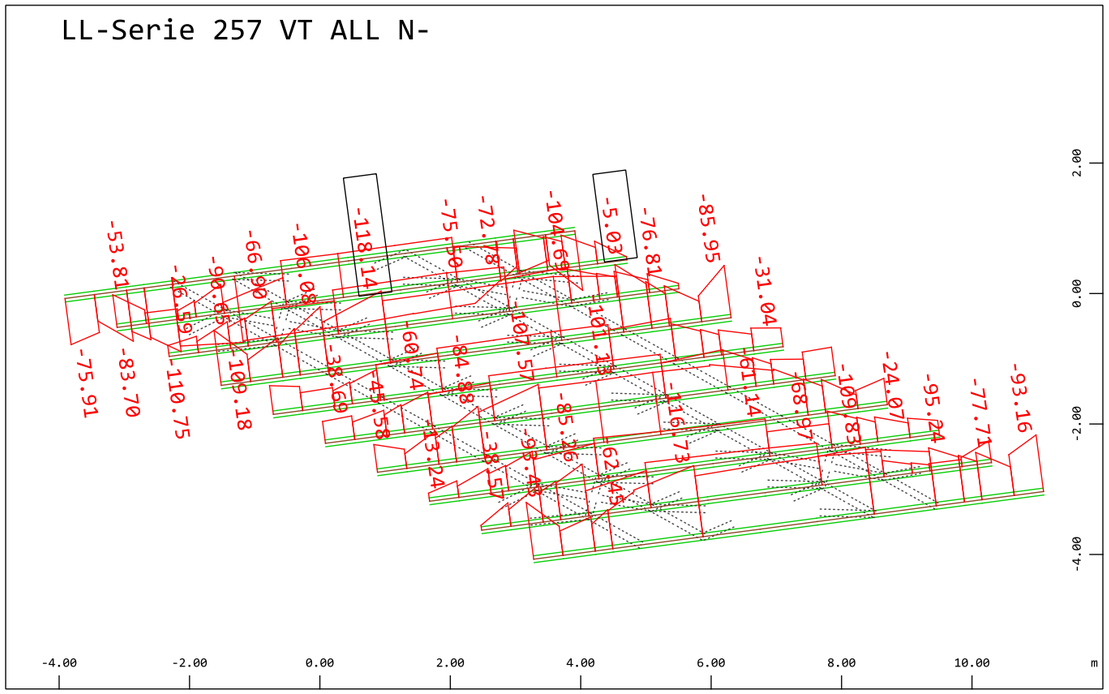



Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1661 254+Tolva 62000 VT ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=83.01)

M 1 : 144
X * 0.502
Y * 0.906
Z * 0.962

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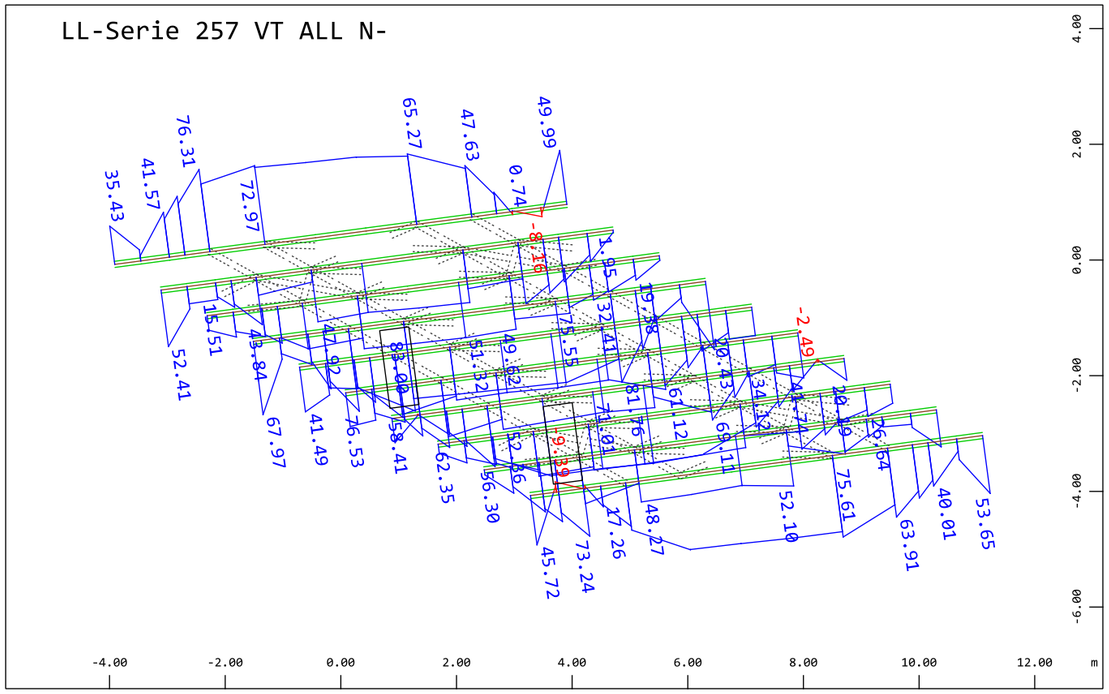
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1612 LL-Serie 257 VT ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-118.14) (Max=-5.03)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

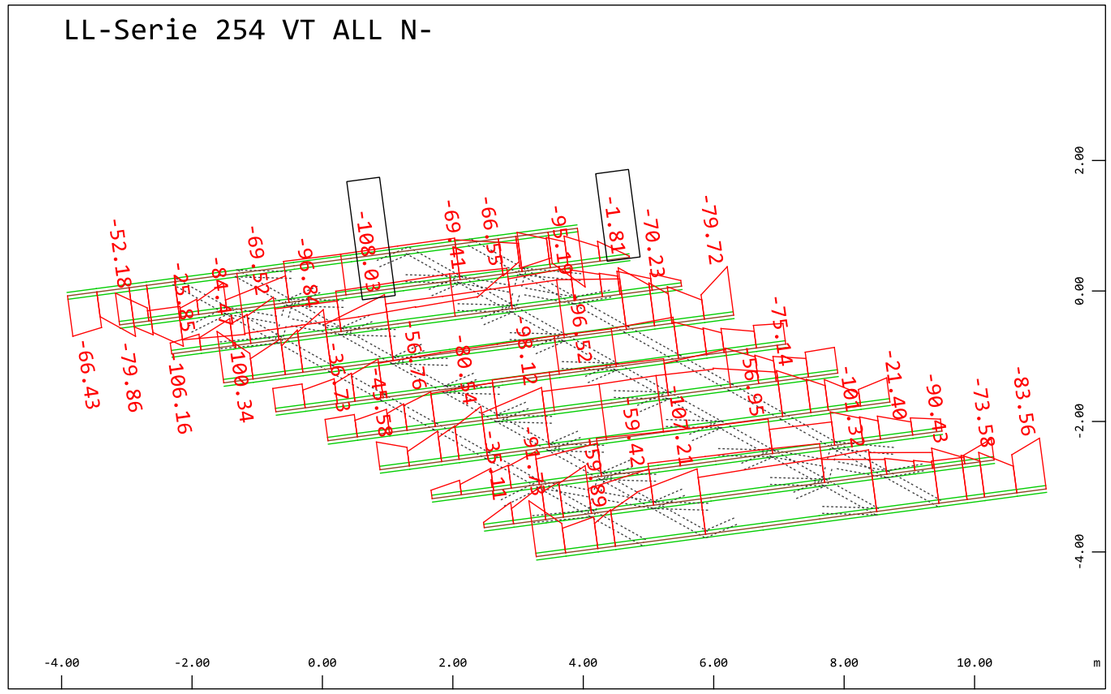
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1612 LL-Serie 257 VT ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-9.39) (Max=83.00)

M 1 : 106
X * 0.502
Y * 0.906
Z * 0.962

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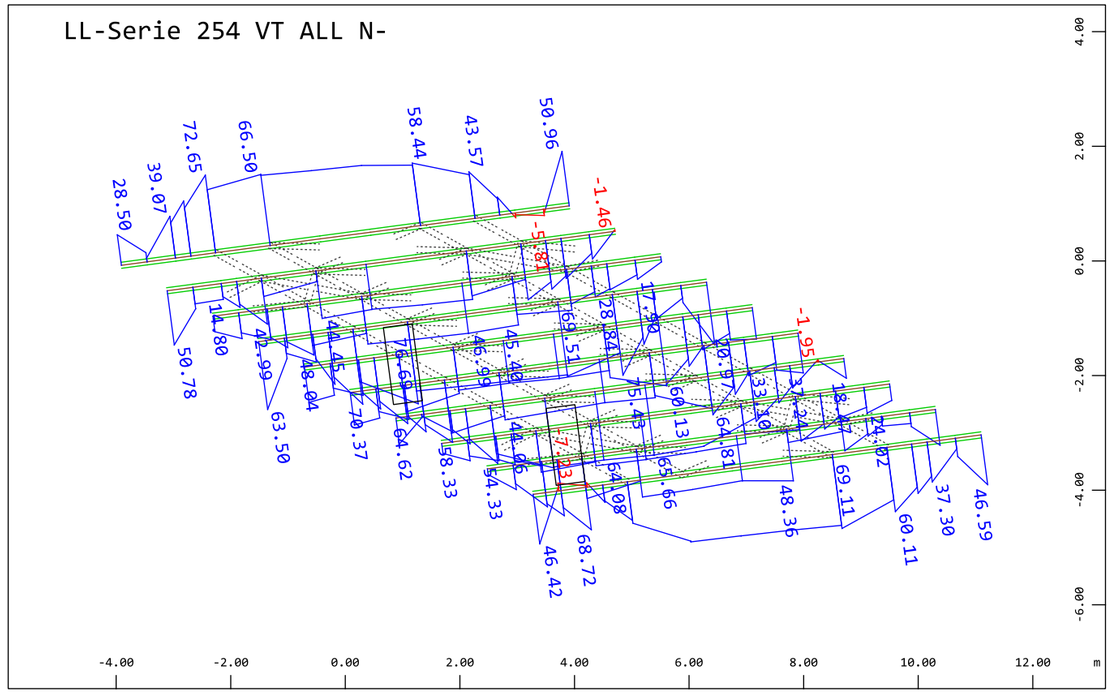
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1602 LL-Serie 254 VT ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-108.03) (Max=-1.81)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



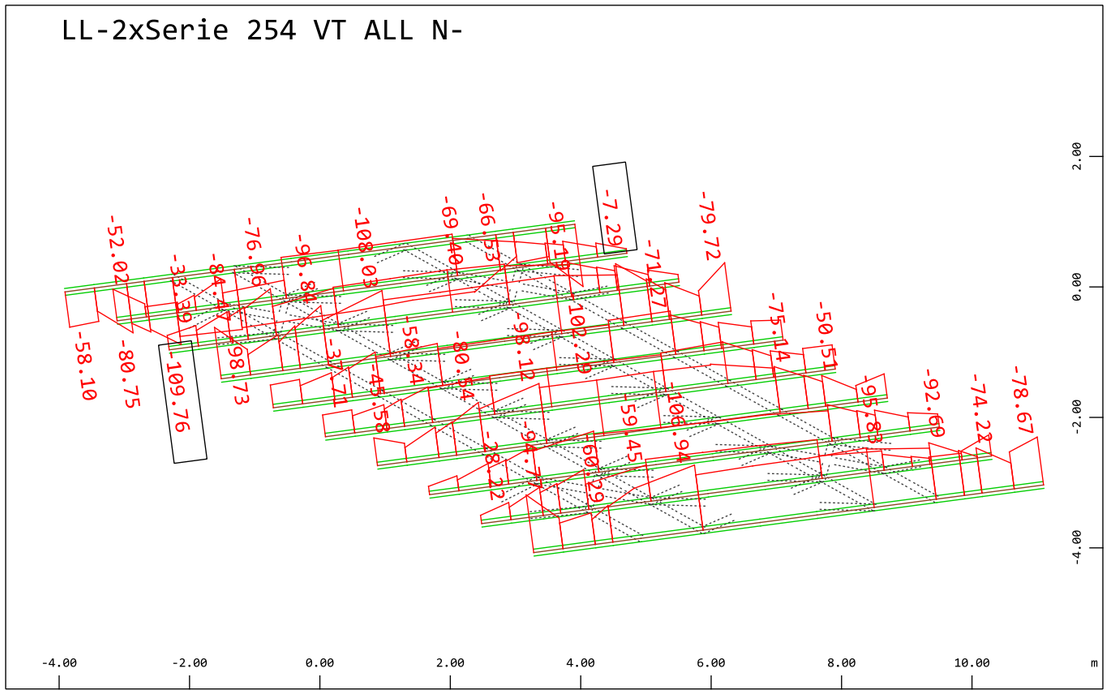

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1602 LL-Serie 254 VT ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-7.23) (Max=76.69)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

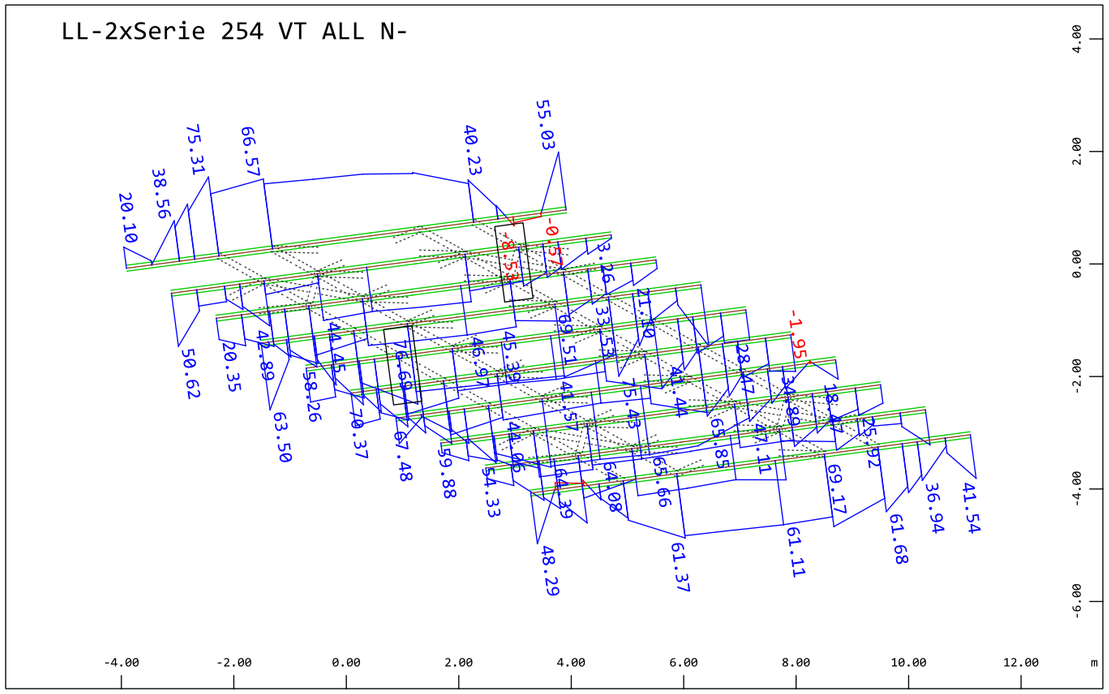
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Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1632 LL-2xSerie 254 VT ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-109.76) (Max=-7.29)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



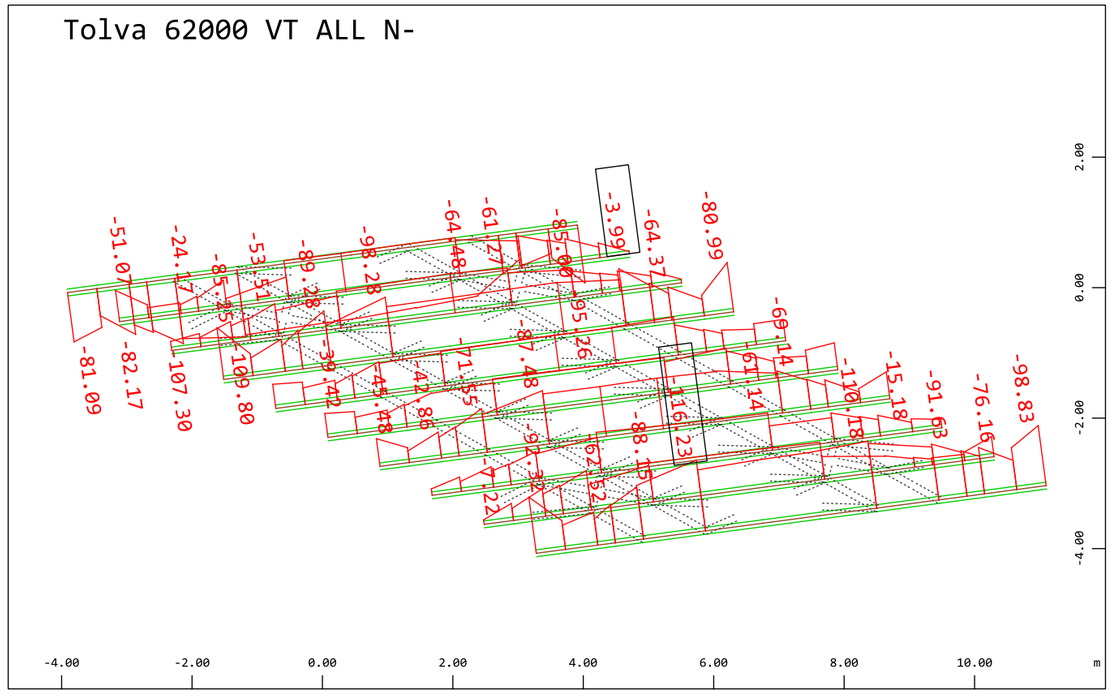

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1632 LL-2xSerie 254 VT ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-8.53) (Max=76.69)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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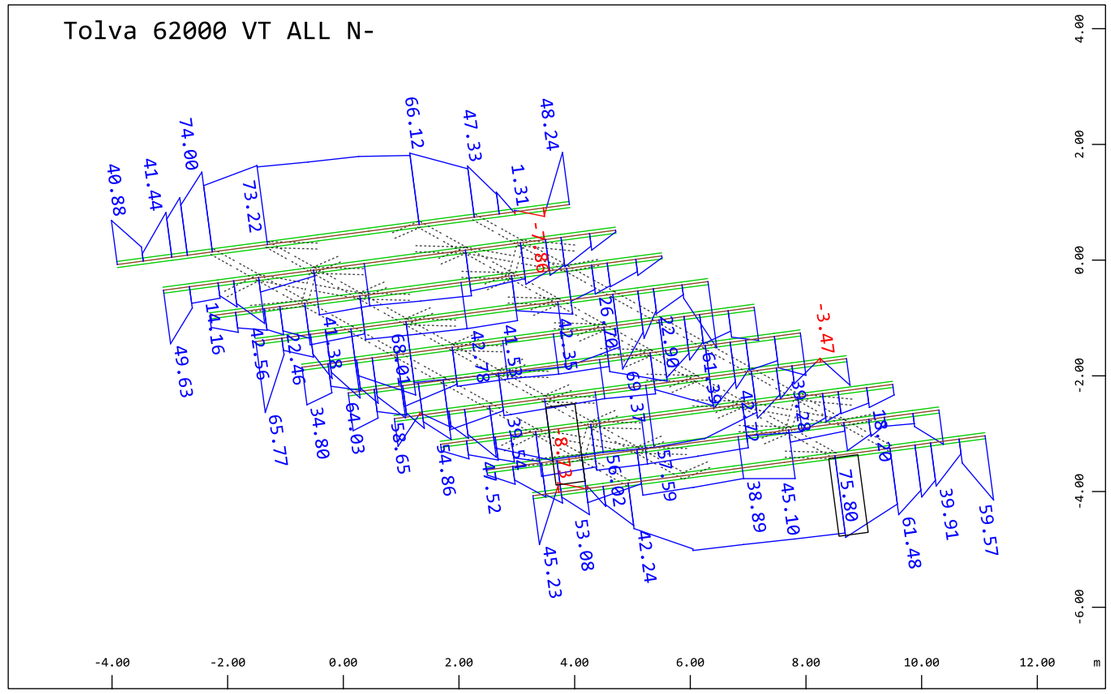


Pont Carretera Vic
Tensiones




Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1622 Tolva 62000 VT ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-116.23) (Max=-3.99)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962

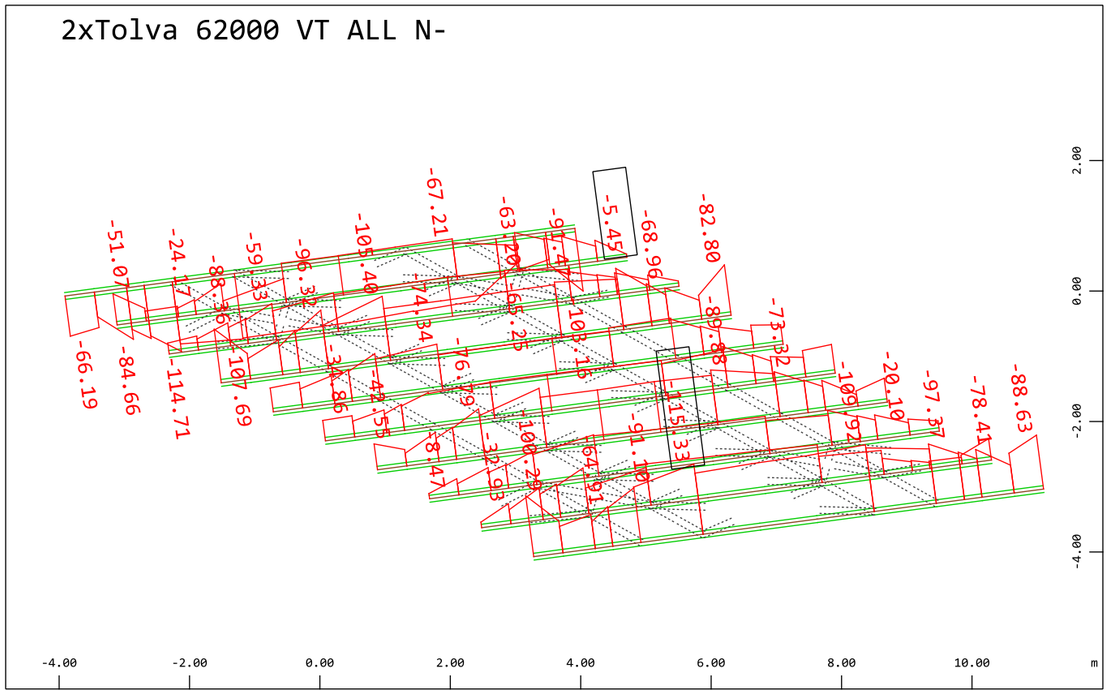


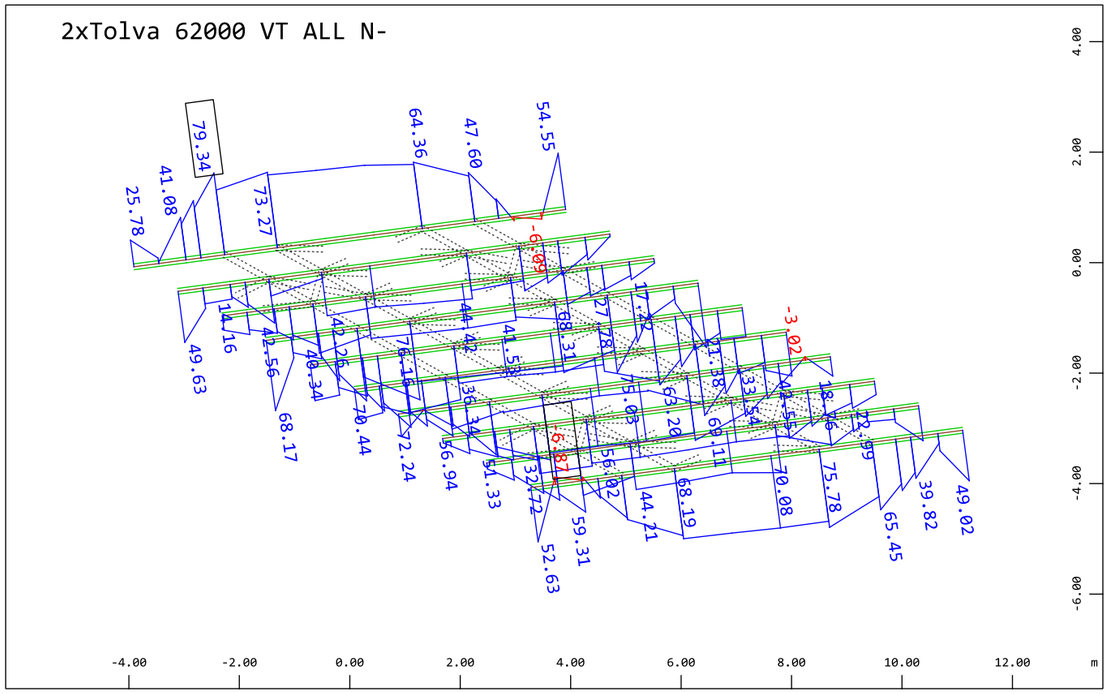

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1622 Tolva 62000 VT ALL N-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-8.73) (Max=75.80)

M 1 : 106
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones

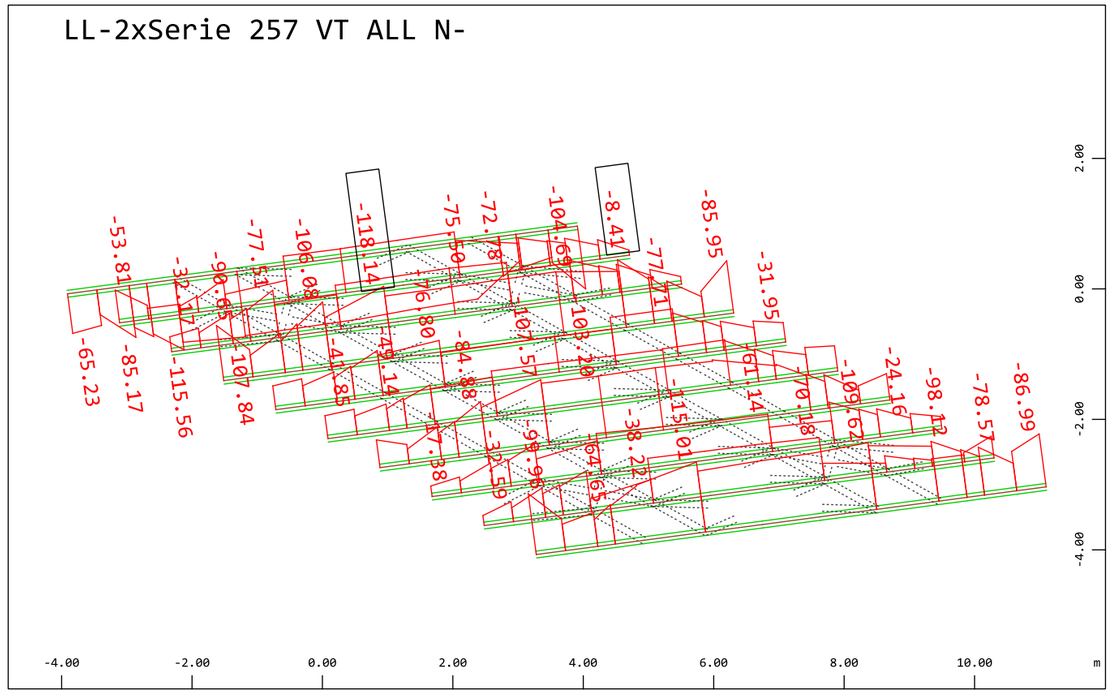


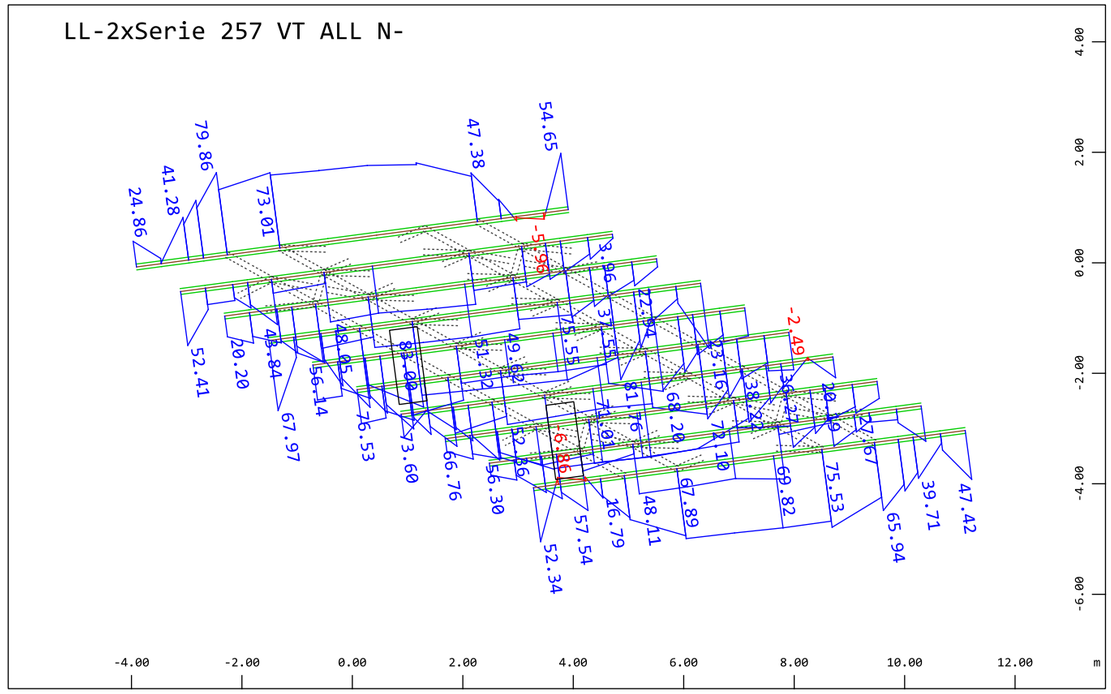




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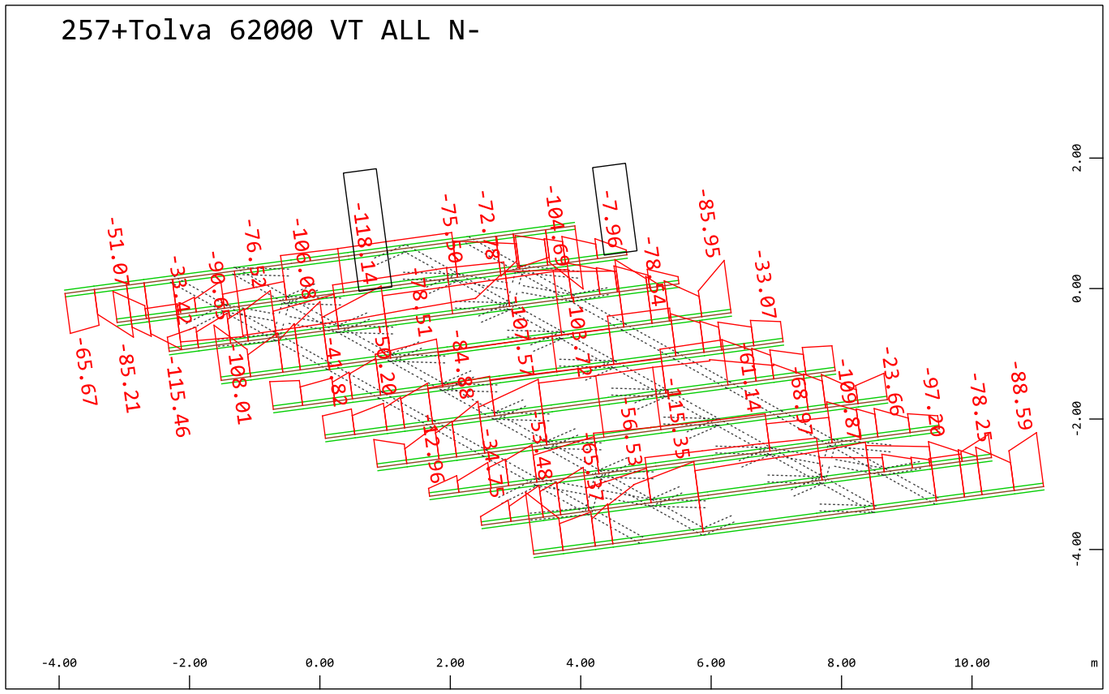
Pont Carretera Vic
Tensiones




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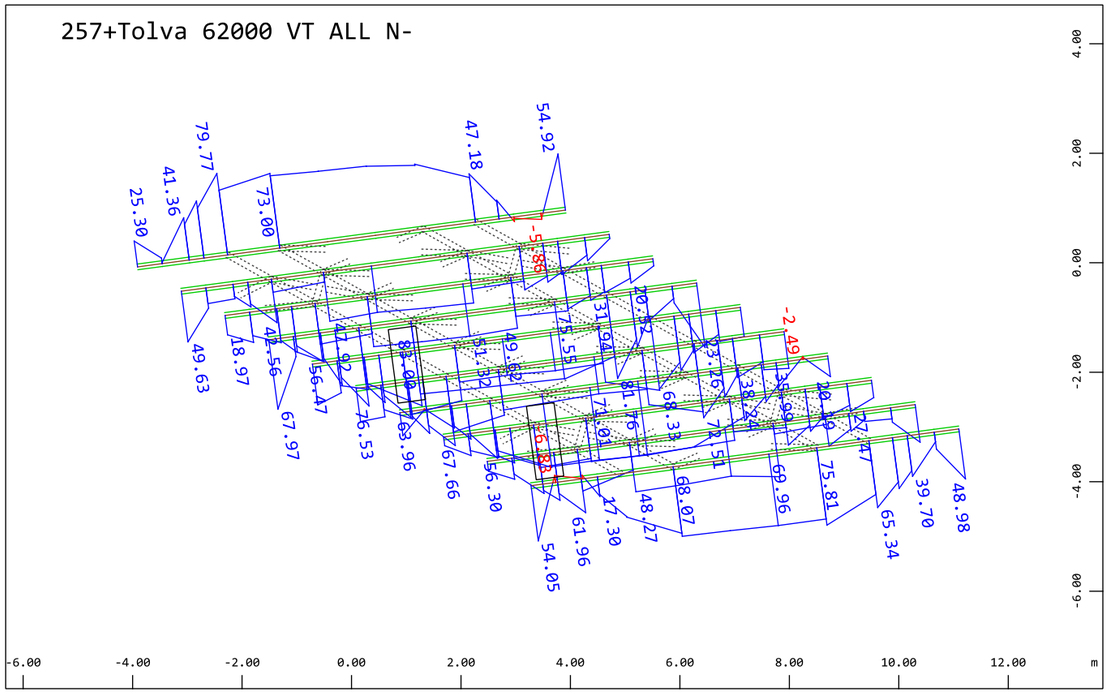
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1672 257+Tolva 62000 VT ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-118.14) (Max=-7.96)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

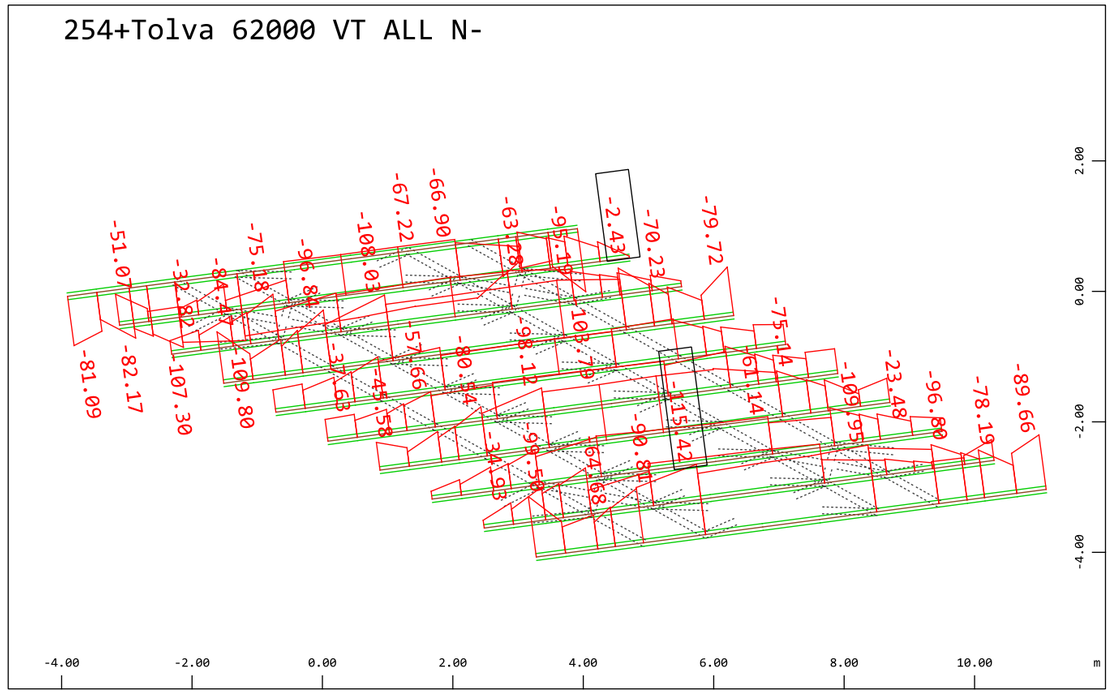
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1672 257+Tolva 62000 VT ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-6.83) (Max=83.00)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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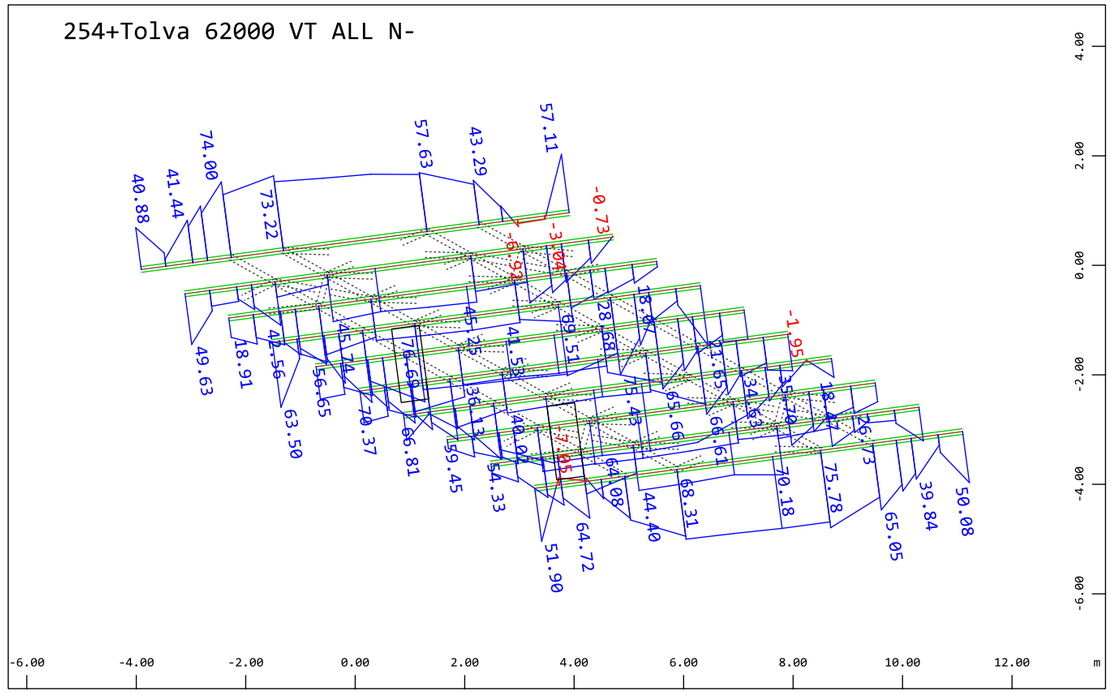
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1662 254+Tolva 62000 VT ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-115.42) (Max=-2.43)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



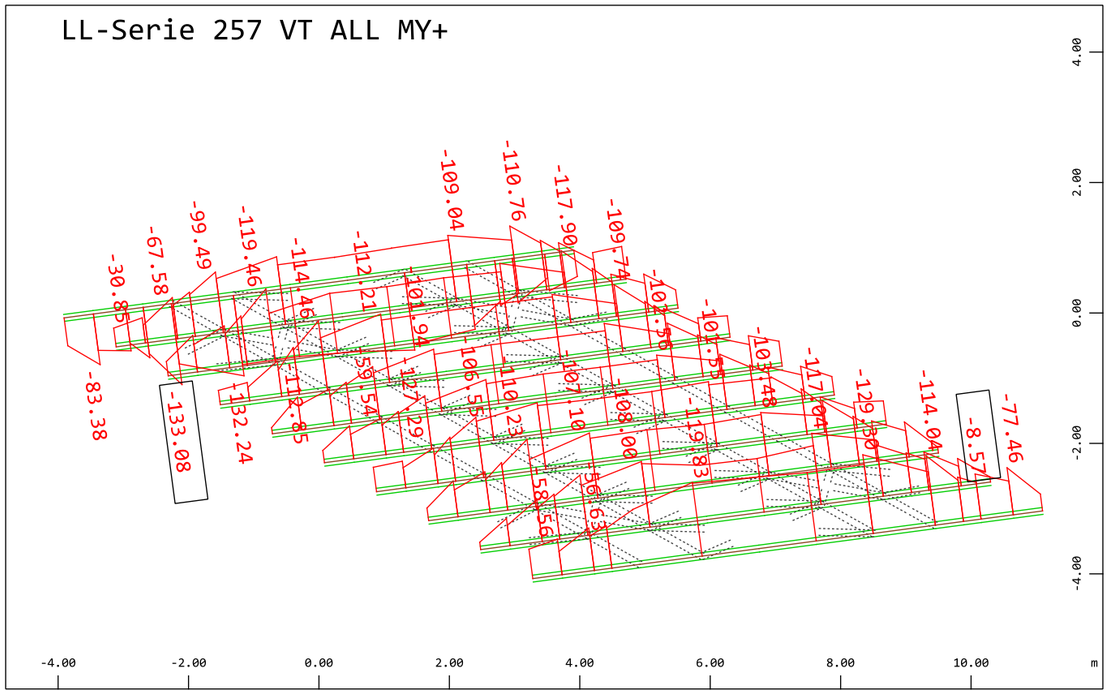

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1662 254+Tolva 62000 VT ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-7.05) (Max=76.69)

M 1 : 112
X * 0.502
Y * 0.906
Z * 0.962

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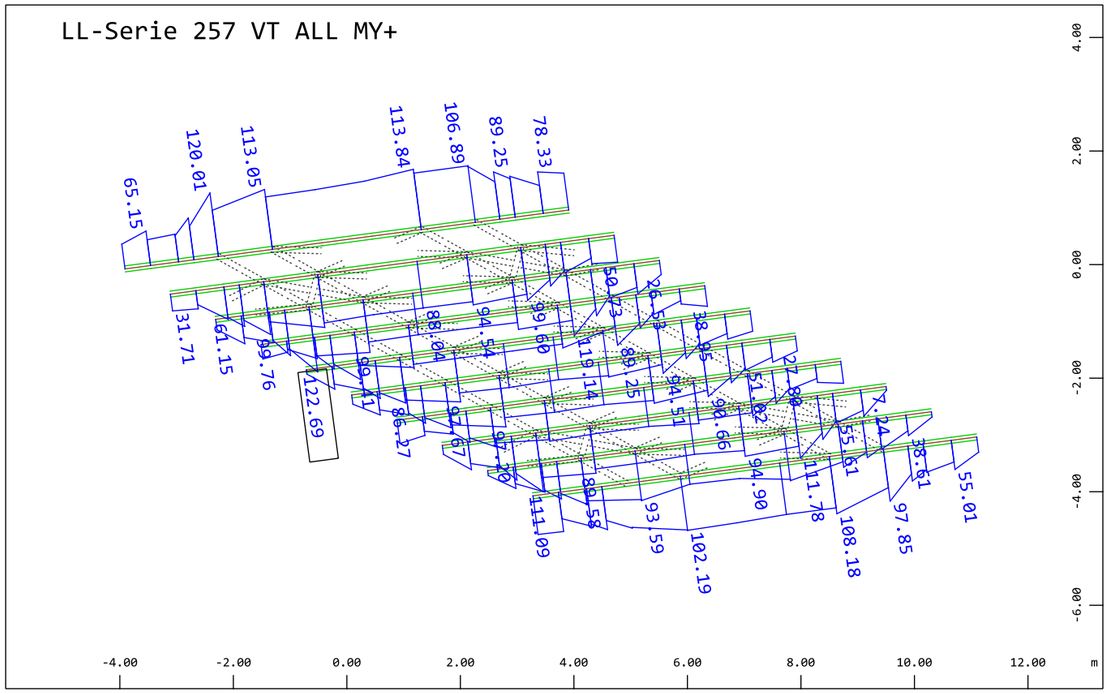
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1613 LL-Serie 257 VT ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-133.08) (Max=-8.57)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

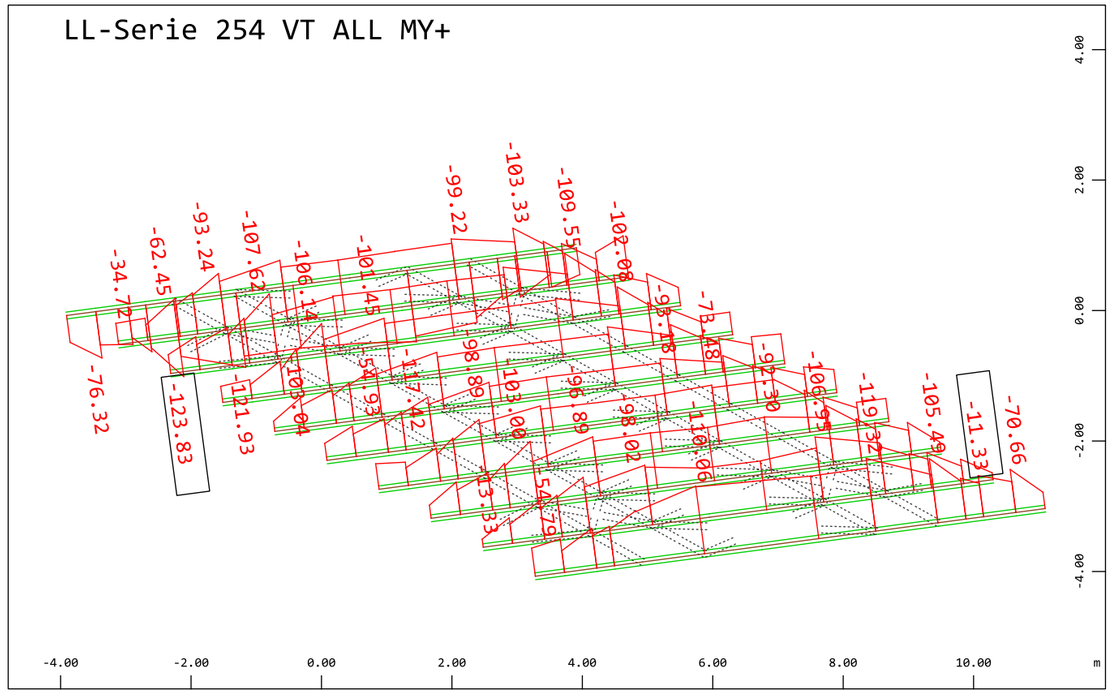
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1613 LL-Serie 257 VT ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=122.69)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962

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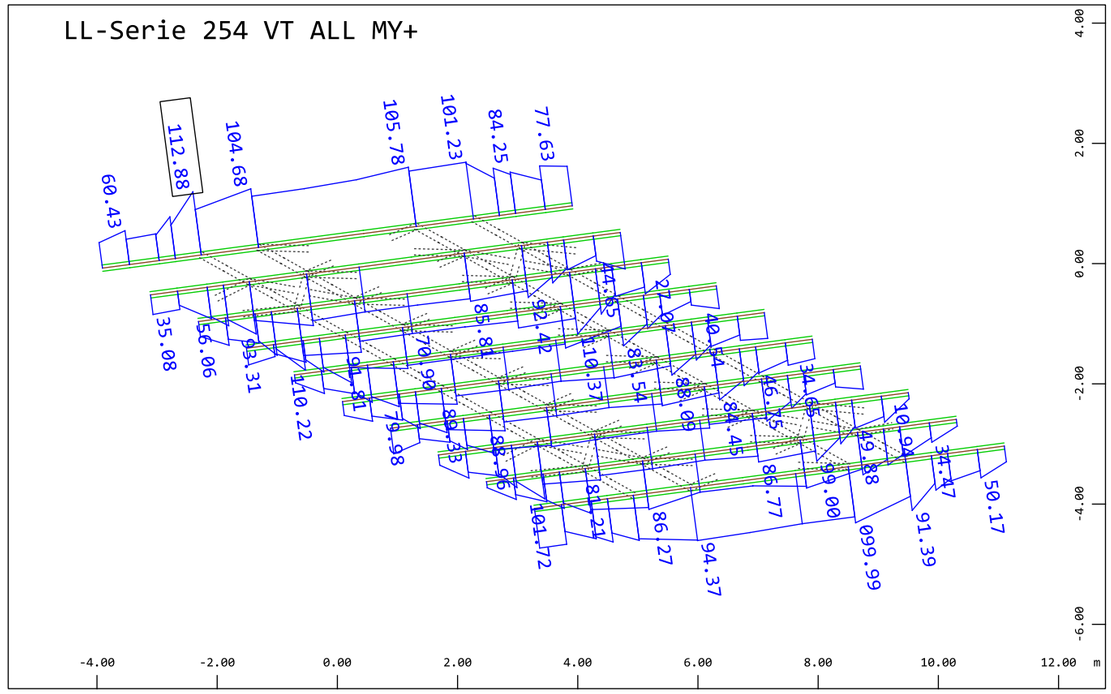
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1603 LL-Serie 254 VT ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-123.83) (Max=-11.33)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



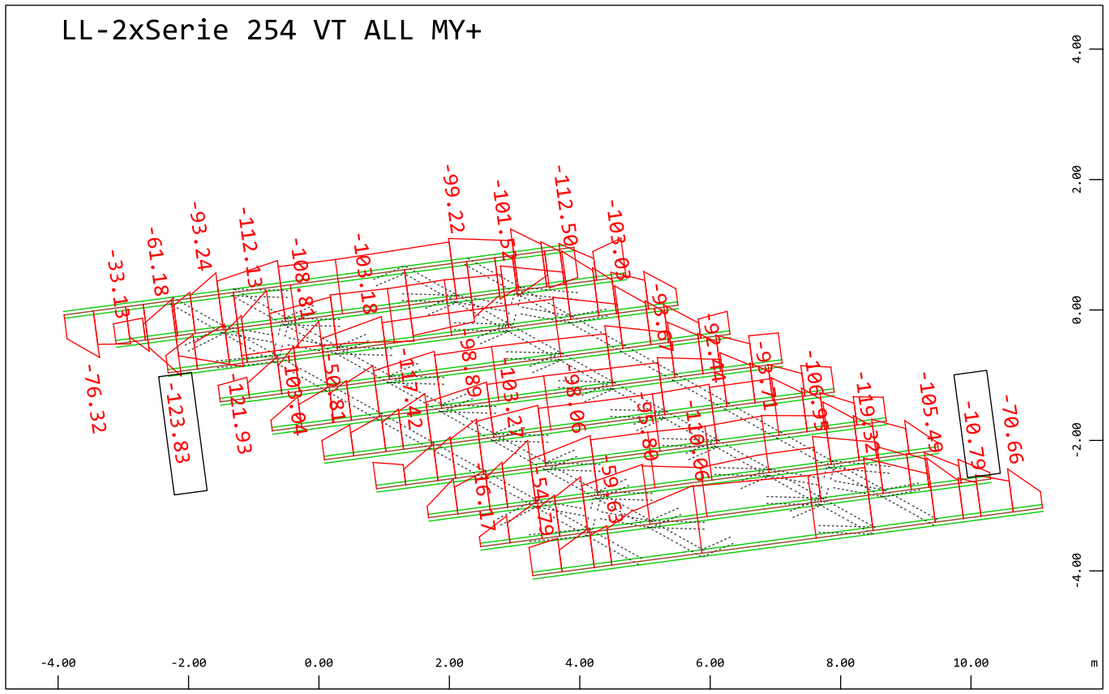

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1603 LL-Serie 254 VT ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=112.88)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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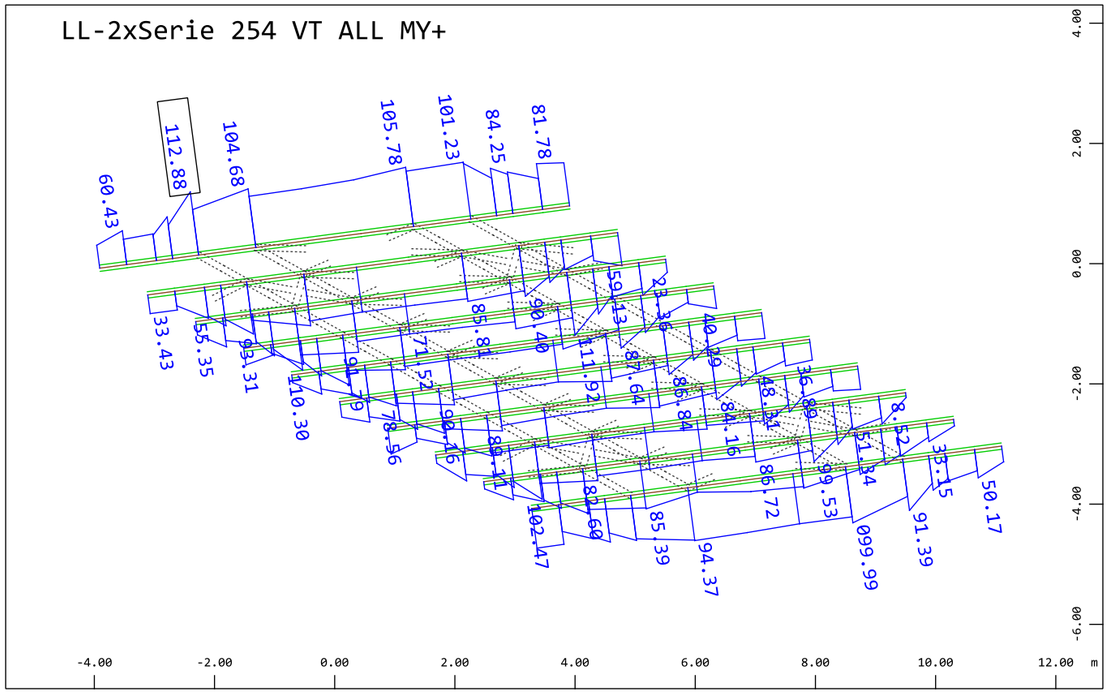
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1633 LL-2xSerie 254 VT ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-123.83) (Max=-10.79)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

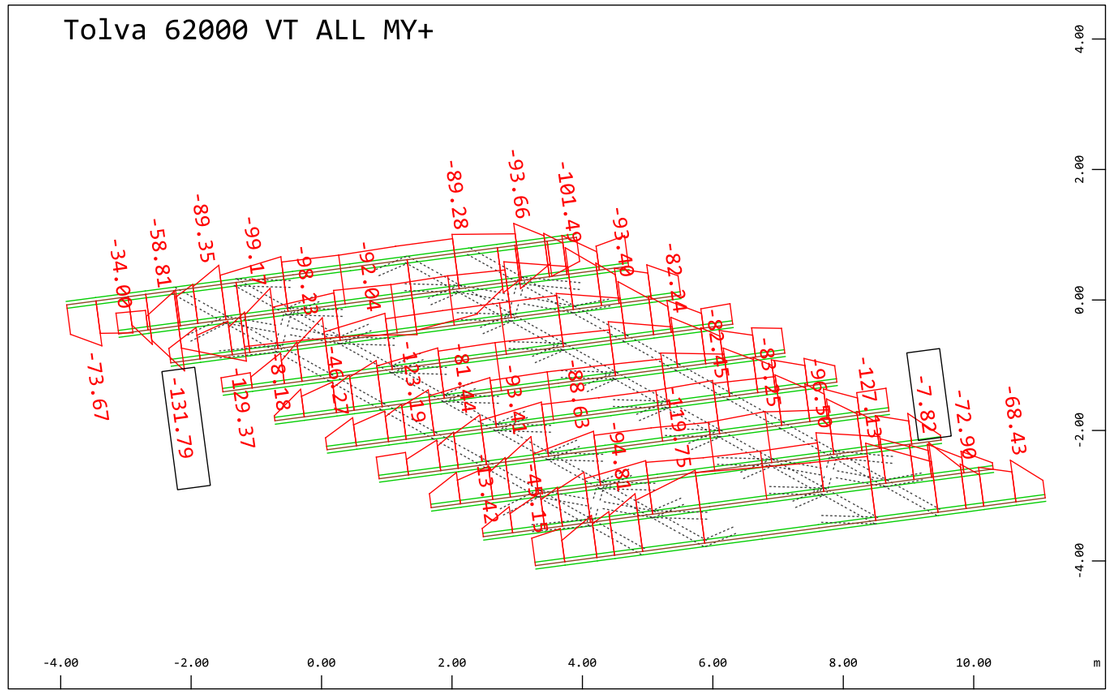
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1633 LL-2xSerie 254 VT ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=112.88)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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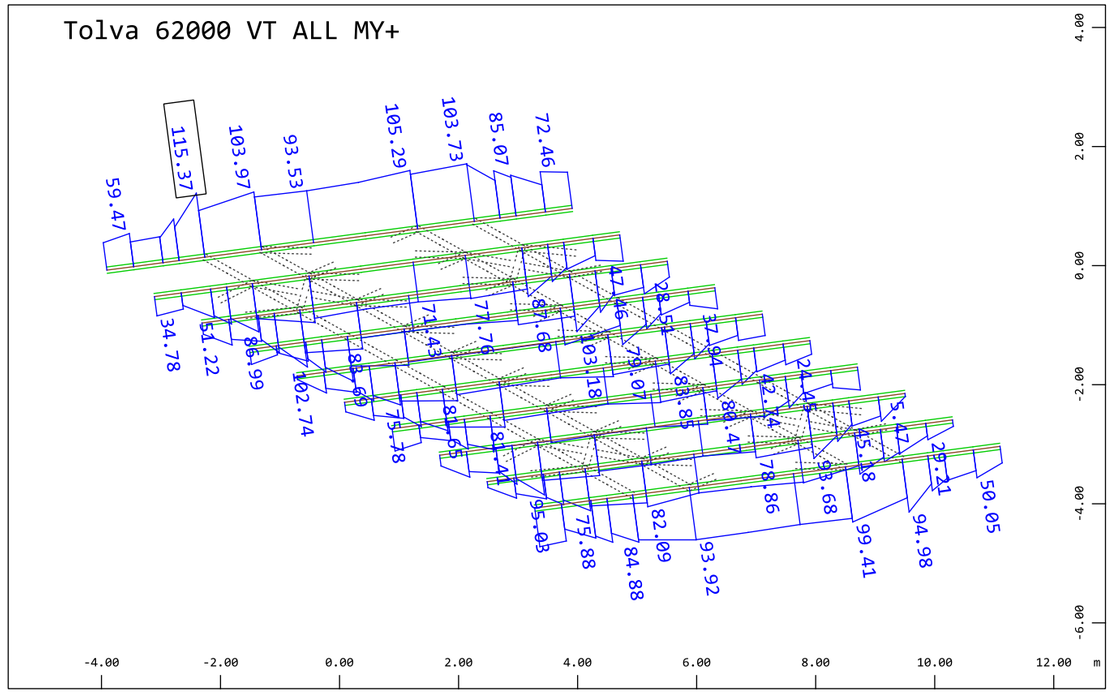
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1623 Tolva 62000 VT ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-131.79) (Max=-7.82)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



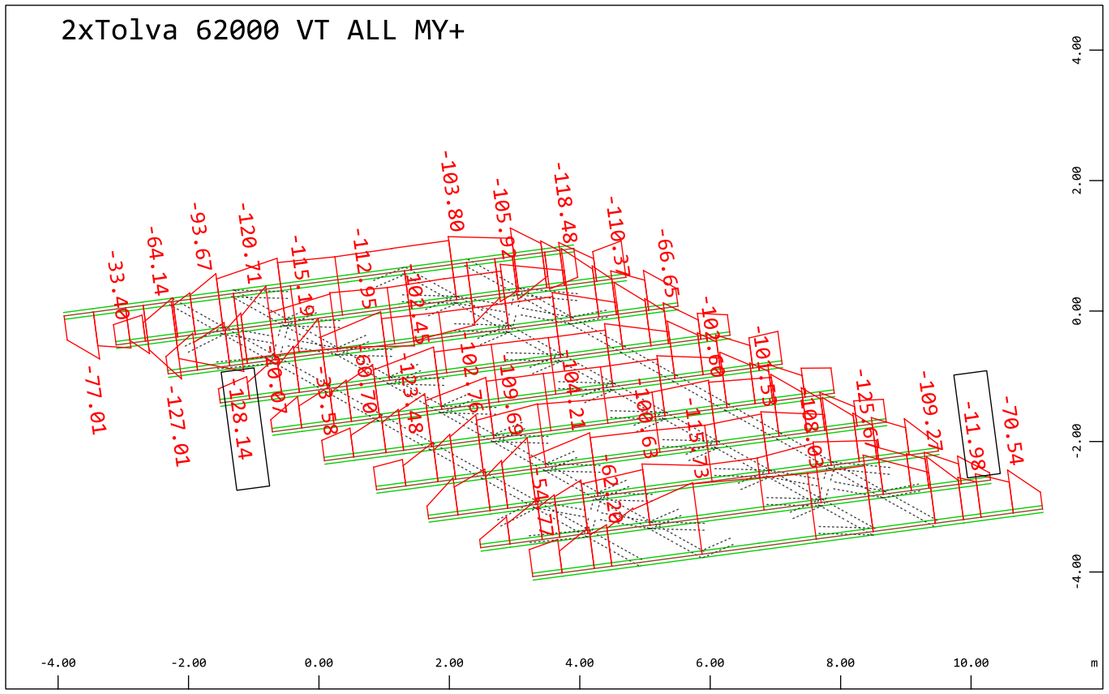

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1623 Tolva 62000 VT ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=115.37)

M 1 : 103
X * 0.502
Y * 0.906
Z * 0.962

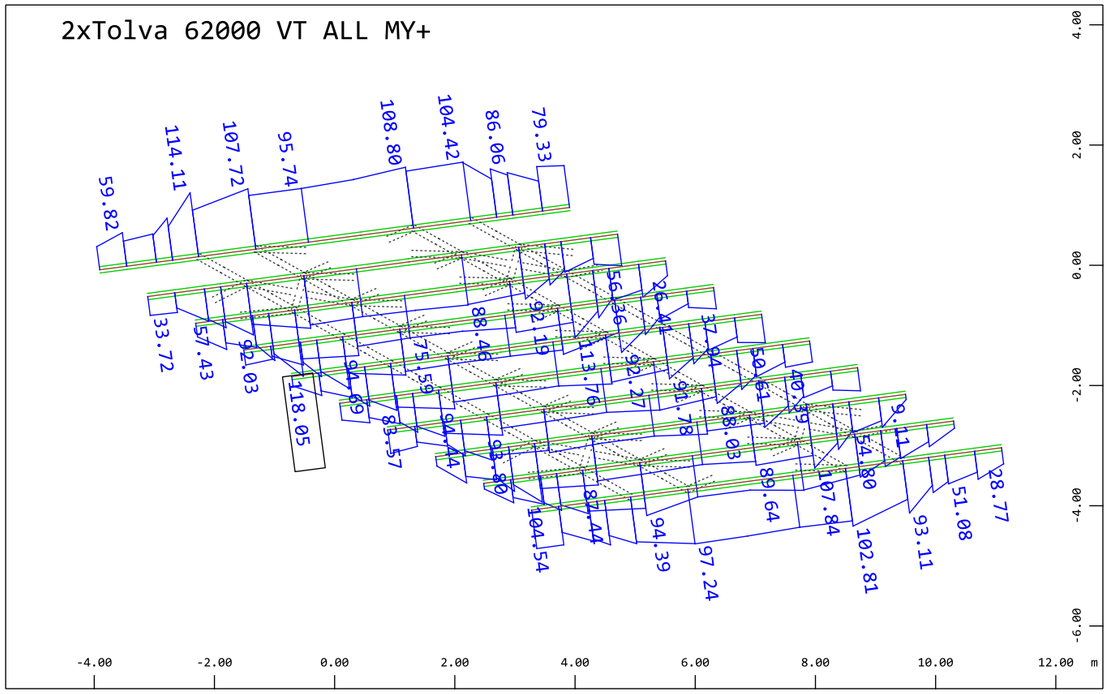
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Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1653 2xTolva 62000 VT ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-128.14) (Max=-11.98)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



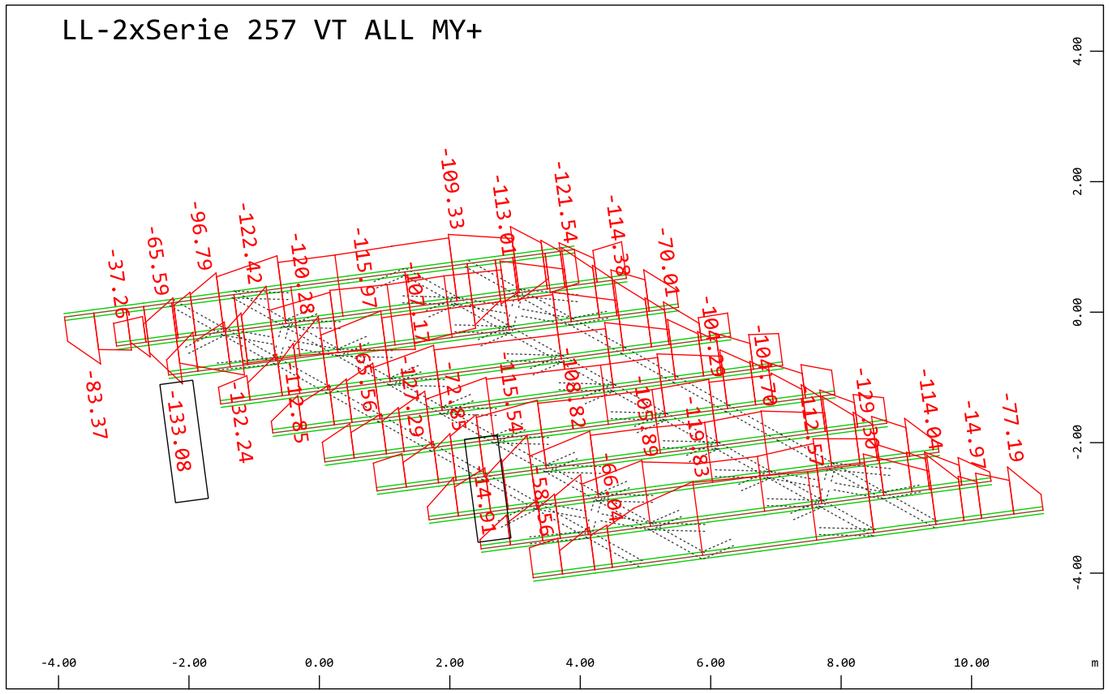

Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1653 2xTolva 62000 VT ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=118.05)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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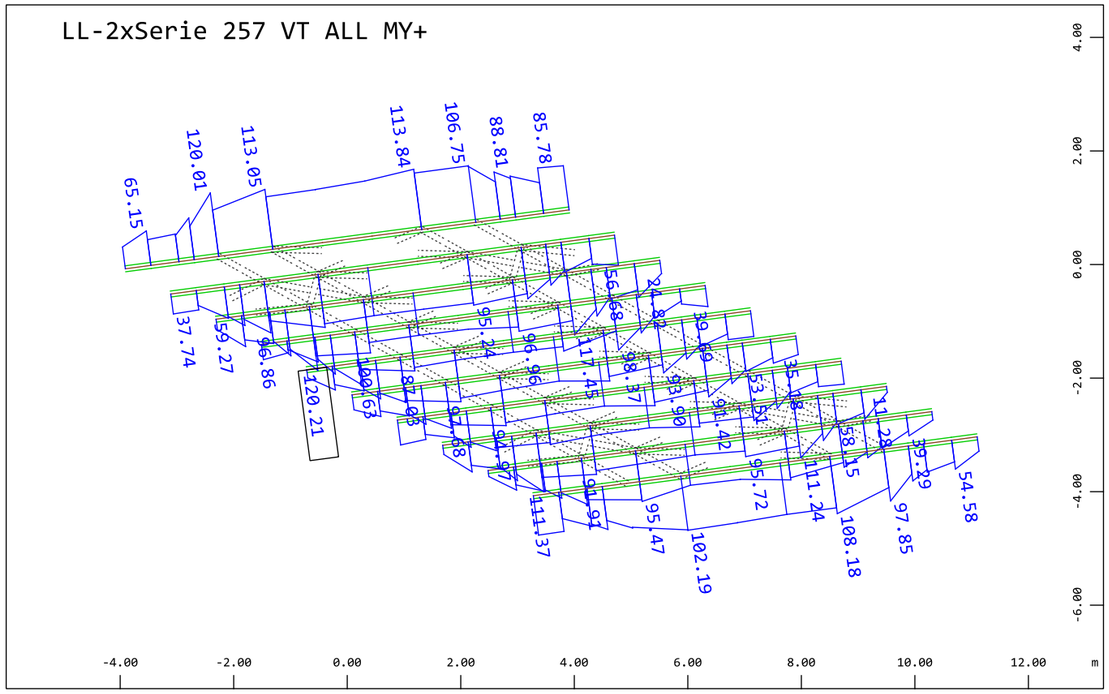


Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1643 LL-2xSerie 257 VT ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-133.08) (Max=-14.91)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962

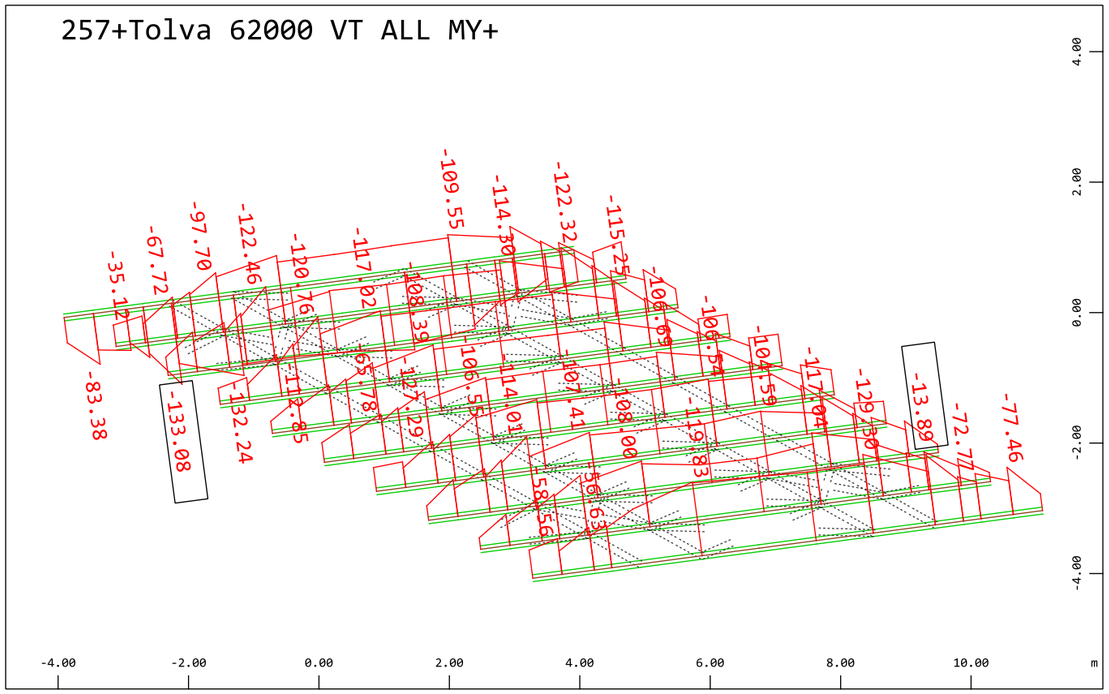


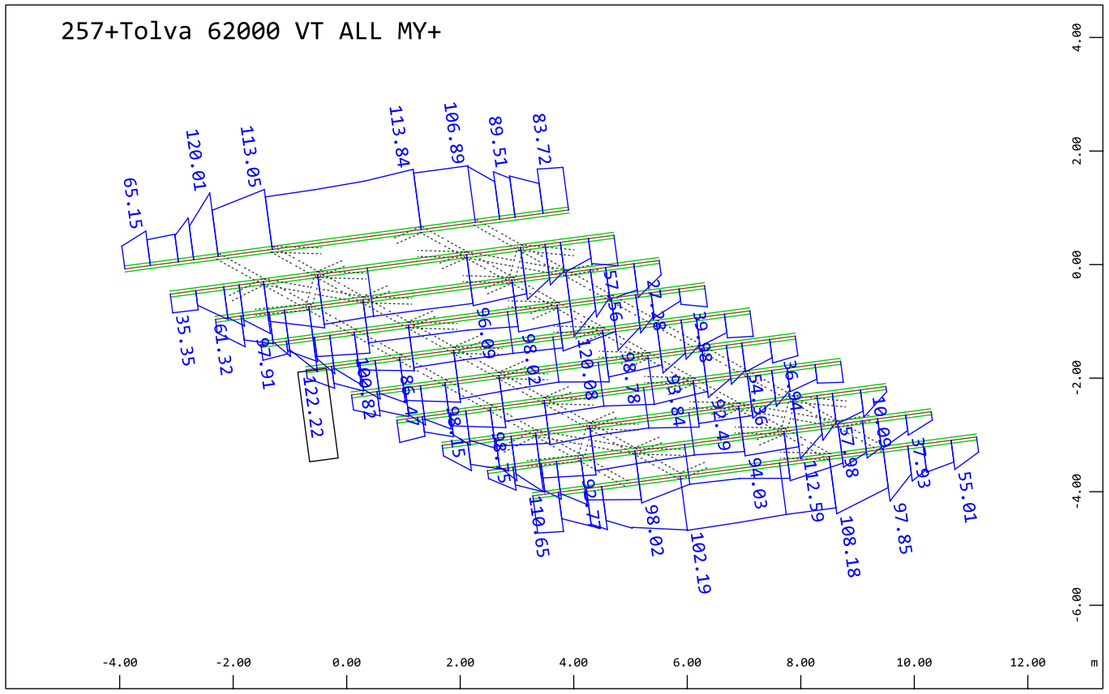

Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1643 LL-2xSerie 257 VT ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=120.21)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones

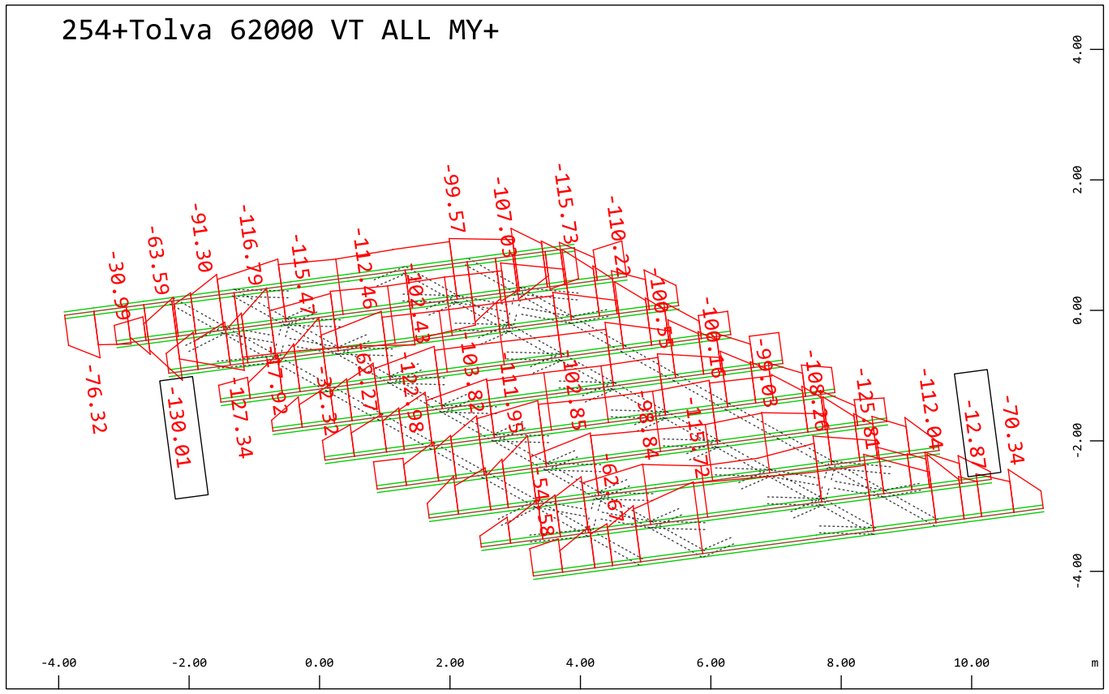


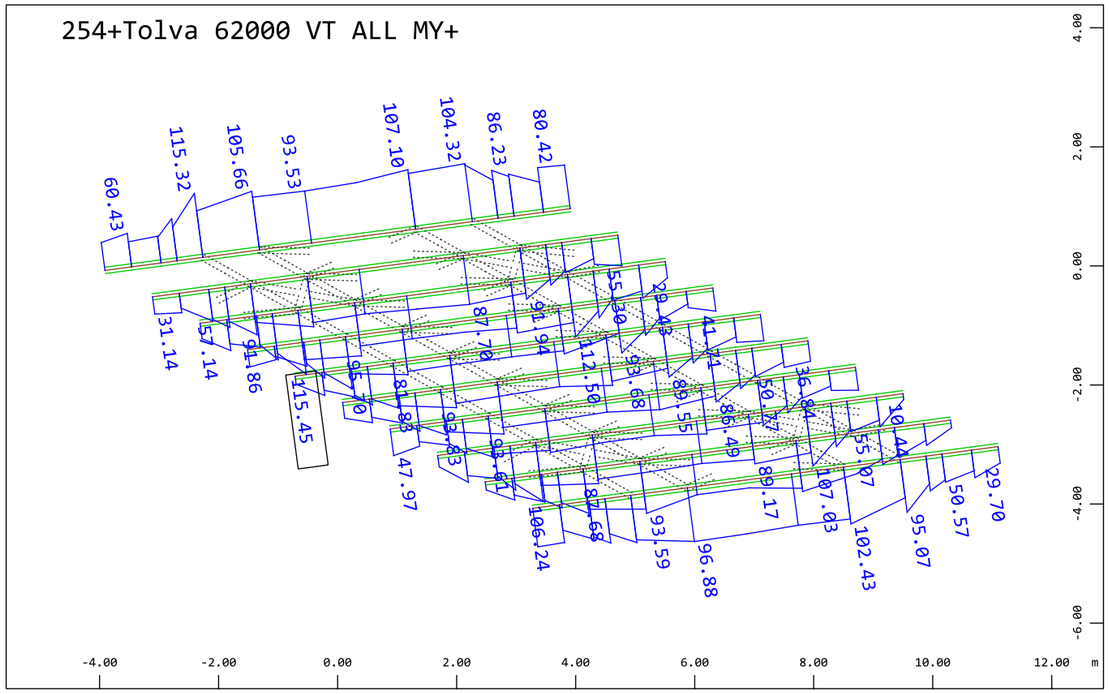




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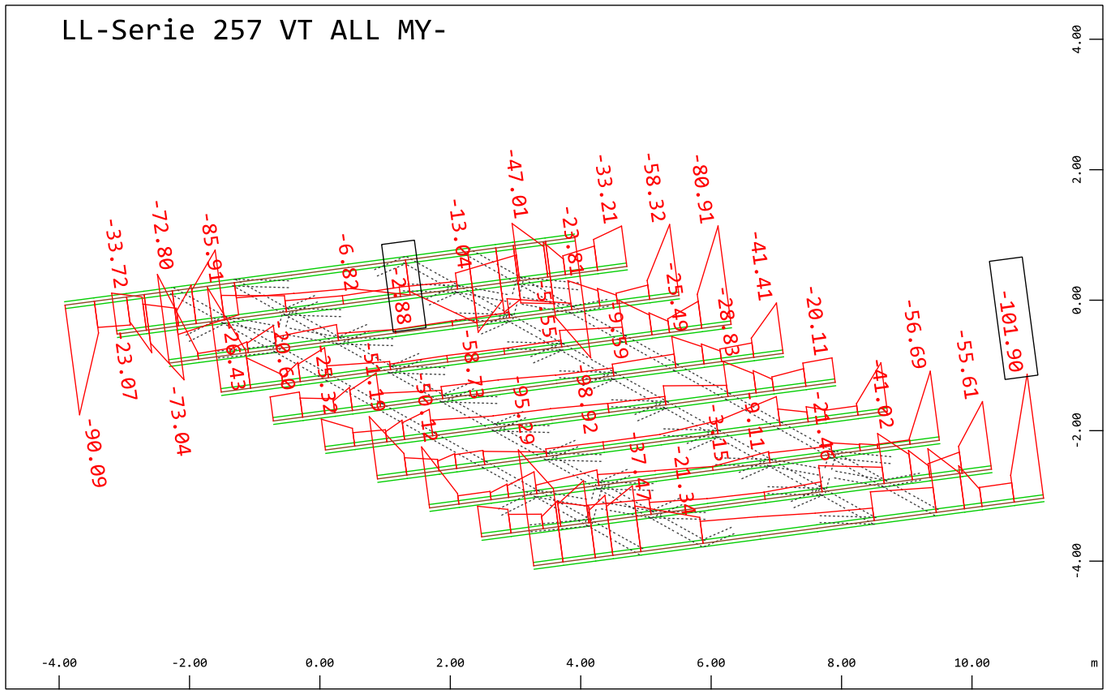
Pont Carretera Vic
Tensiones




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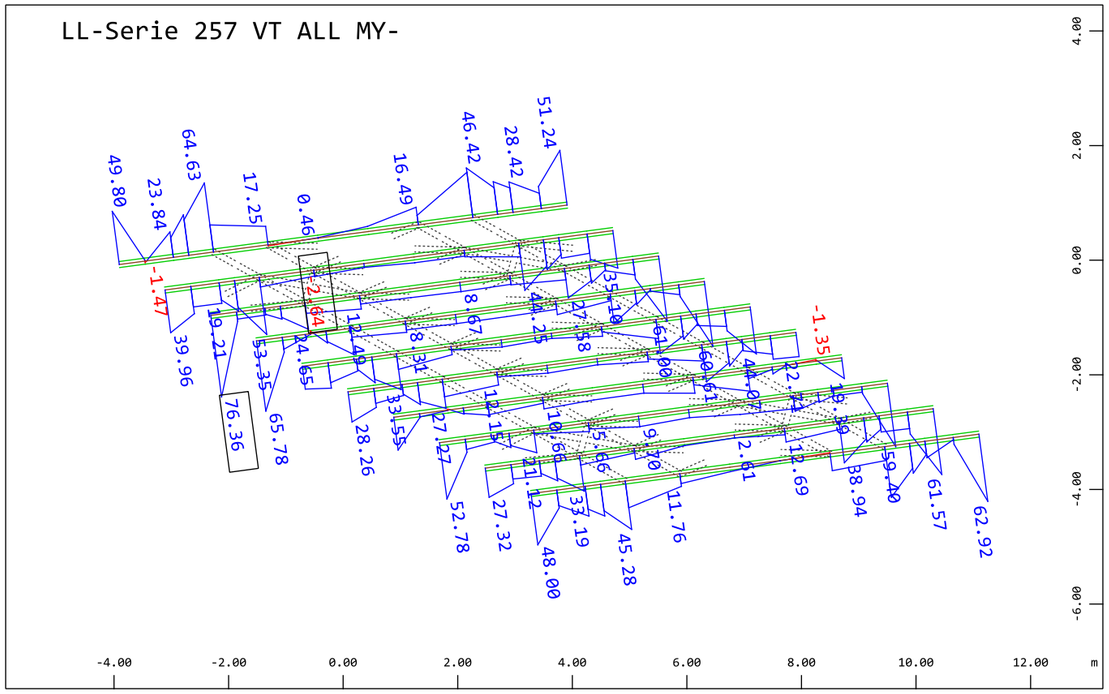
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1614 LL-Serie 257 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-101.90) (Max=-2.88)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

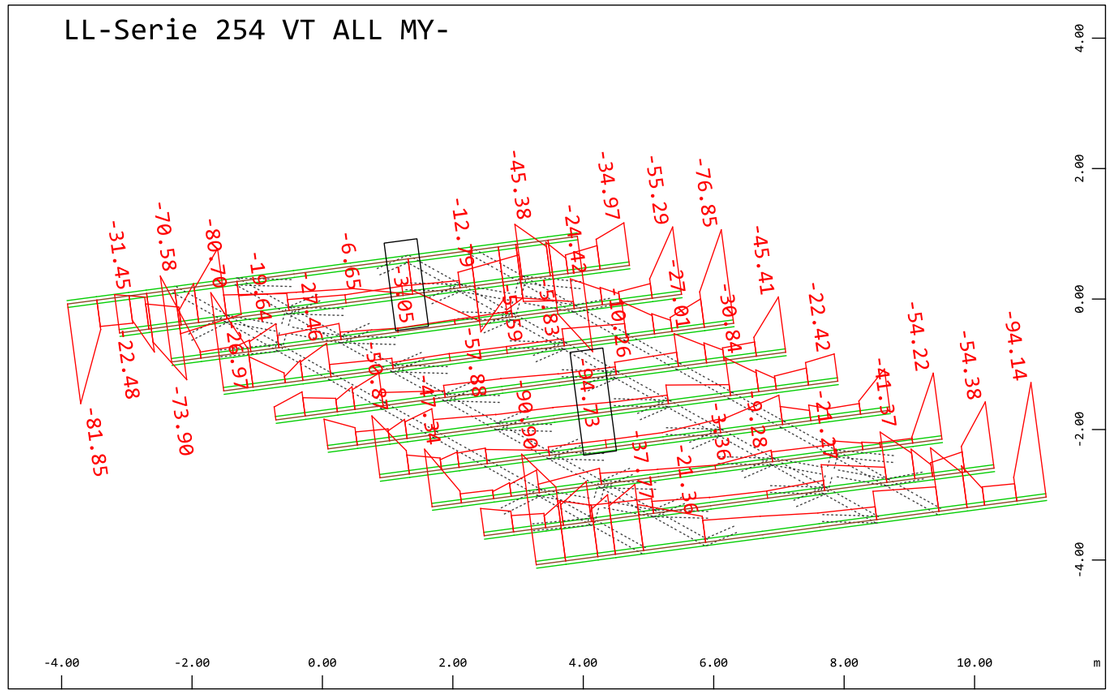
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1614 LL-Serie 257 VT ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-2.64) (Max=76.36)

M 1 : 107
X * 0.502
Y * 0.906
Z * 0.962

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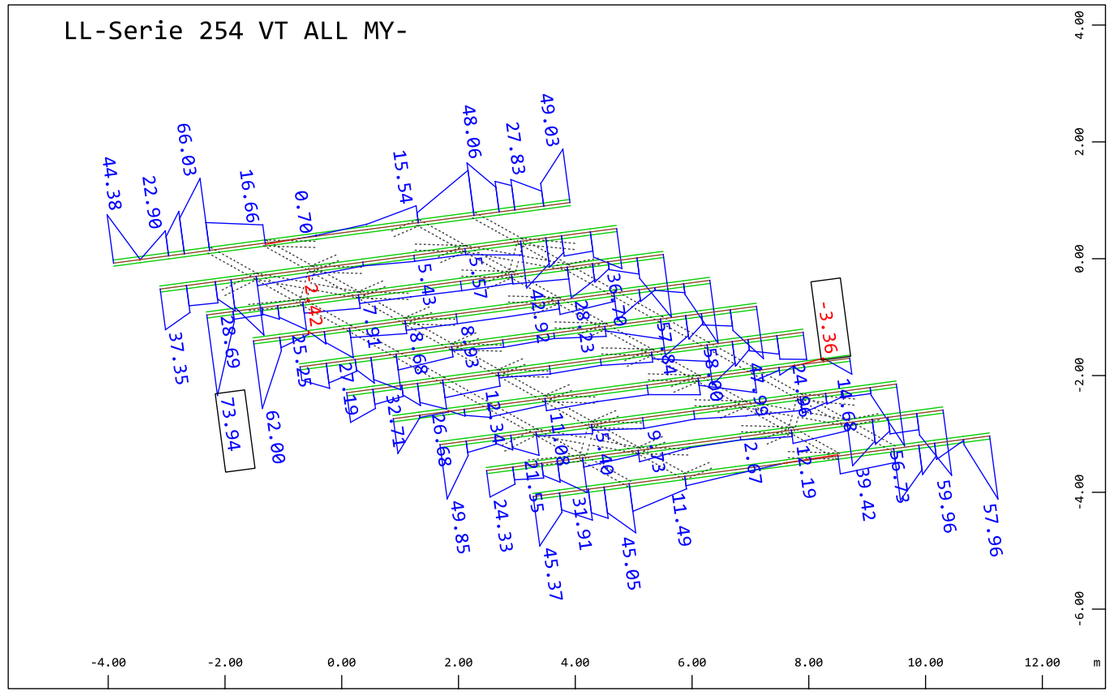
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1604 LL-Serie 254 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-94.73) (Max=-3.05)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



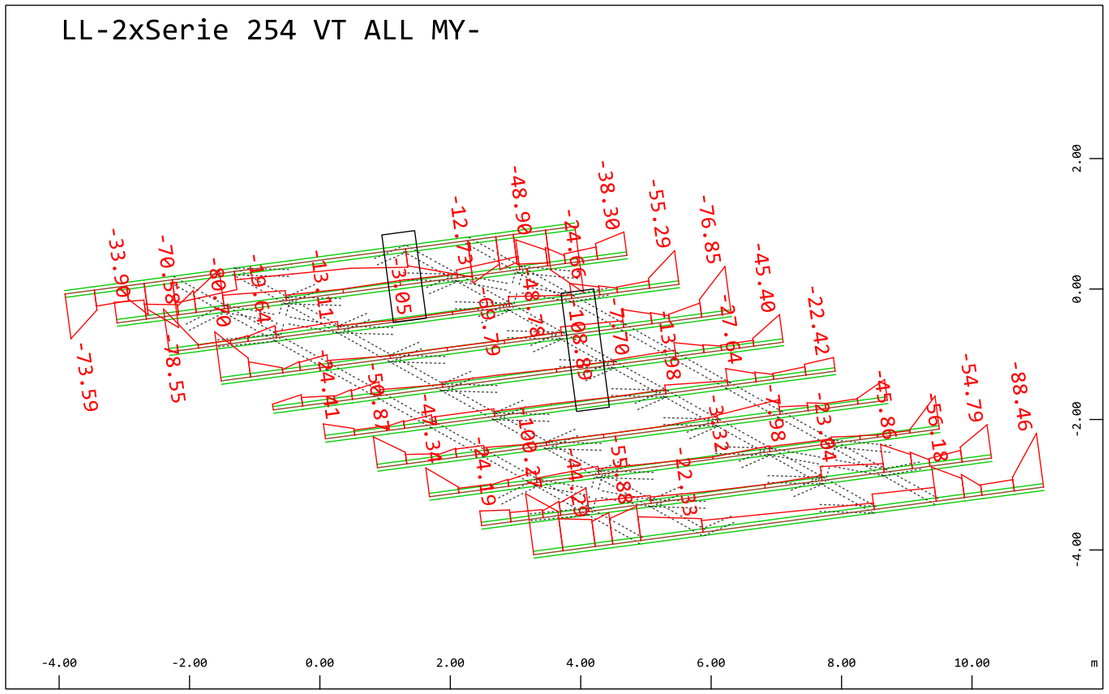

Z
Y
X

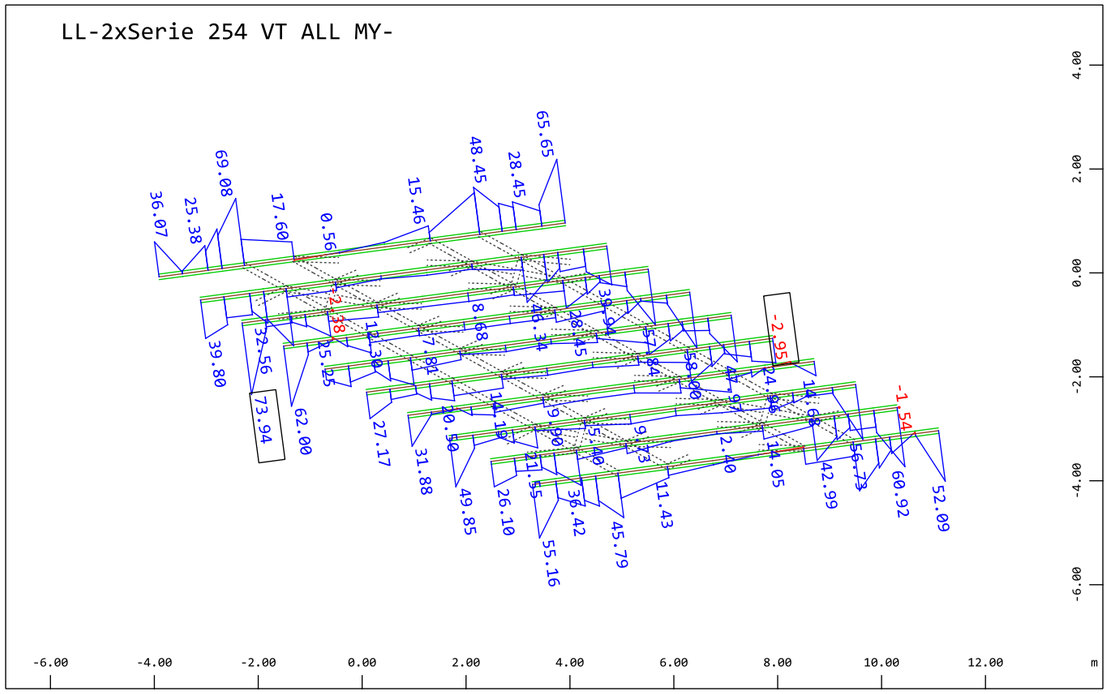
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1604 LL-Serie 254 VT ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-3.36) (Max=73.94)

M 1 : 105
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones

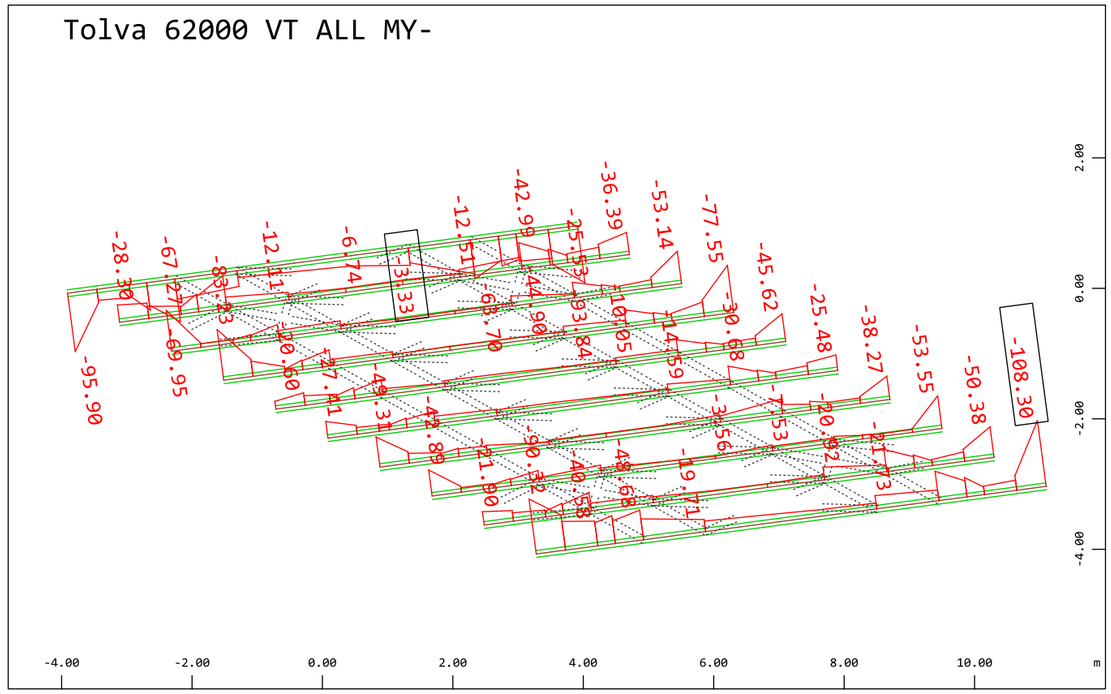


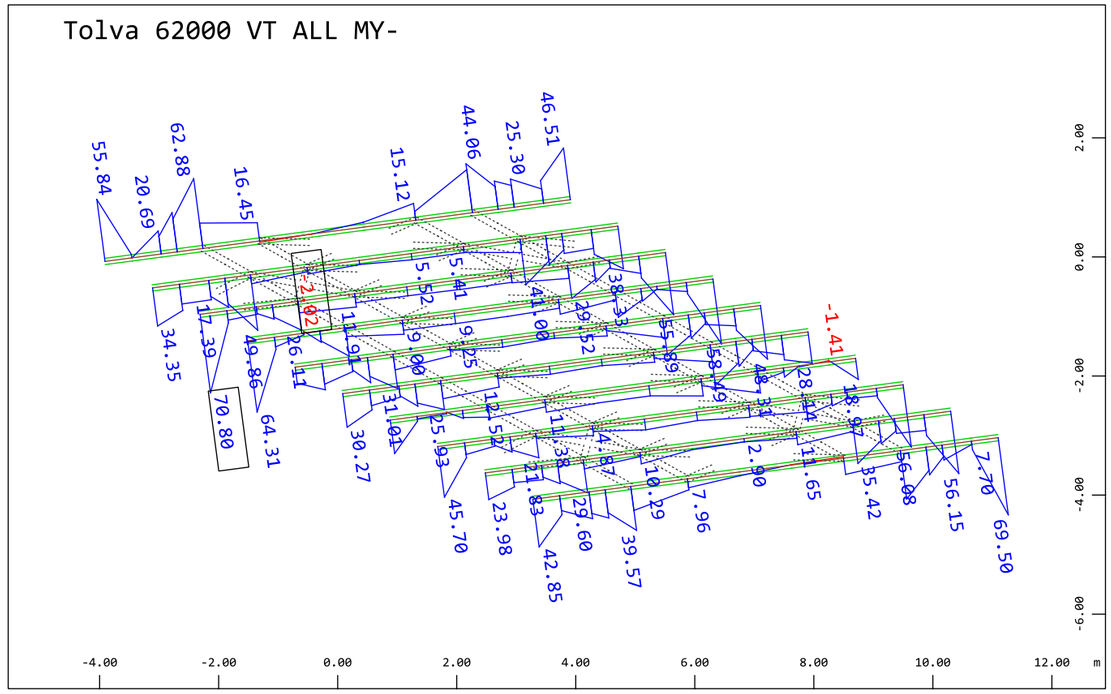




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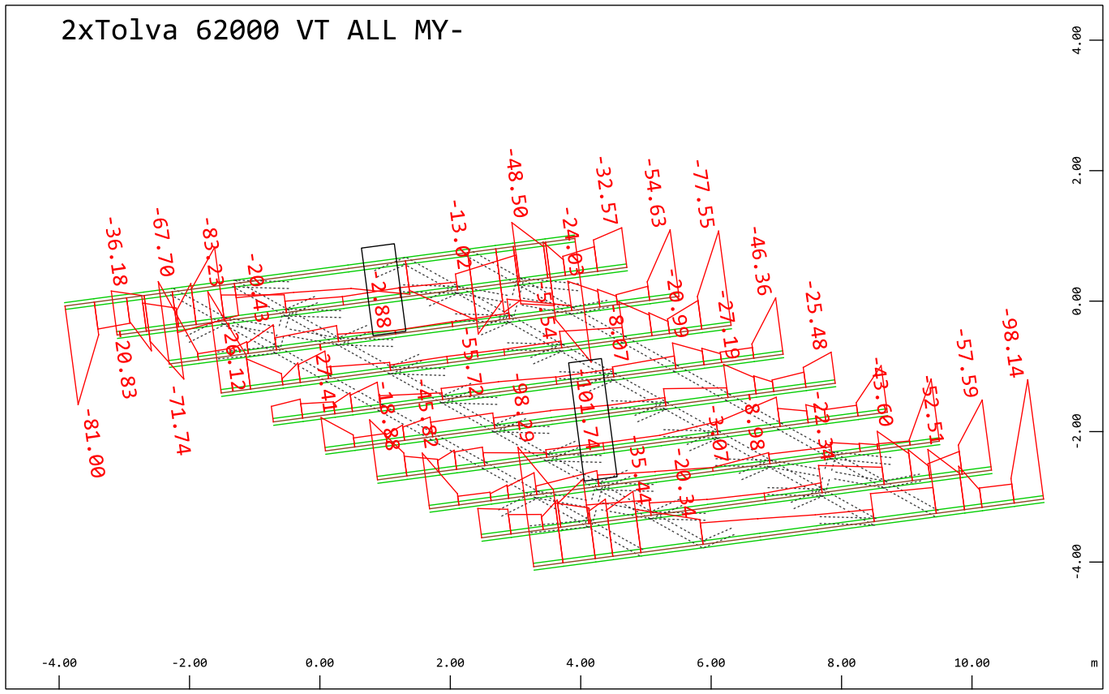
Pont Carretera Vic
Tensiones




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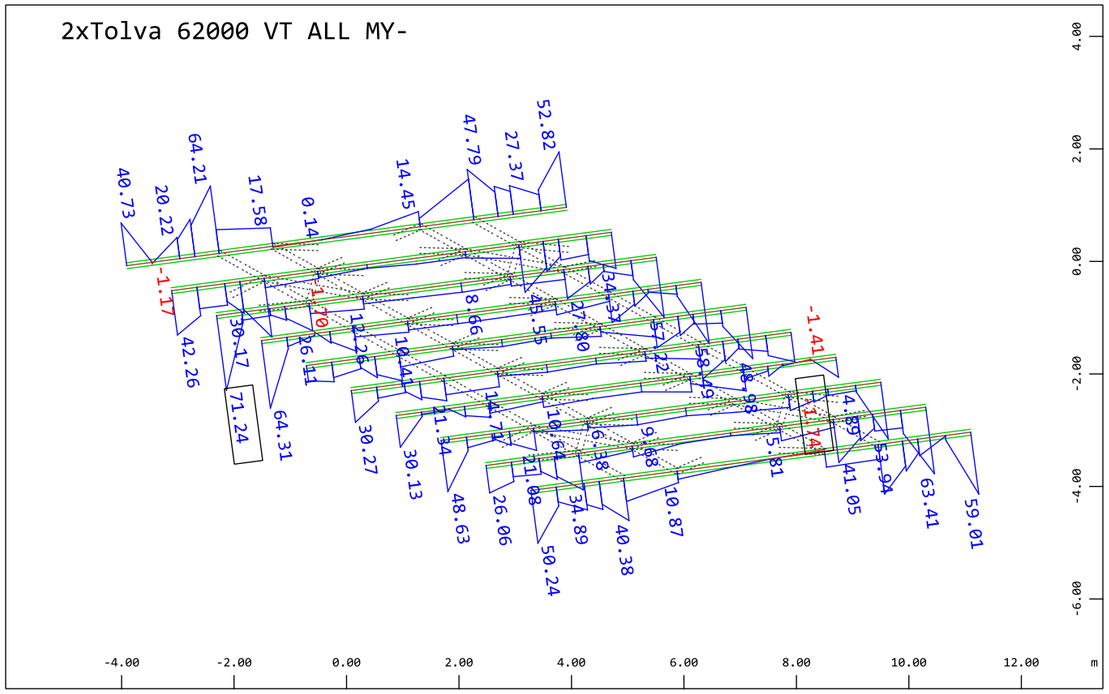
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1654 2xTolva 62000 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-101.74) (Max=-2.88)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

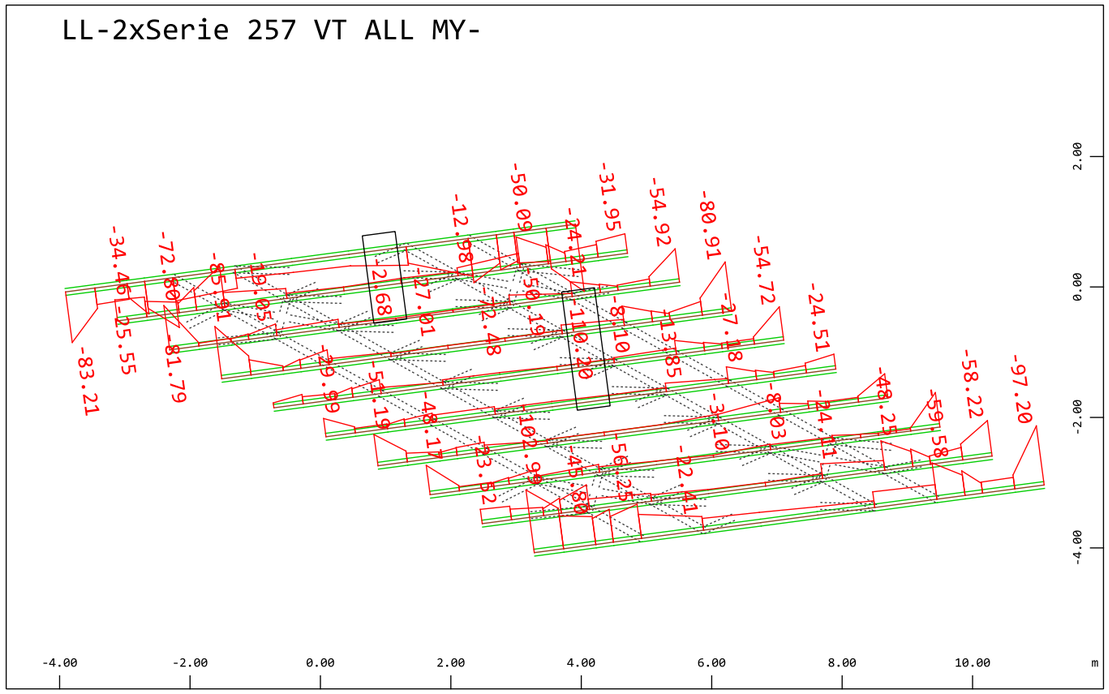
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1654 2xTolva 62000 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-1.74) (Max=71.24)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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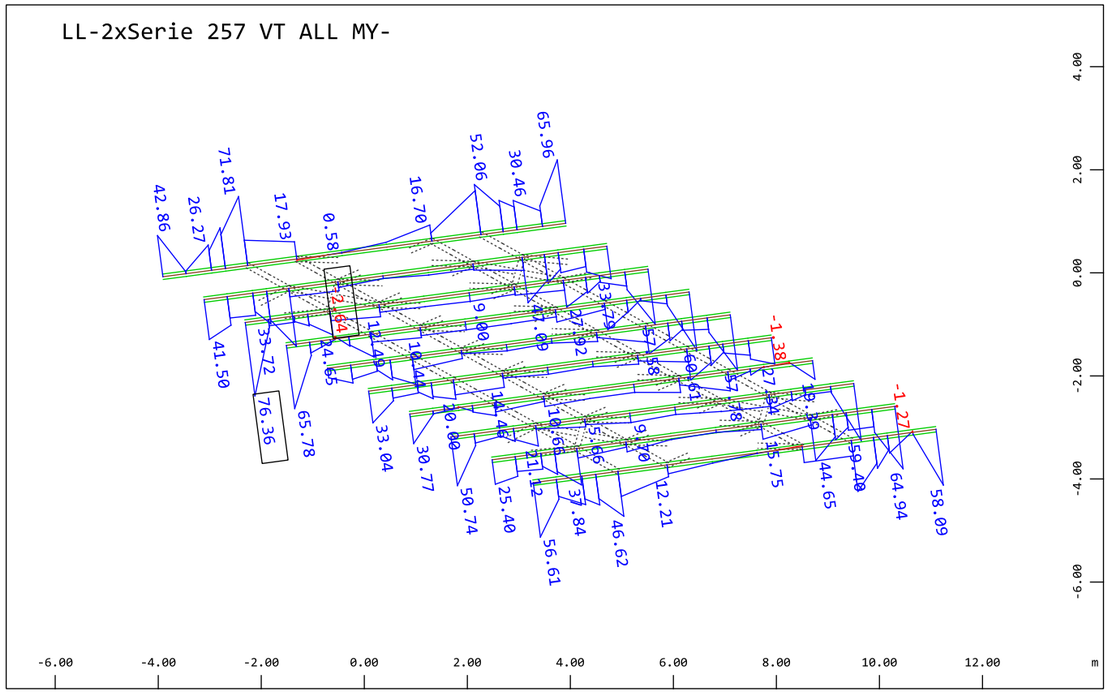
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1644 LL-2xSerie 257 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-110.20) (Max=-2.68)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



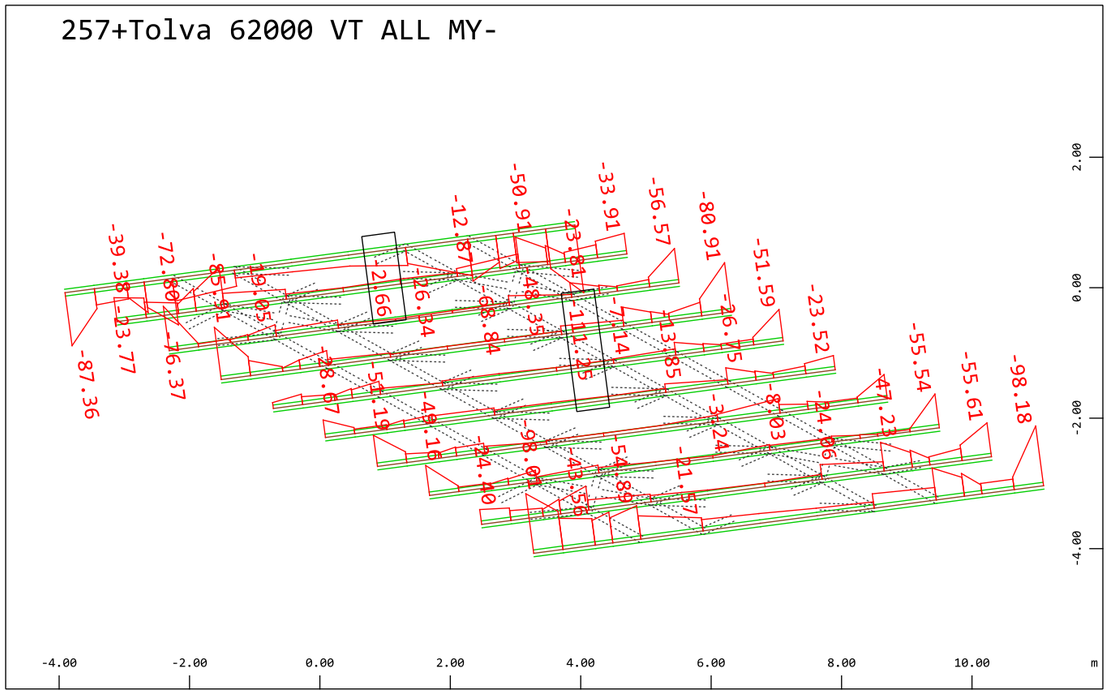

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1644 LL-2xSerie 257 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-2.64) (Max=76.36)

M 1 : 119
X * 0.502
Y * 0.906
Z * 0.962

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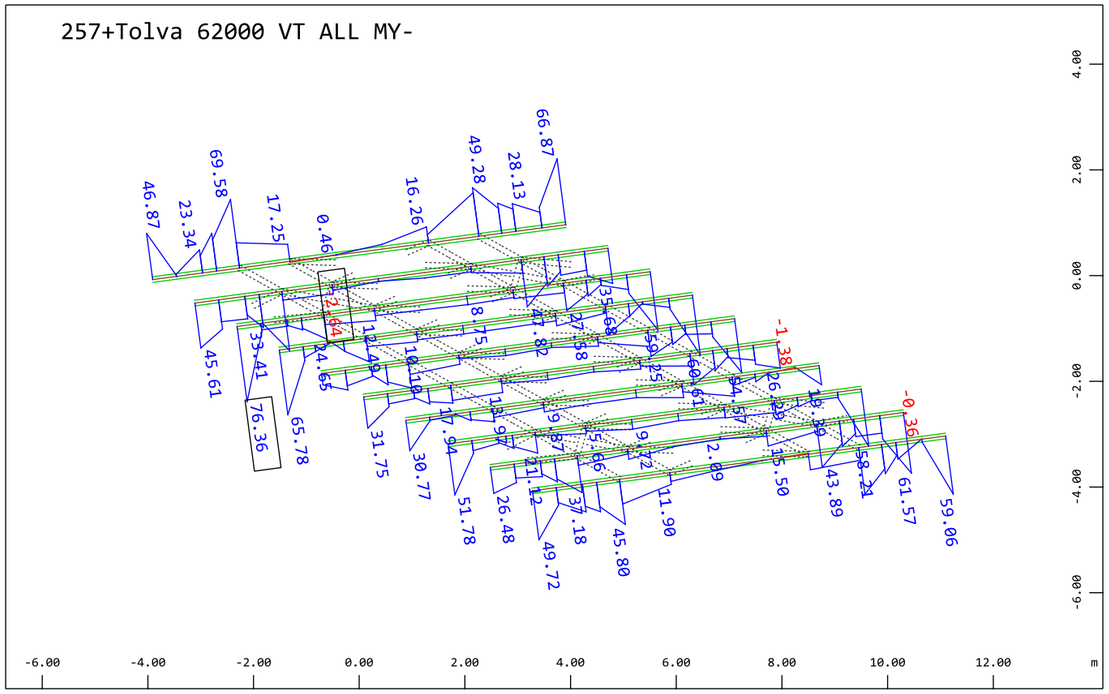
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1674 257+Tolva 62000 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-111.25) (Max=-2.66)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

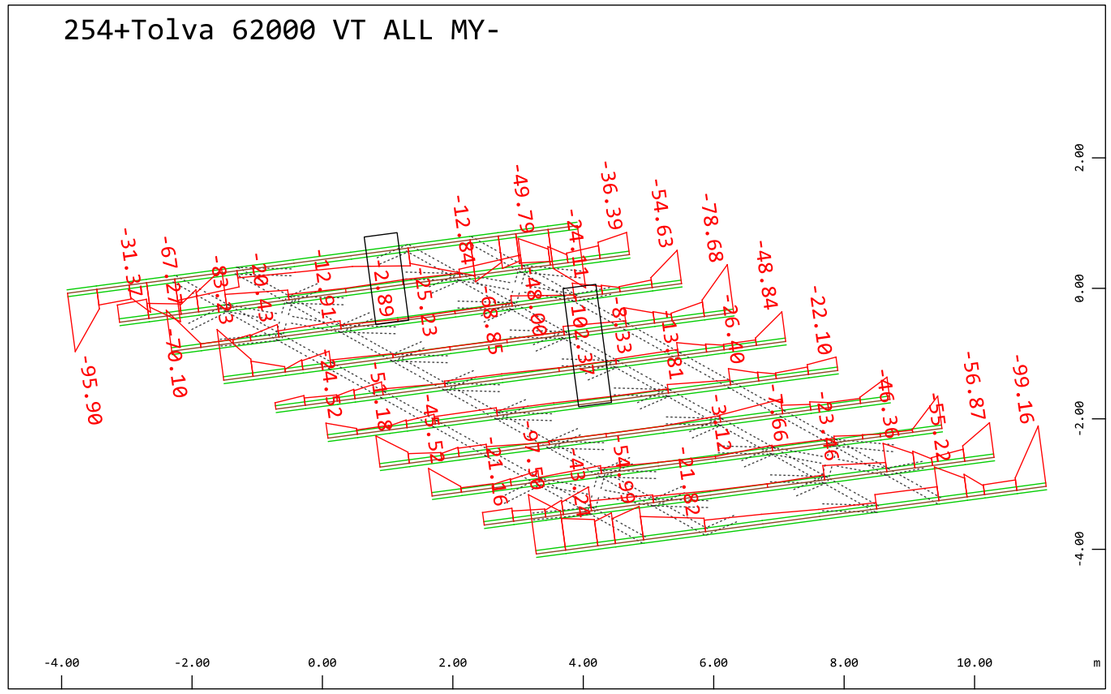
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1674 257+Tolva 62000 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-2.64) (Max=76.36)

M 1 : 116
X * 0.502
Y * 0.906
Z * 0.962

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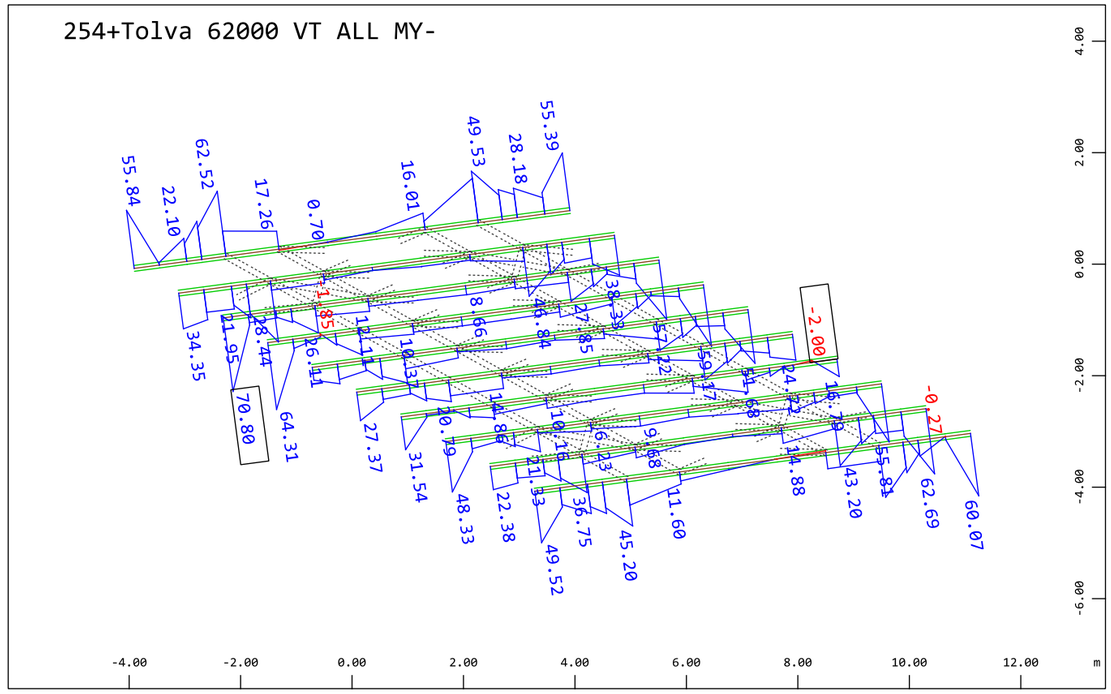
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1664 254+Tolva 62000 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-102.37) (Max=-2.89)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



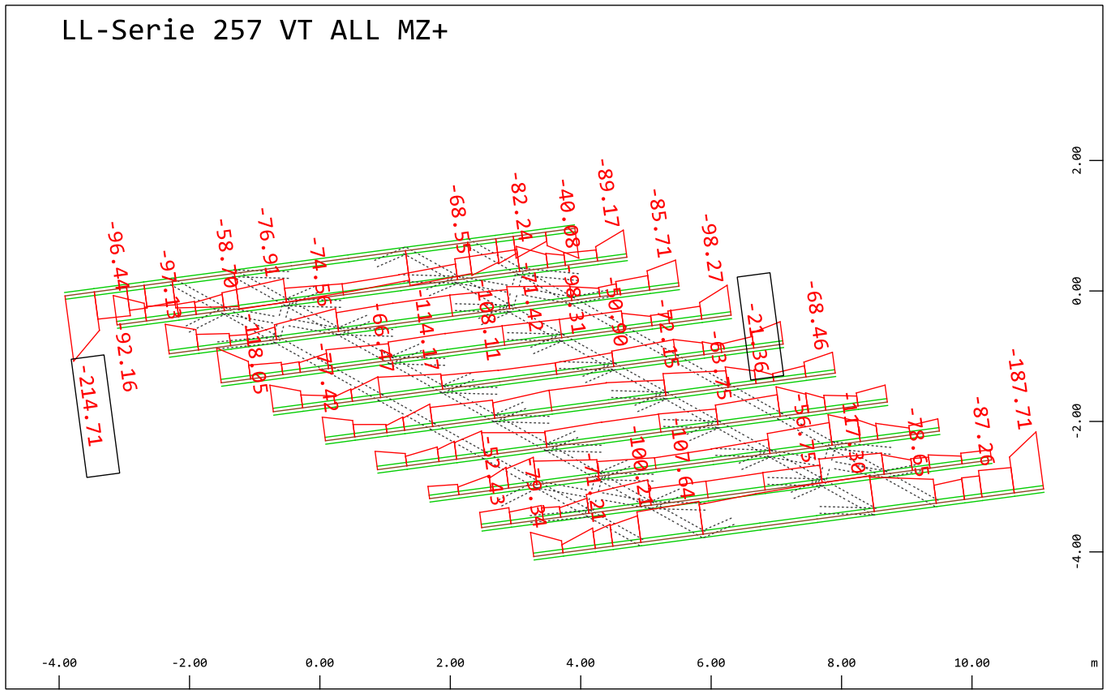

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1664 254+Tolva 62000 VT ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-2.00) (Max=70.80)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962

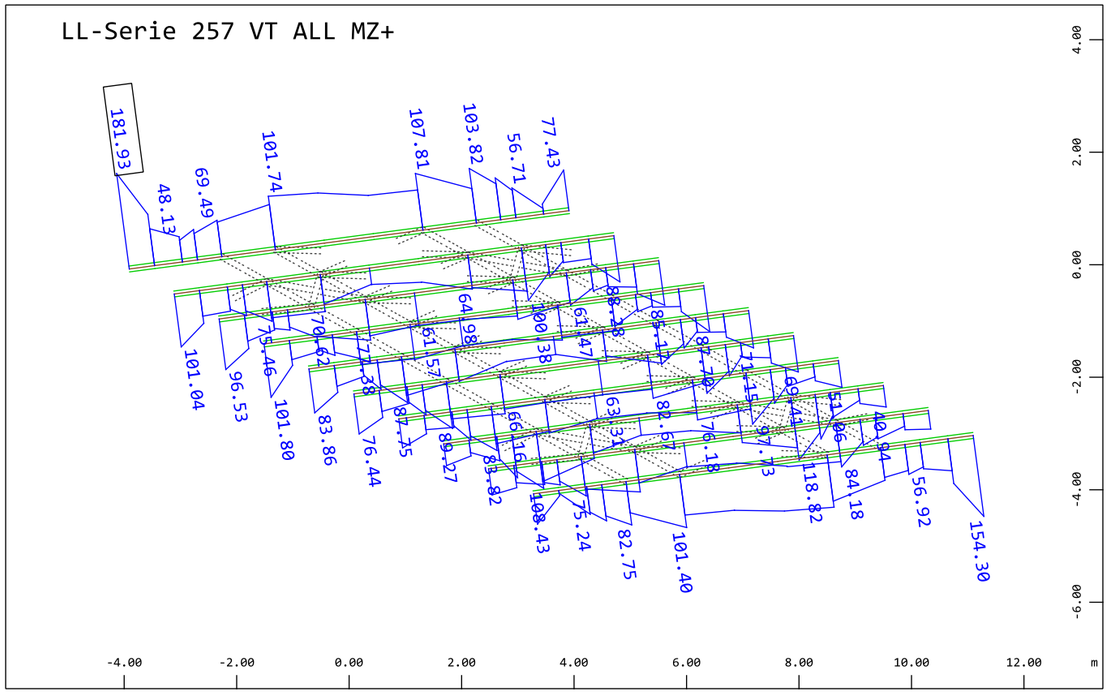
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Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1615 LL-Serie 257 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 200.00 MPa (Min=-214.71) (Max=-21.36)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



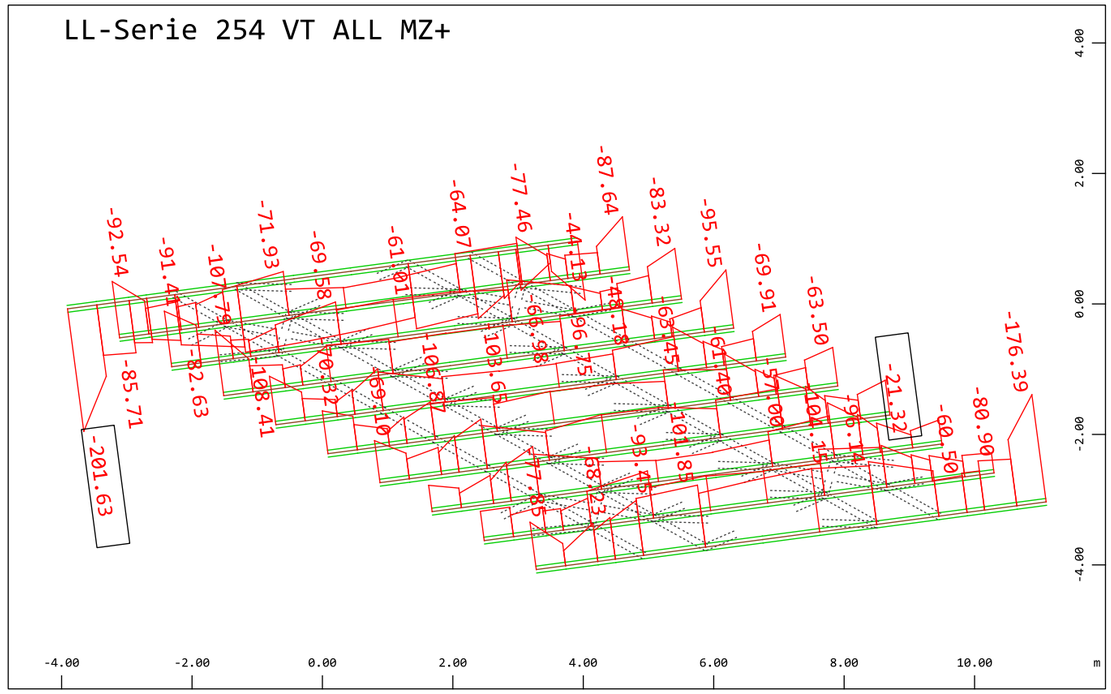

Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1615 LL-Serie 257 VT ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=181.93)

M 1 : 109
X * 0.502
Y * 0.906
Z * 0.962

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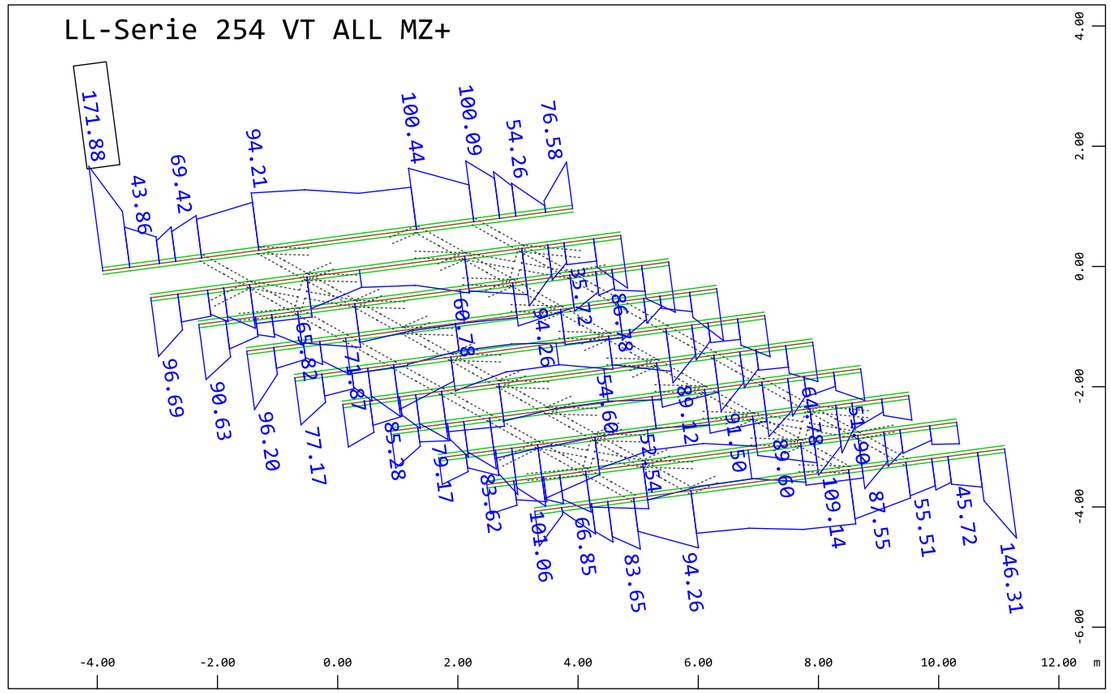


Pont Carretera Vic
Tensiones




Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1605 LL-Serie 254 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-201.63) (Max=-21.32)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962

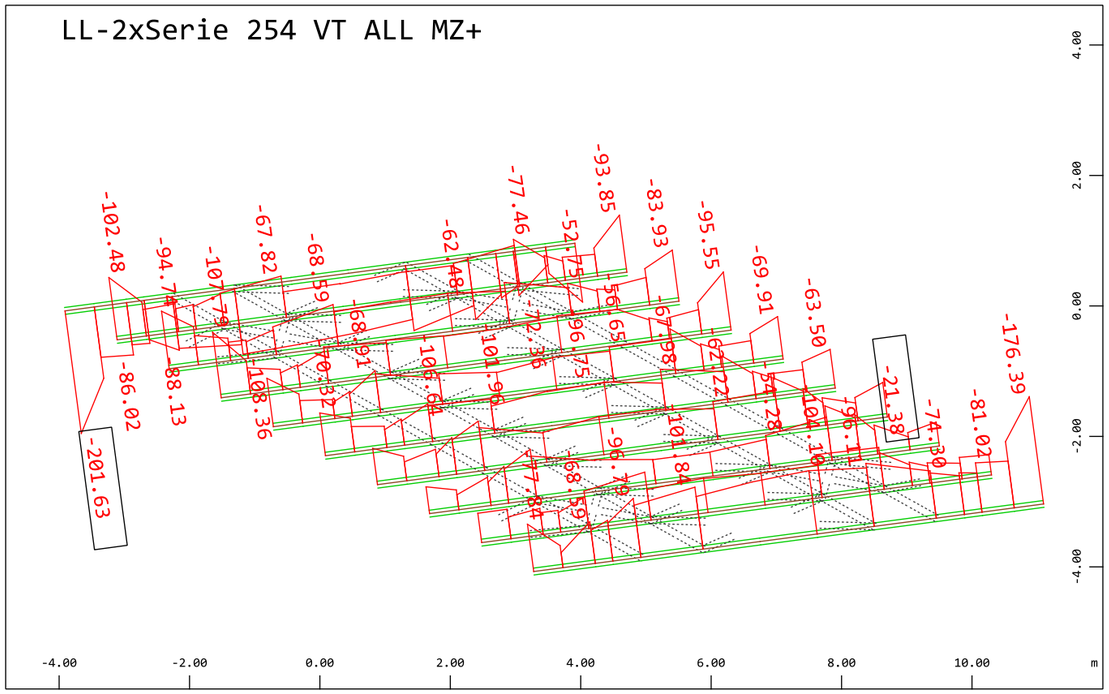



Z
Y X
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1605 LL-Serie 254 VT ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=171.88)

M 1 : 102
X * 0.502
Y * 0.906
Z * 0.962

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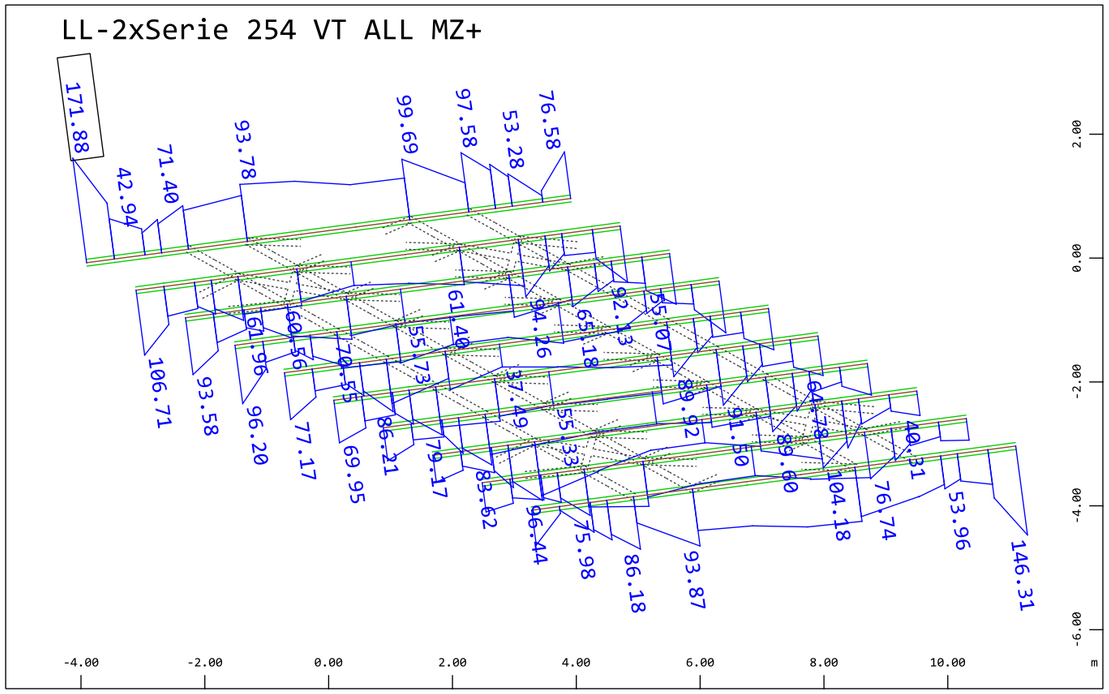
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1635 LL-2xSerie 254 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-201.63) (Max=-21.38)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

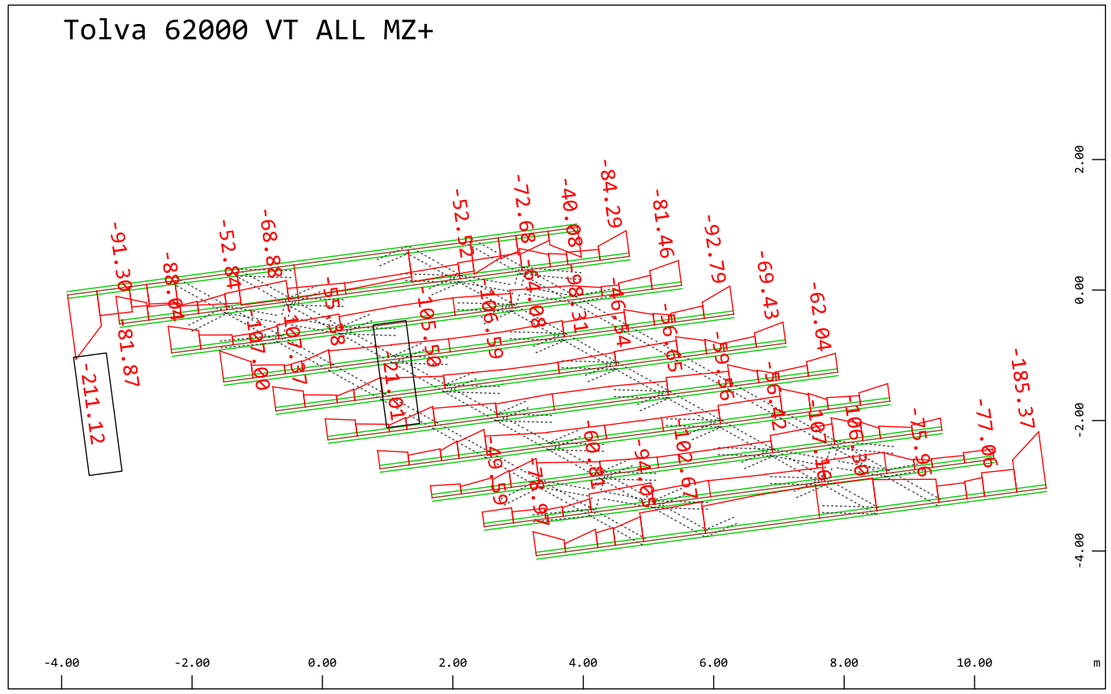
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1635 LL-2xSerie 254 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=171.88)

M 1 : 99
X * 0.502
Y * 0.906
Z * 0.962

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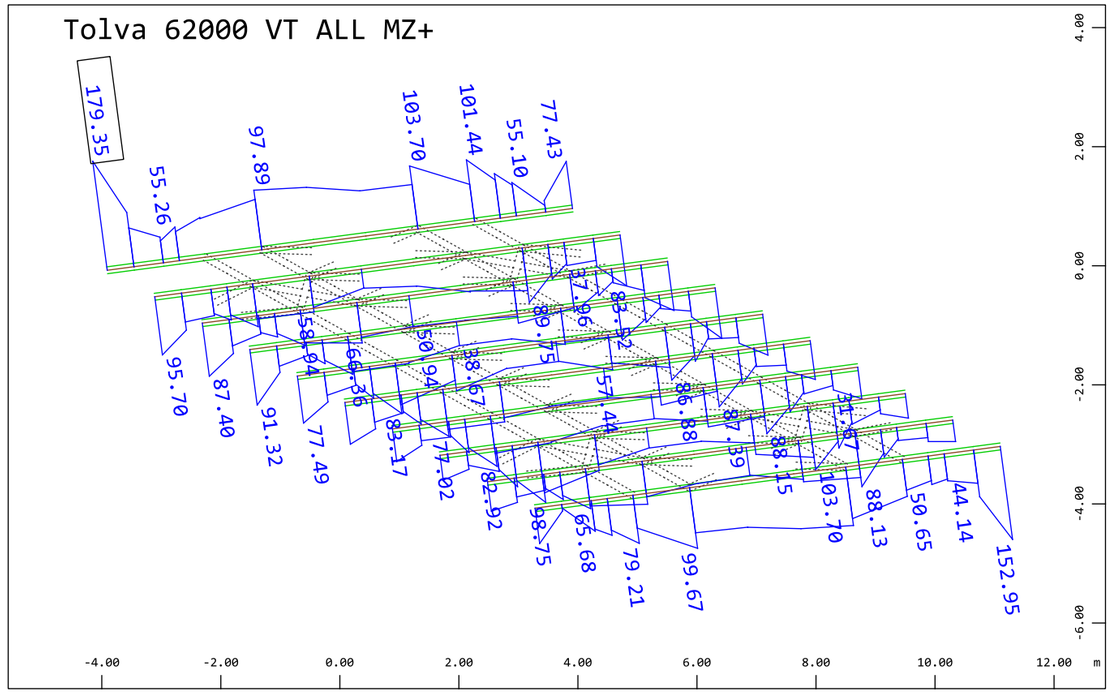
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1625 Tolva 62000 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 200.00 MPa (Min=-211.12) (Max=-21.01)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



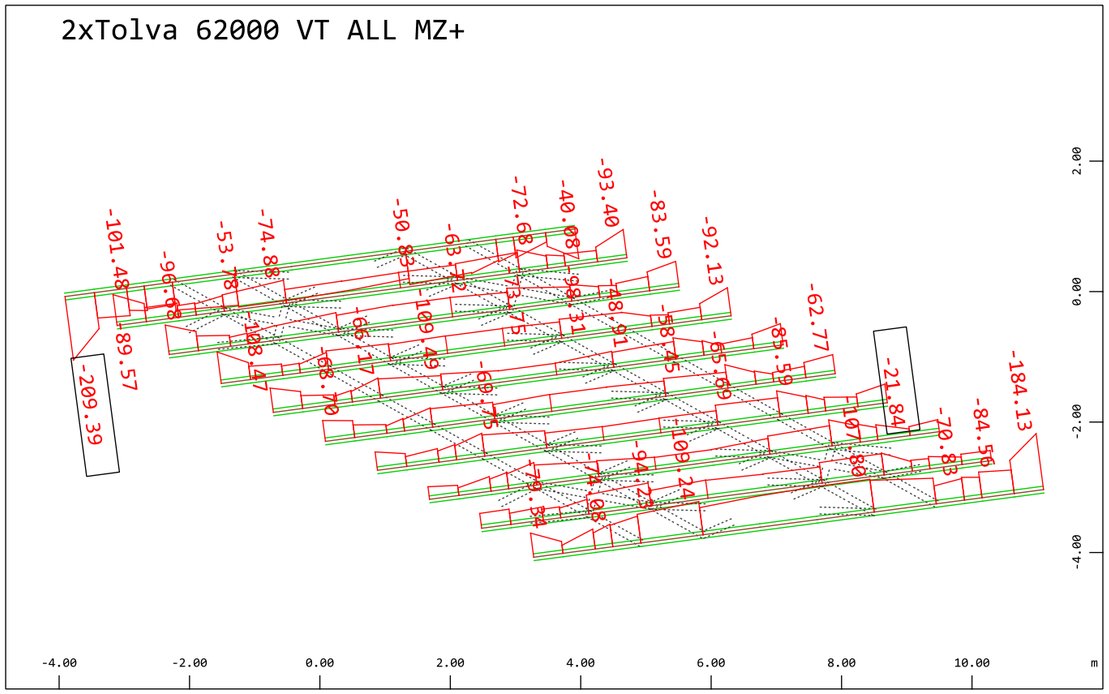

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1625 Tolva 62000 VT ALL MZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=179.35)

M 1 : 103
X * 0.502
Y * 0.906
Z * 0.962

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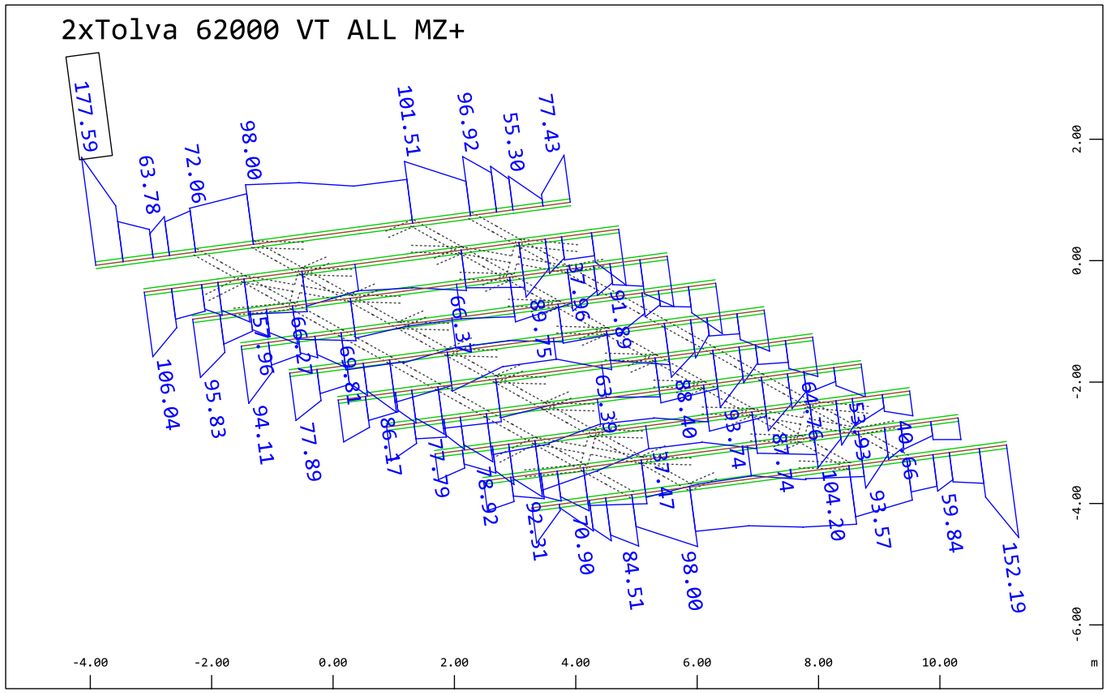
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1655 2xTolva 62000 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 200.00 MPa (Min=-209.39) (Max=-21.84)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

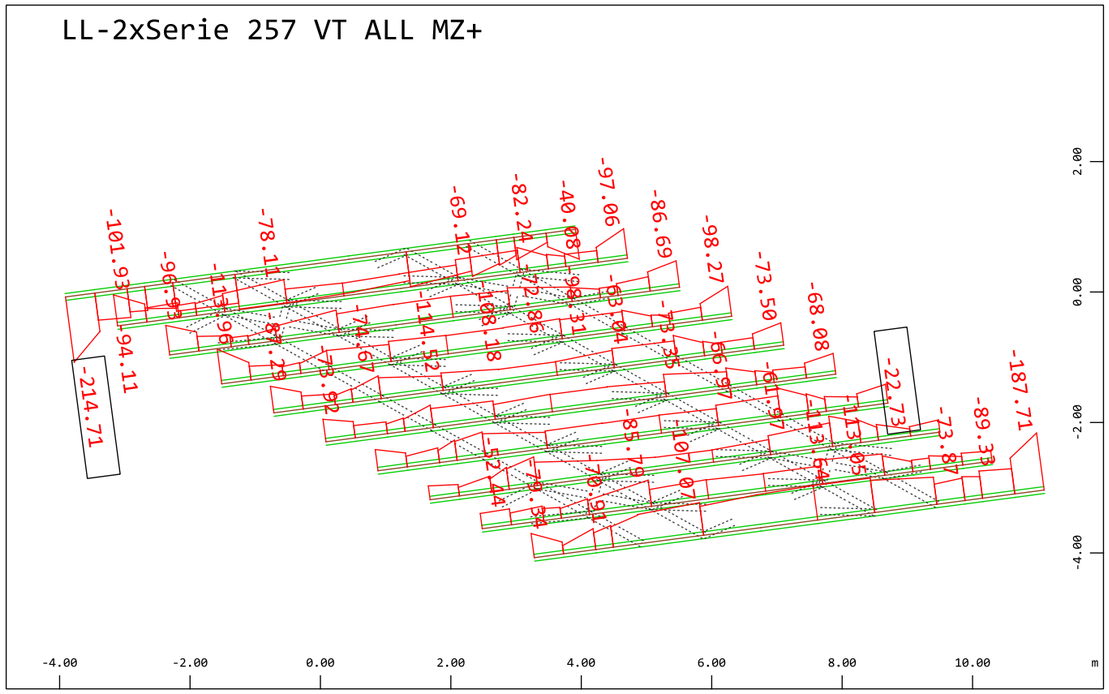
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1655 2xTolva 62000 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=177.59)

M 1 : 101
X * 0.502
Y * 0.906
Z * 0.962

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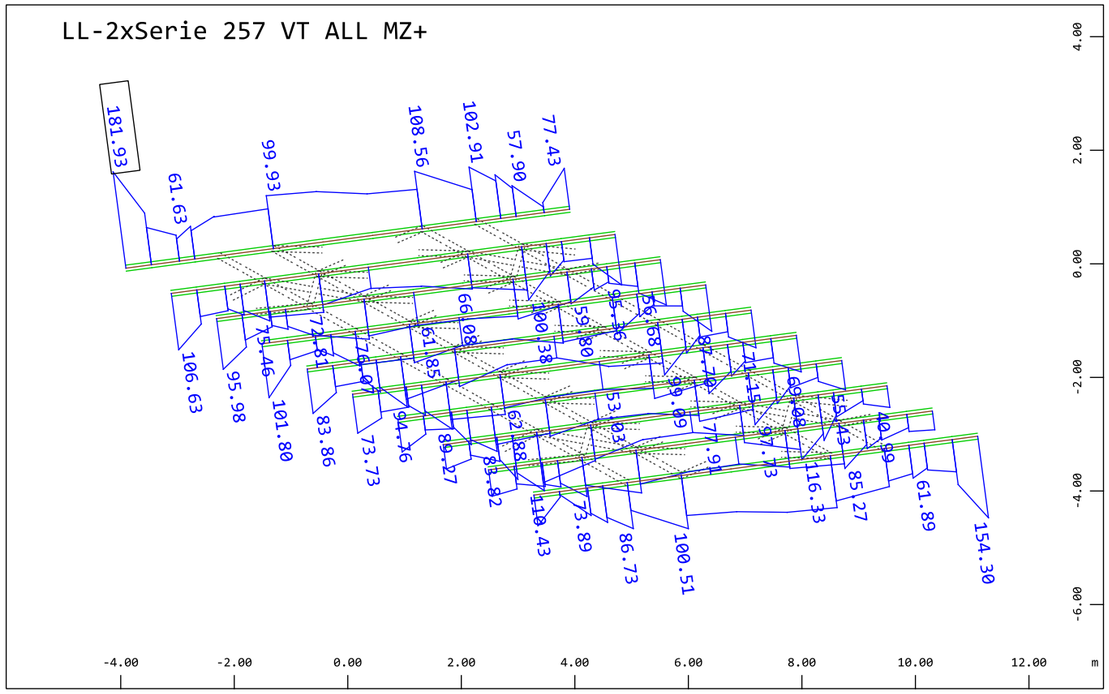
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1645 LL-2xSerie 257 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 200.00 MPa (Min=-214.71) (Max=-22.73)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



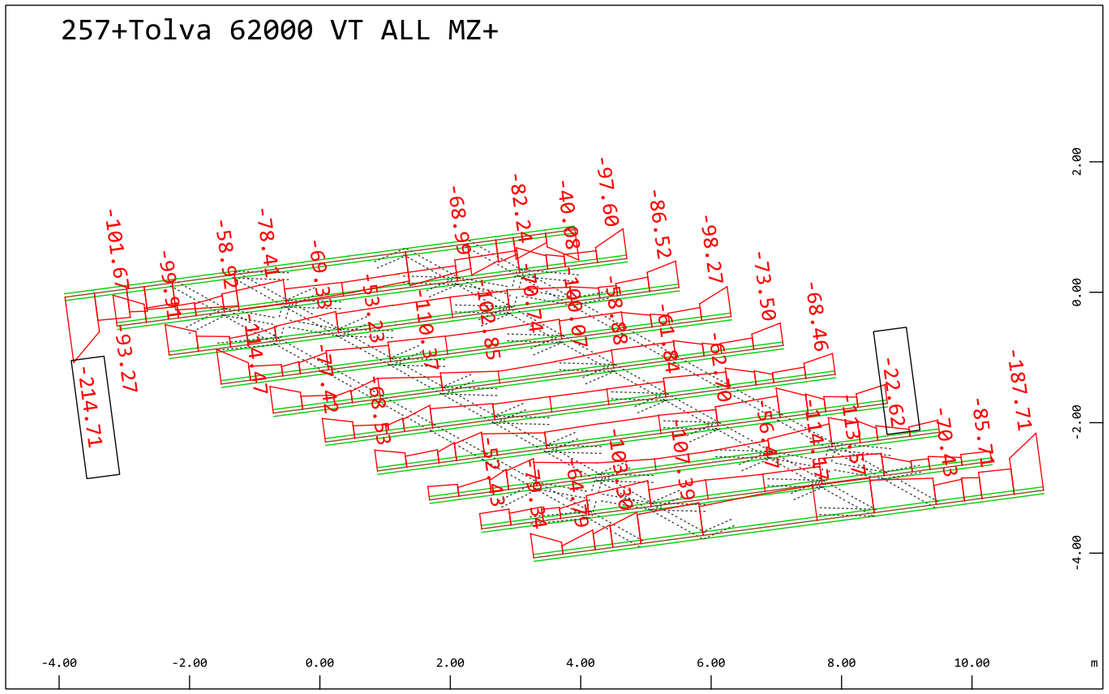

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1645 LL-2xSerie 257 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=181.93)

M 1 : 108
X * 0.502
Y * 0.906
Z * 0.962

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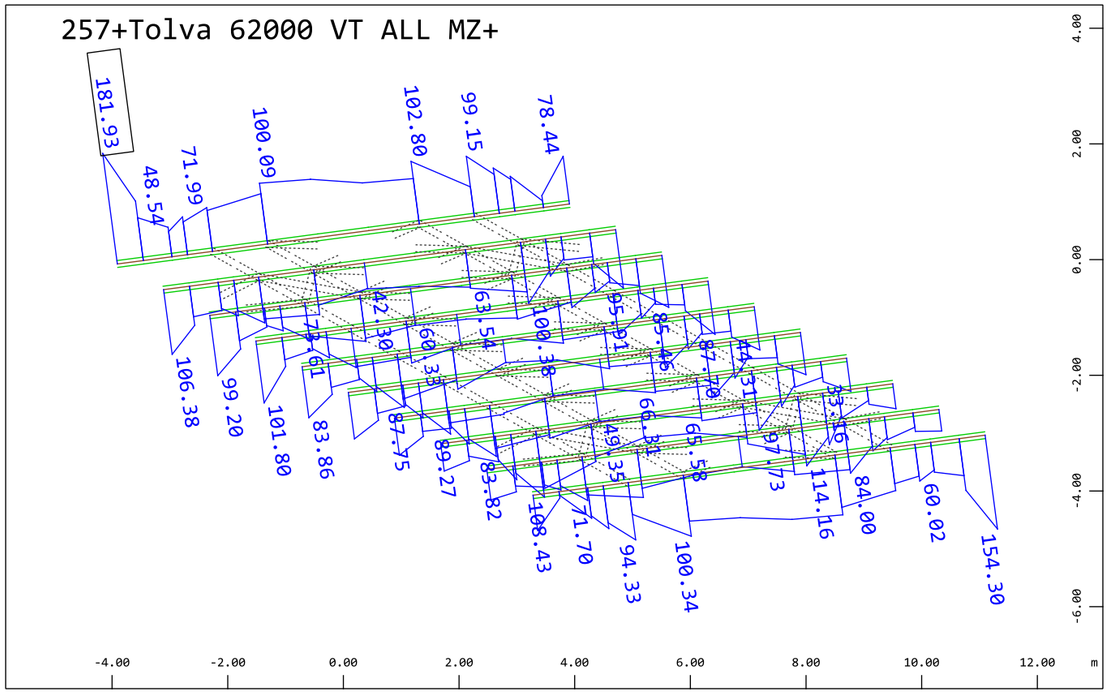
Pont Carretera Vic
Tensiones




Z
Y X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1675 257+Tolva 62000 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 200.00 MPa (Min=-214.71) (Max=-22.62)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y X

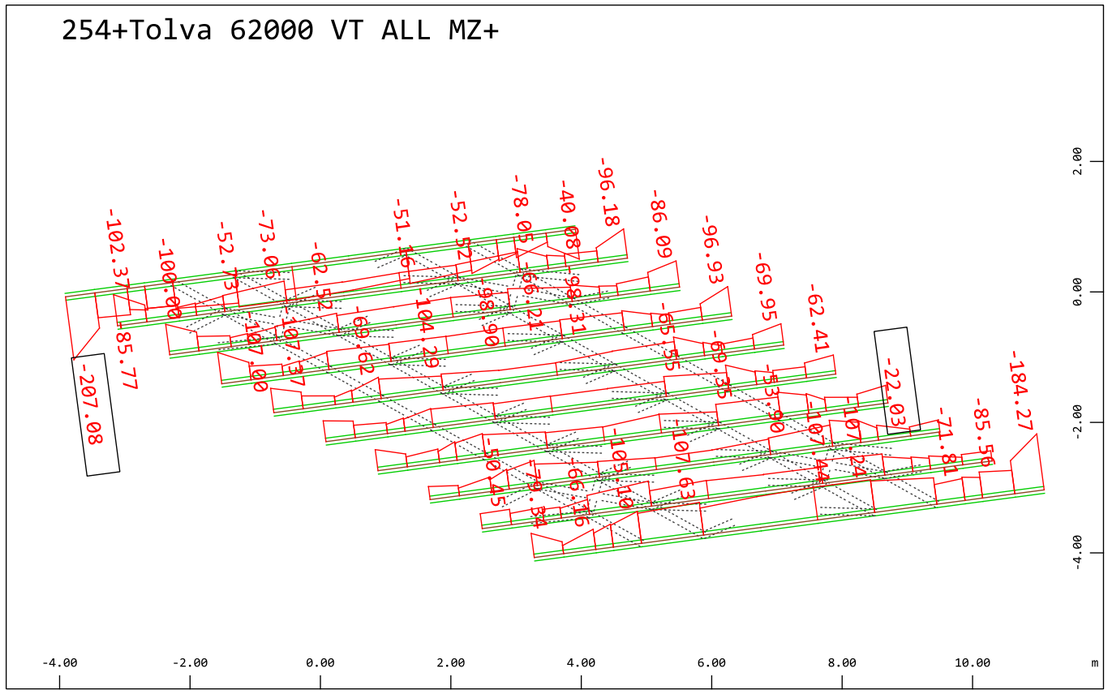
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1675 257+Tolva 62000 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=181.93)

M 1 : 106
X * 0.502
Y * 0.906
Z * 0.962

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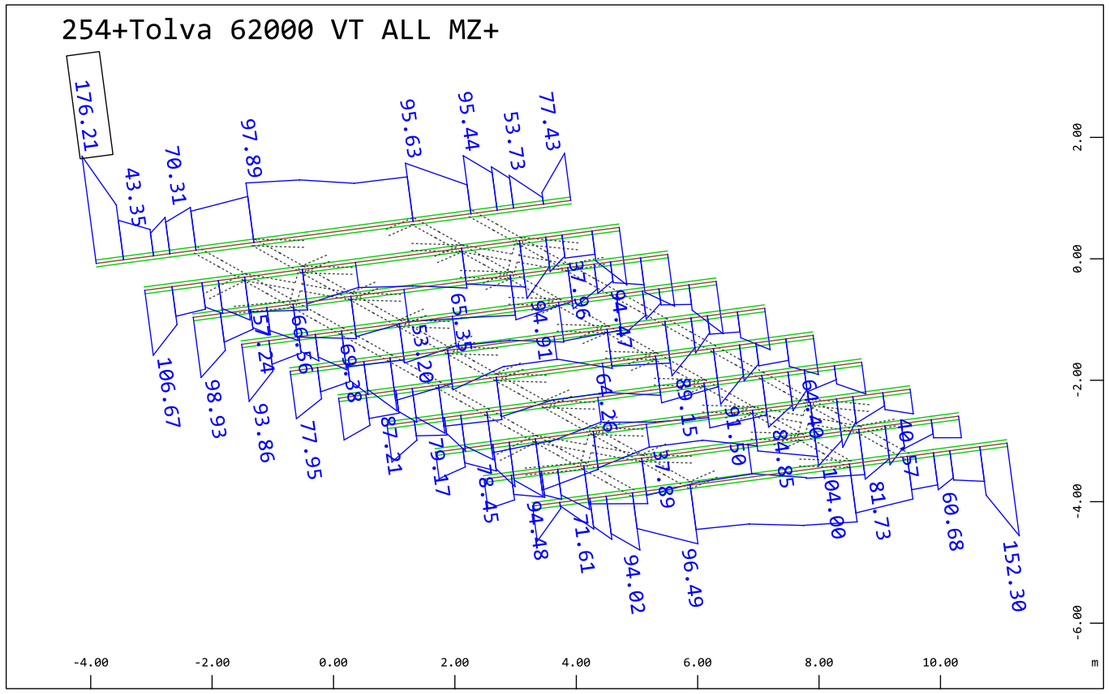
Pont Carretera Vic
Tensiones




Z
Y X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1665 254+Tolva 62000 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 200.00 MPa (Min=-207.08) (Max=-22.03)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



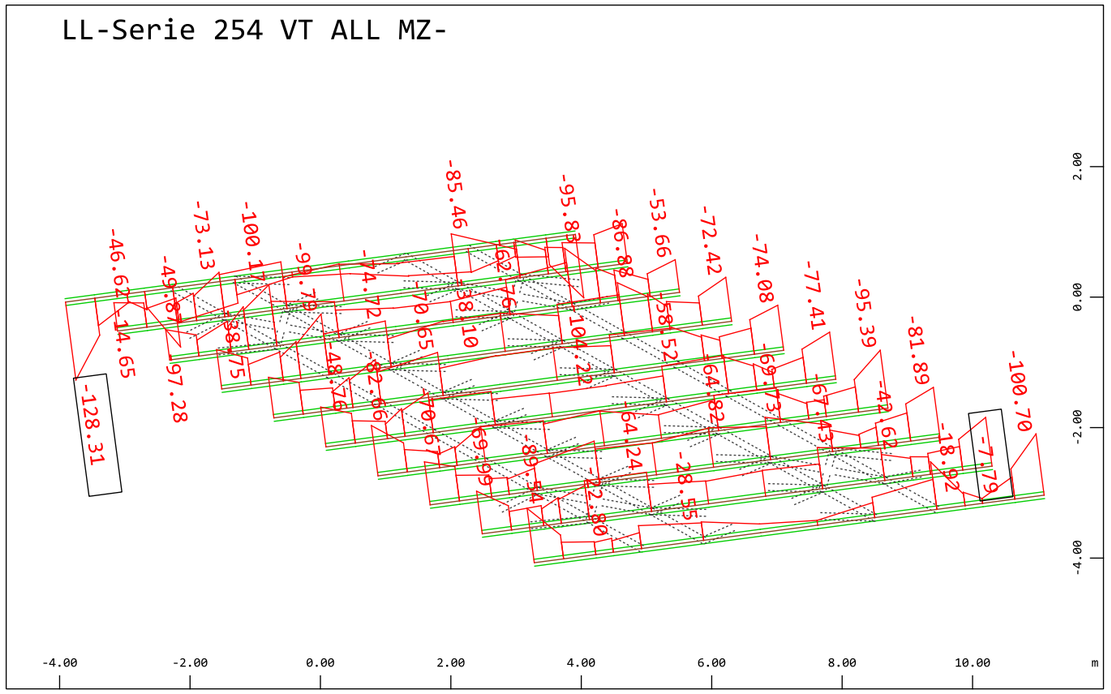

Z
Y X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1665 254+Tolva 62000 VT ALL MZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=176.21)

M 1 : 101
X * 0.502
Y * 0.906
Z * 0.962

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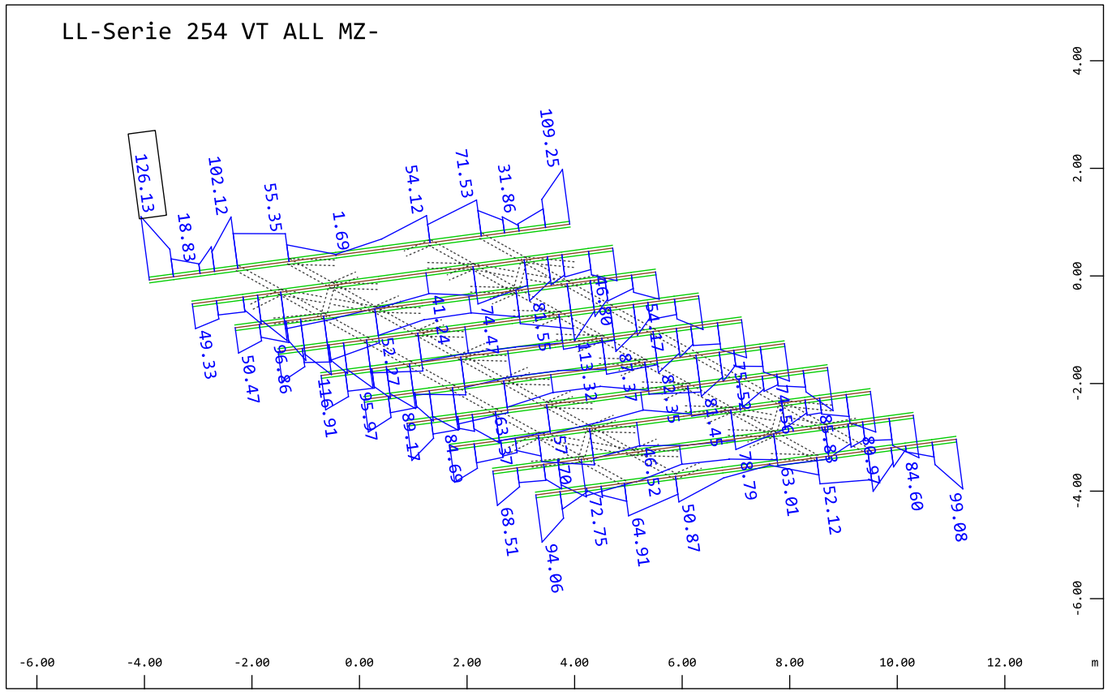
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1606 LL-Serie 254 VT ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-128.31) (Max=-7.79)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

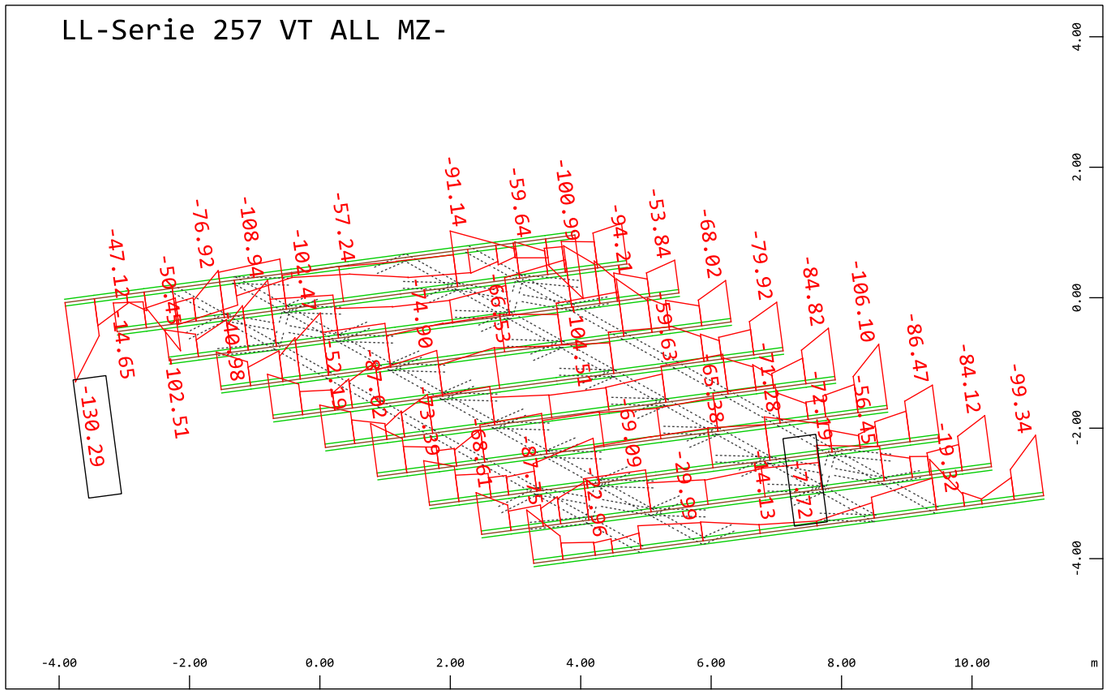
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1606 LL-Serie 254 VT ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=126.13)

M 1 : 114
X * 0.502
Y * 0.906
Z * 0.962

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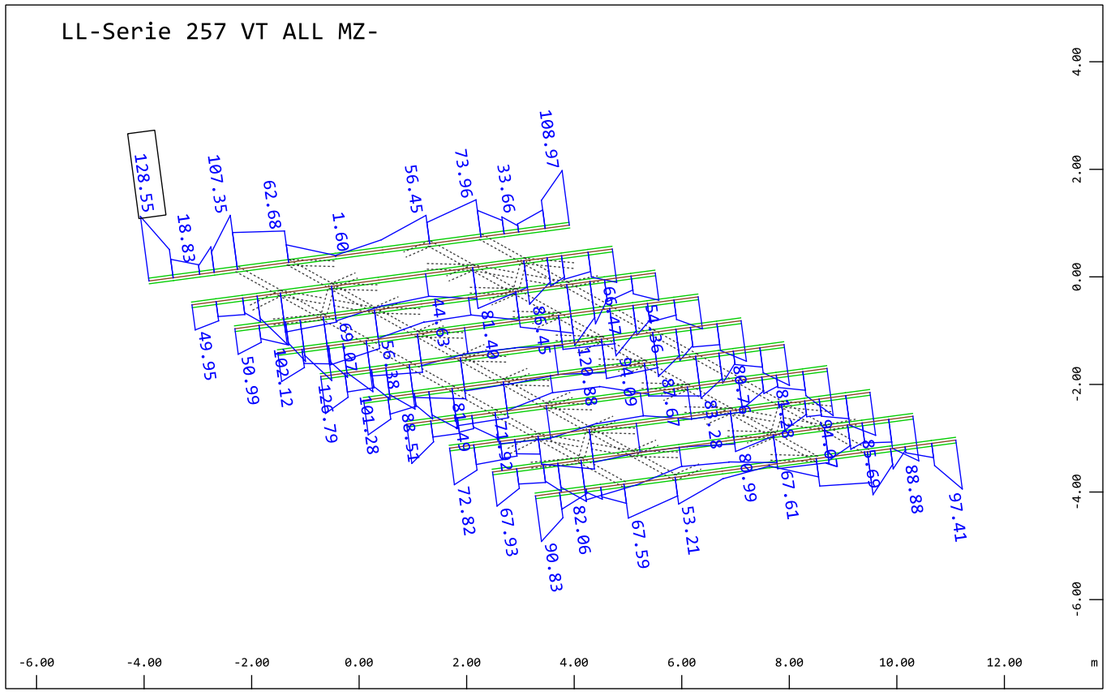
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1616 LL-Serie 257 VT ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-130.29) (Max=-7.72)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



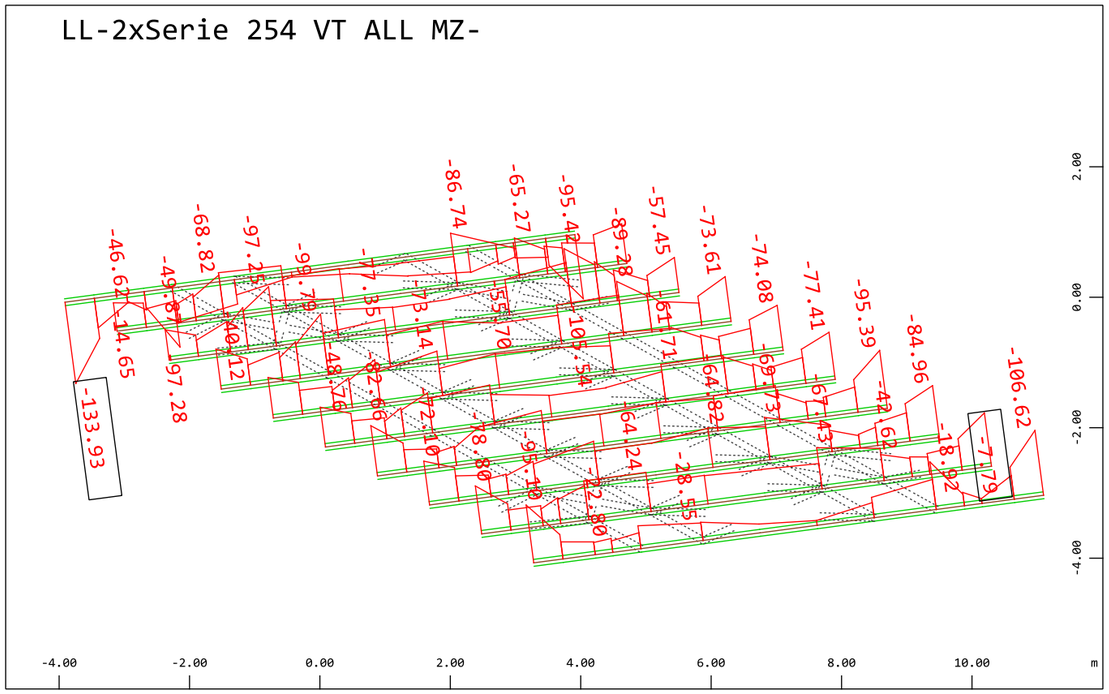

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1616 LL-Serie 257 VT ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=128.55)

M 1 : 114
X * 0.502
Y * 0.906
Z * 0.962

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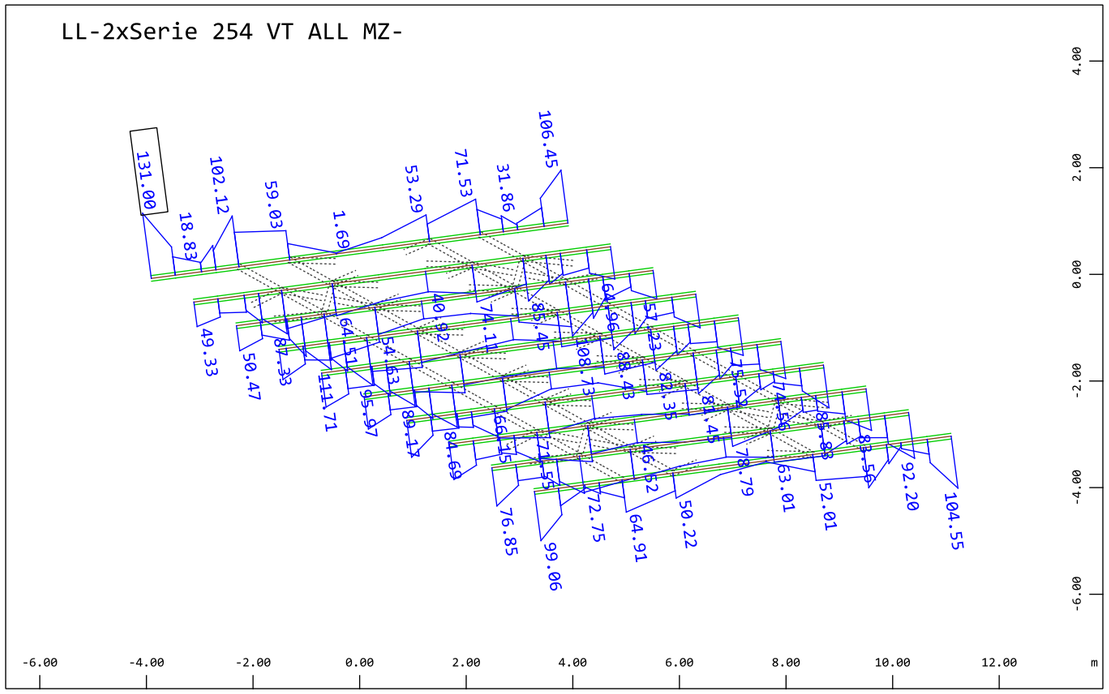
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1636 LL-2xSerie 254 VT ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-133.93) (Max=-7.79)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

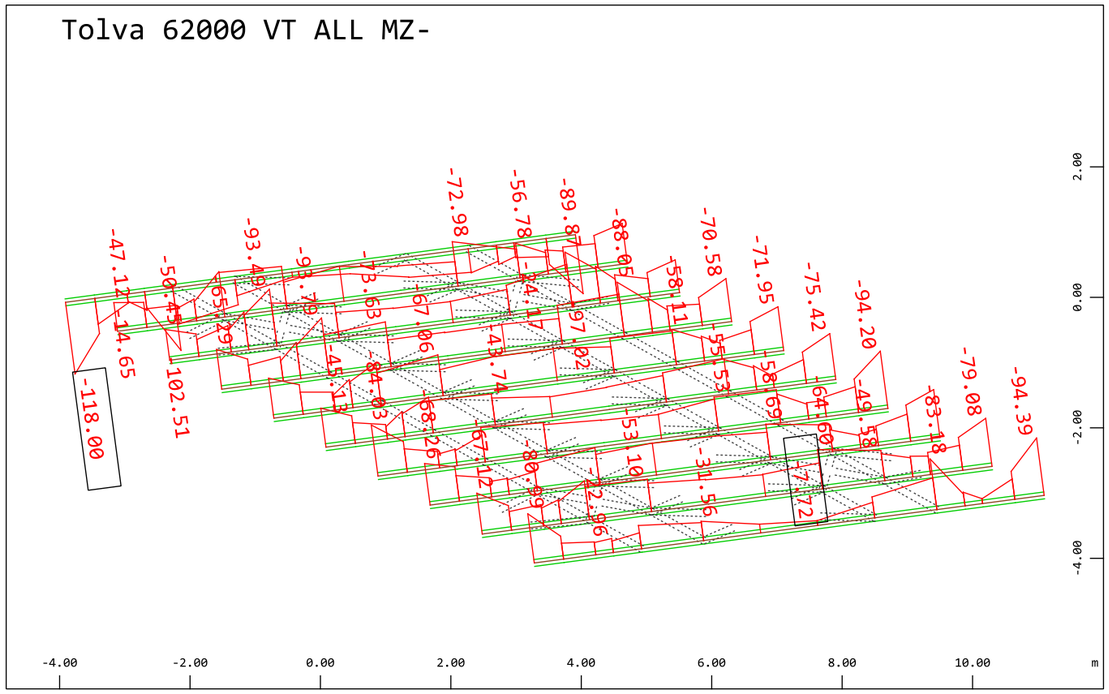
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1636 LL-2xSerie 254 VT ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=131.00)

M 1 : 115
X * 0.502
Y * 0.906
Z * 0.962

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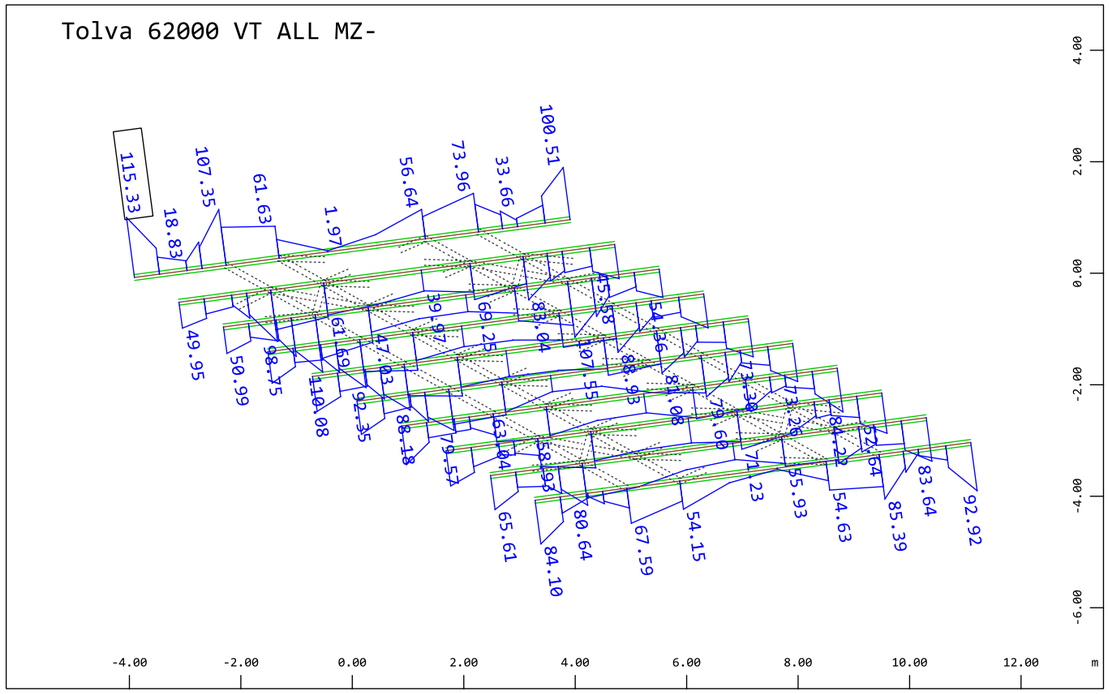
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1626 Tolva 62000 VT ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-118.00) (Max=-7.72)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



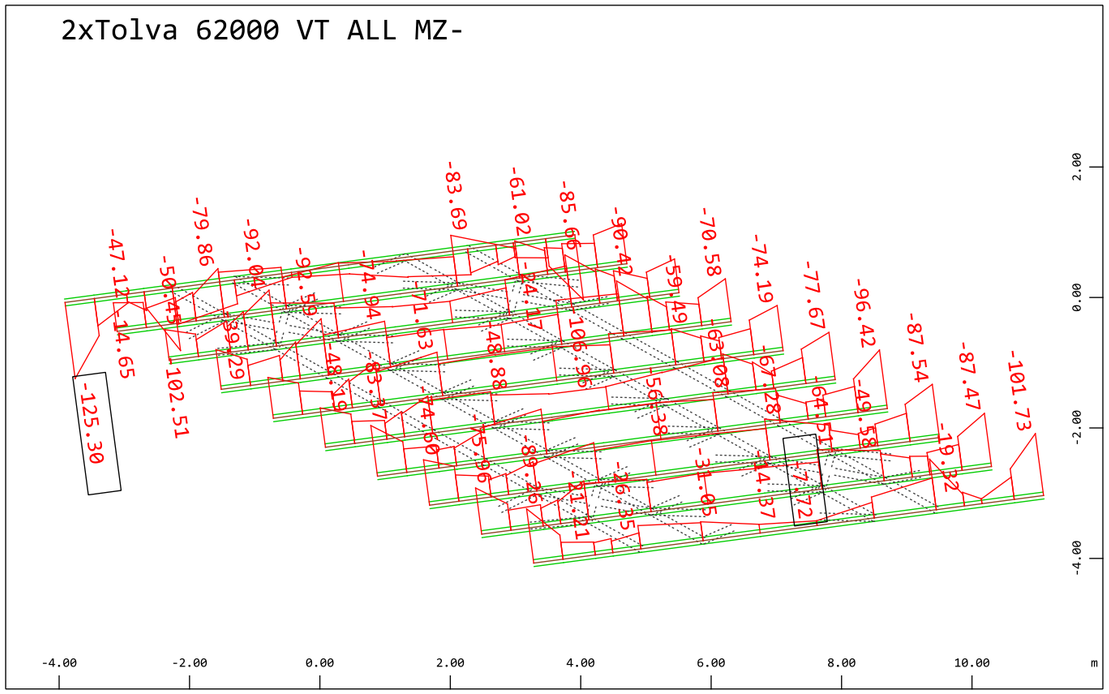

Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1626 Tolva 62000 VT ALL MZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=115.33)

M 1 : 110
X * 0.502
Y * 0.906
Z * 0.962

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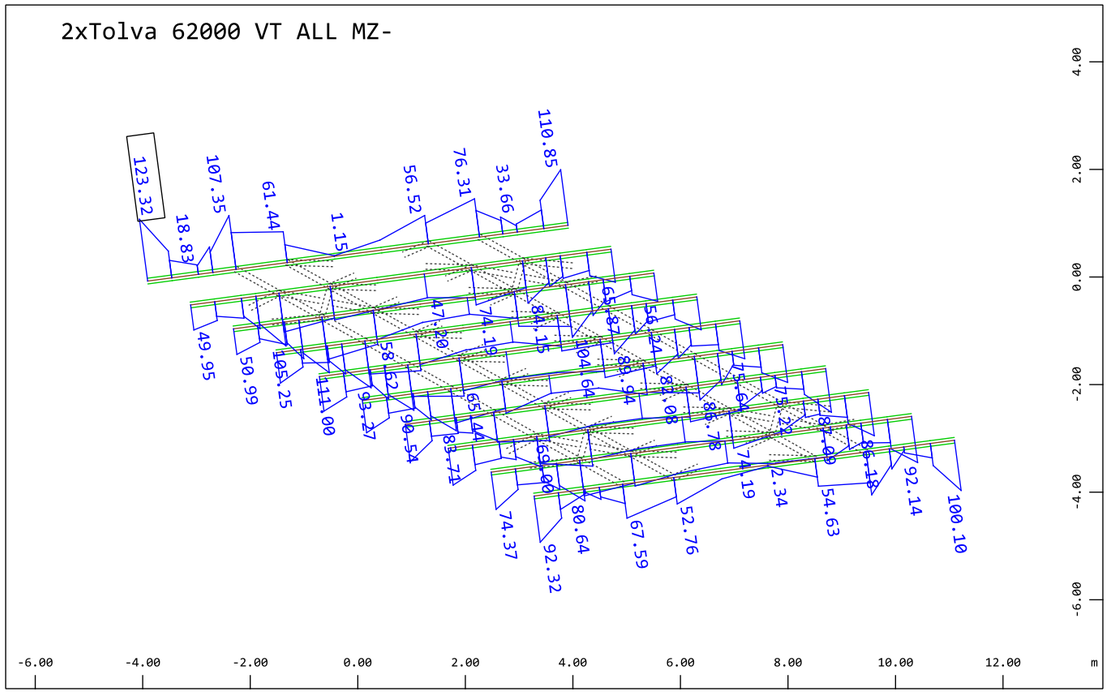
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1656 2xTolva 62000 VT ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-125.30) (Max=-7.72)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

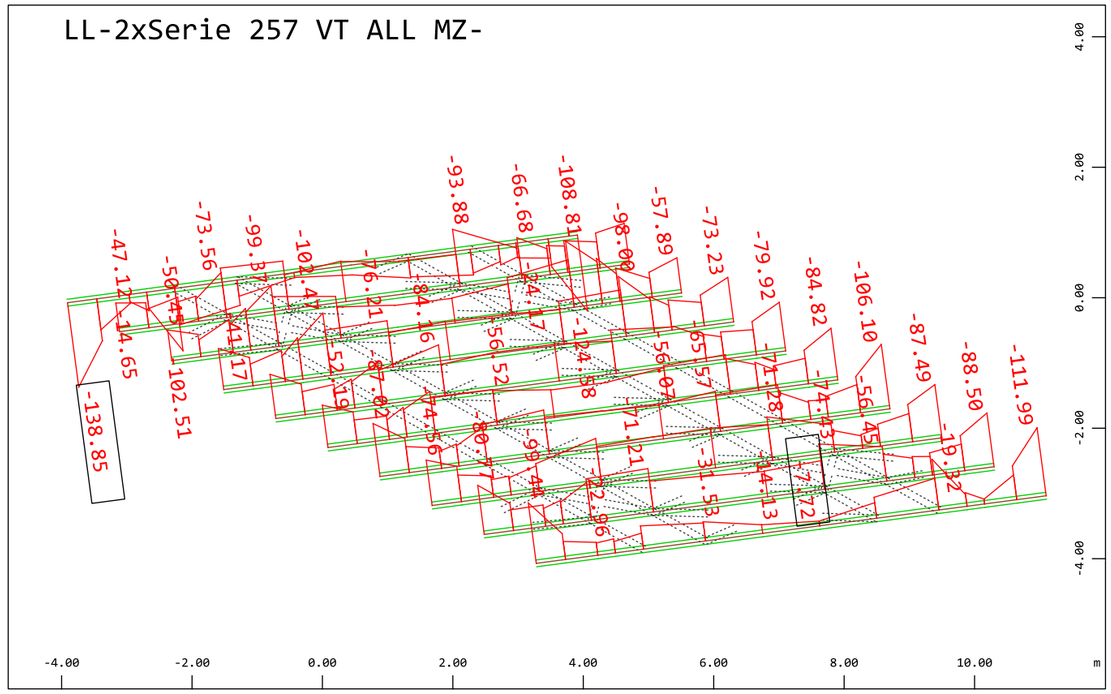
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1656 2xTolva 62000 VT ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=123.32)

M 1 : 114
X * 0.502
Y * 0.906
Z * 0.962

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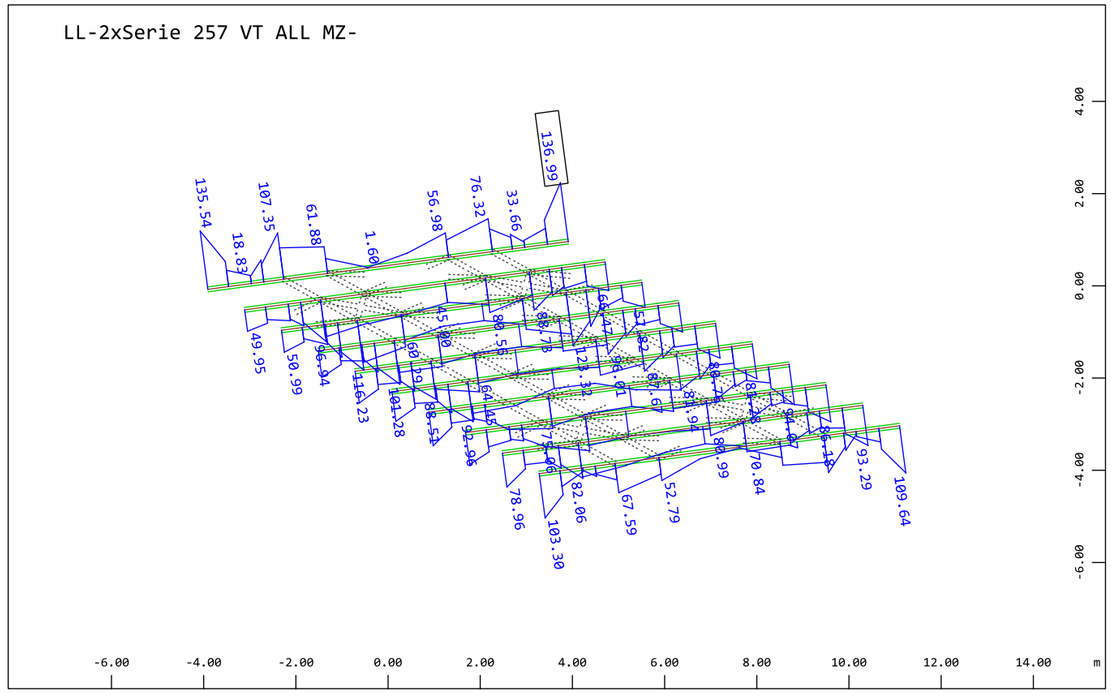
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum compression stress, Design Case 1646 LL-2xSerie 257 VT ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-138.85) (Max=-7.72)

M 1 : 94
X * 0.502
Y * 0.906
Z * 0.962



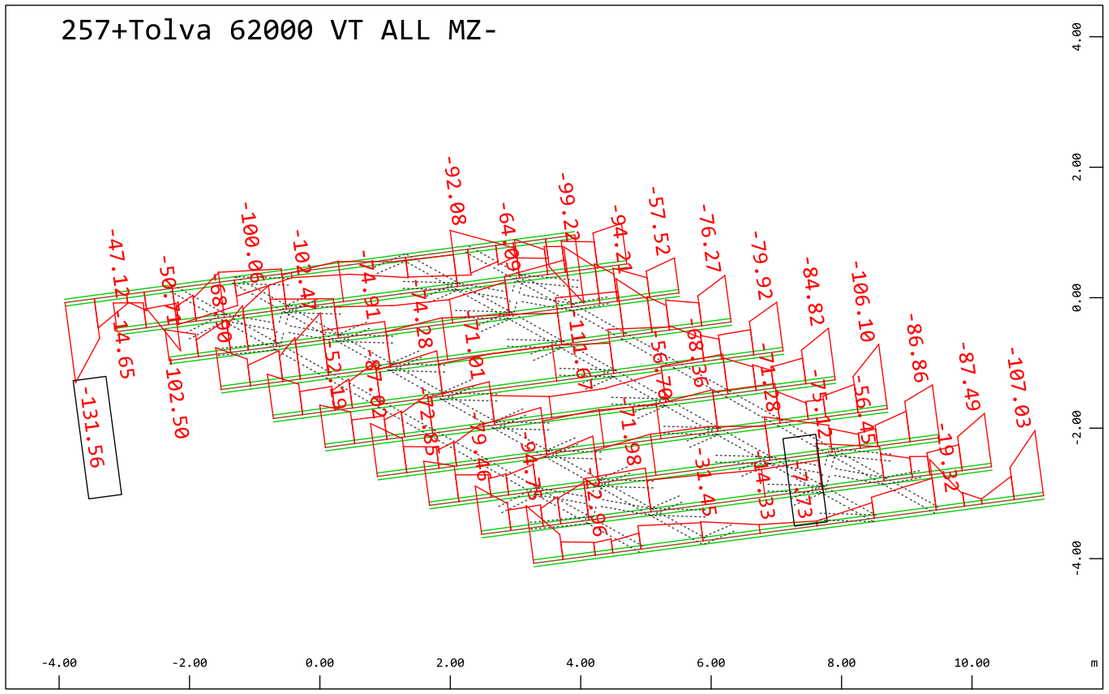

Z
Y
X

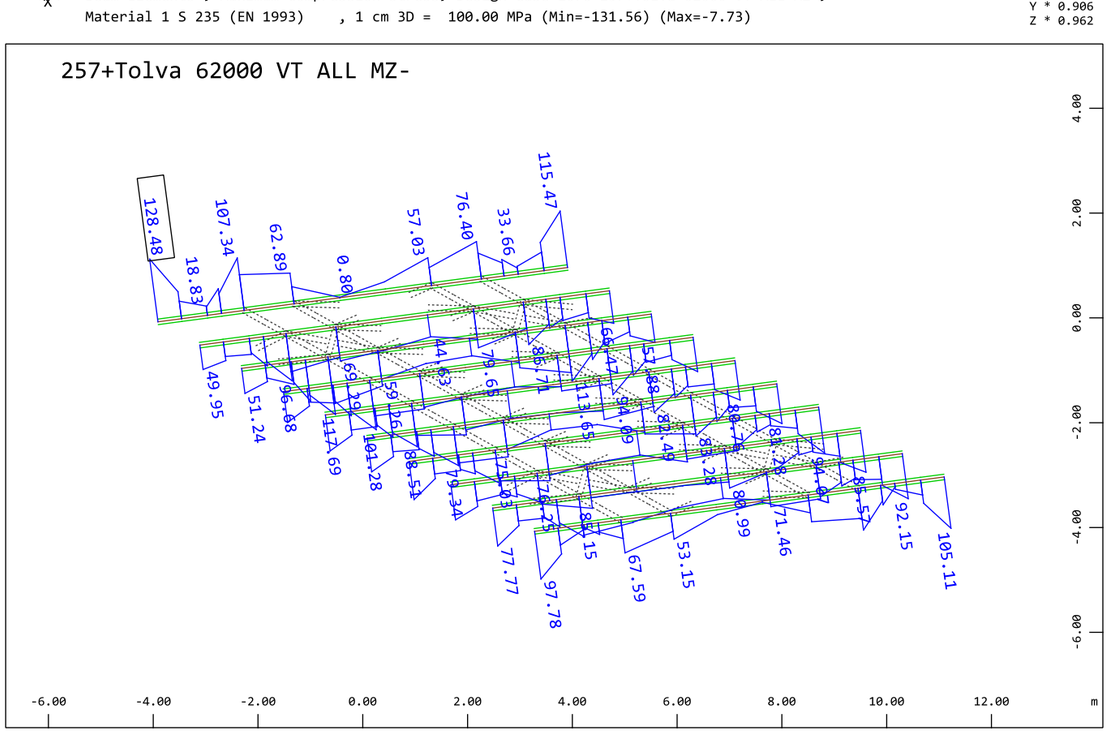
Sector of system Beam Elements Group 11...14 21...24
Beam Elements , Maximum tensile stress, Design Case 1646 LL-2xSerie 257 VT ALL MZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=136.99)

M 1 : 133
X * 0.502
Y * 0.906
Z * 0.962

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Pont Carretera Vic
Tensiones

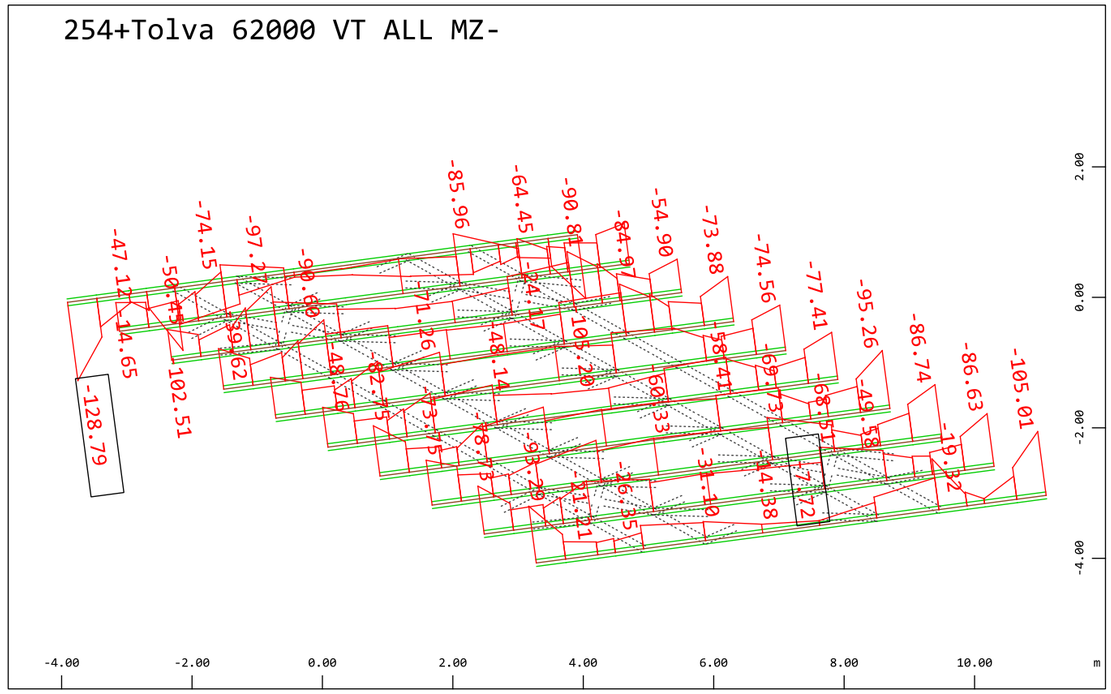


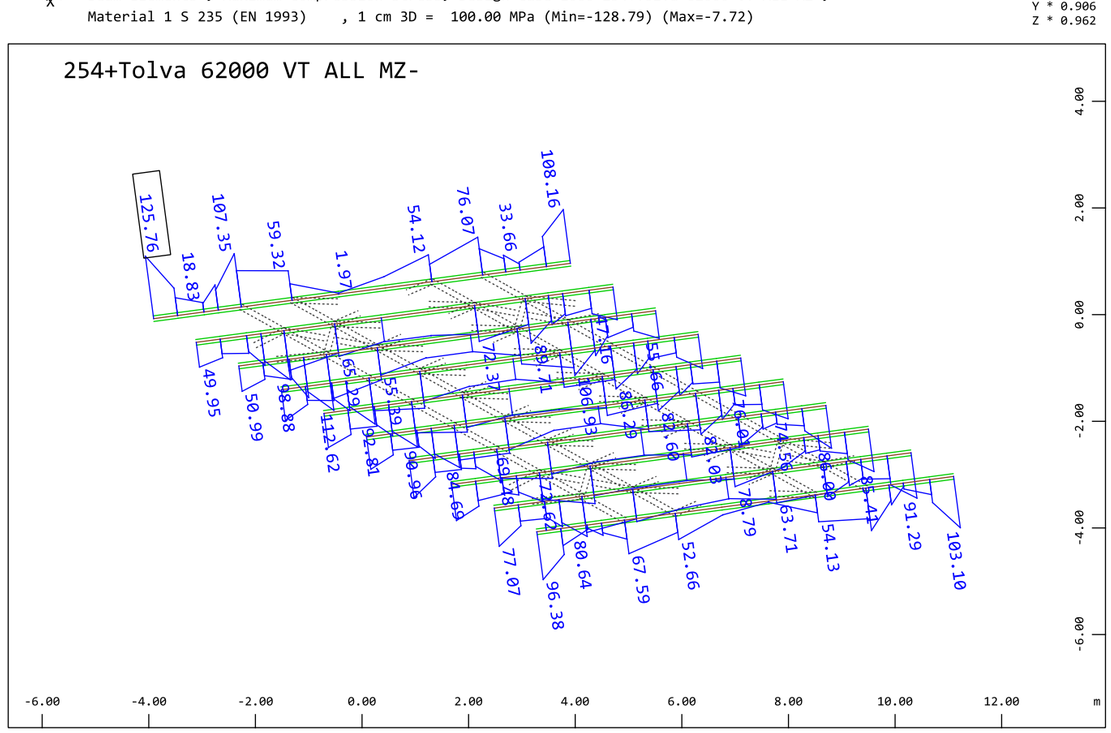




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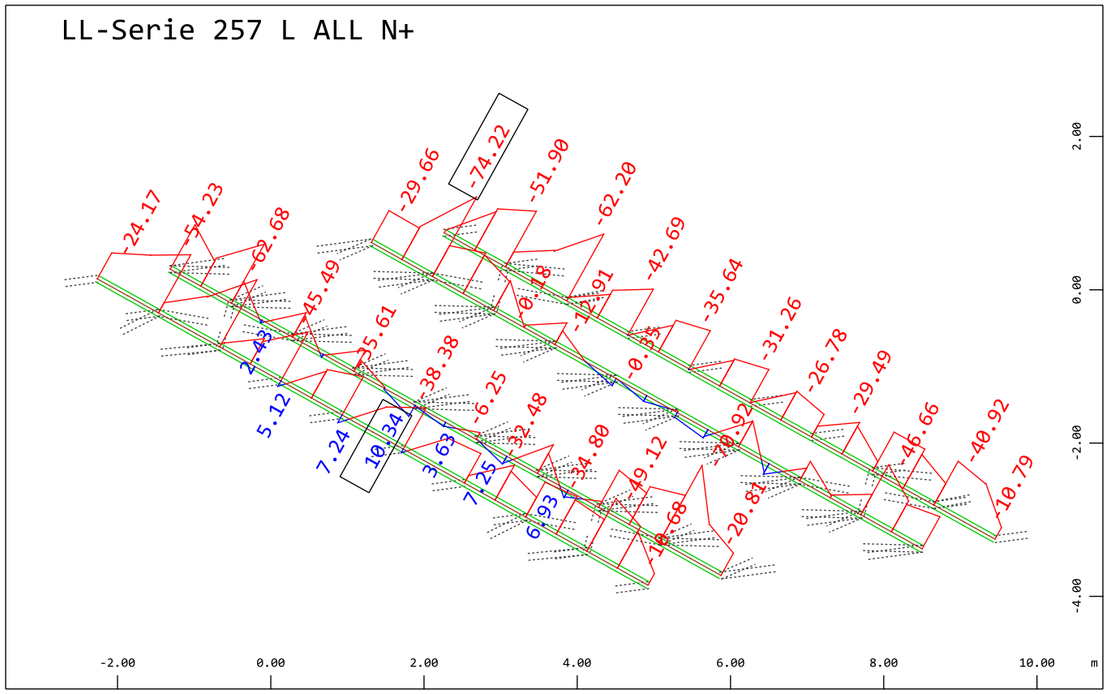
Pont Carretera Vic
Tensiones




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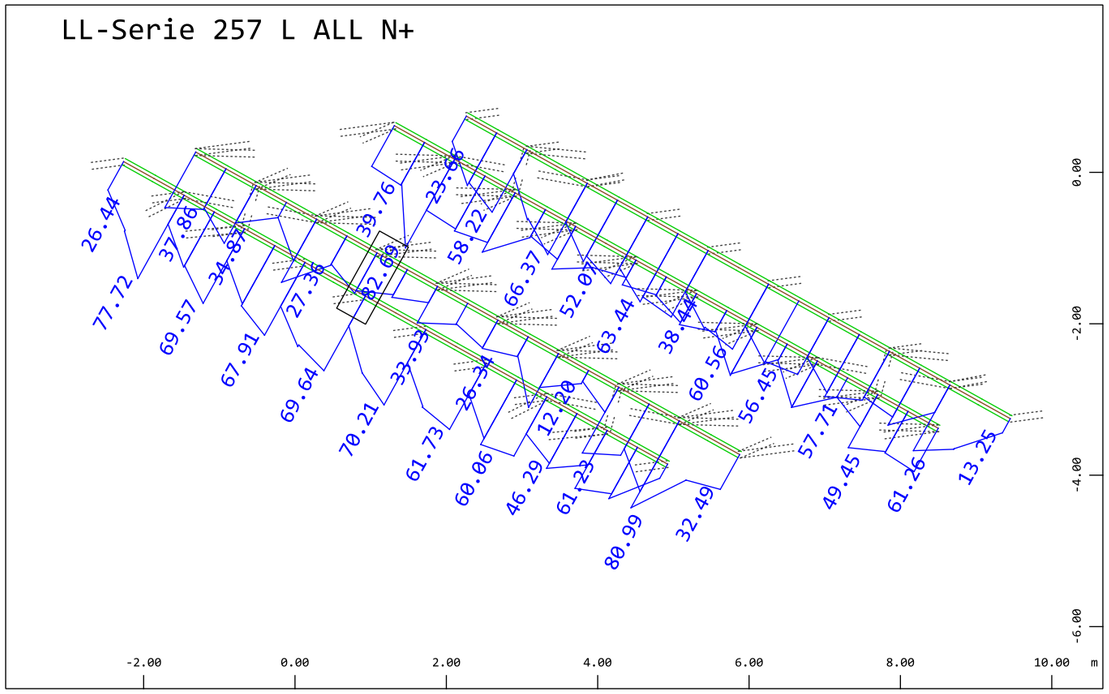
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1911 LL-Serie 257 L ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-74.22) (Max=10.34)

M 1 : 80
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

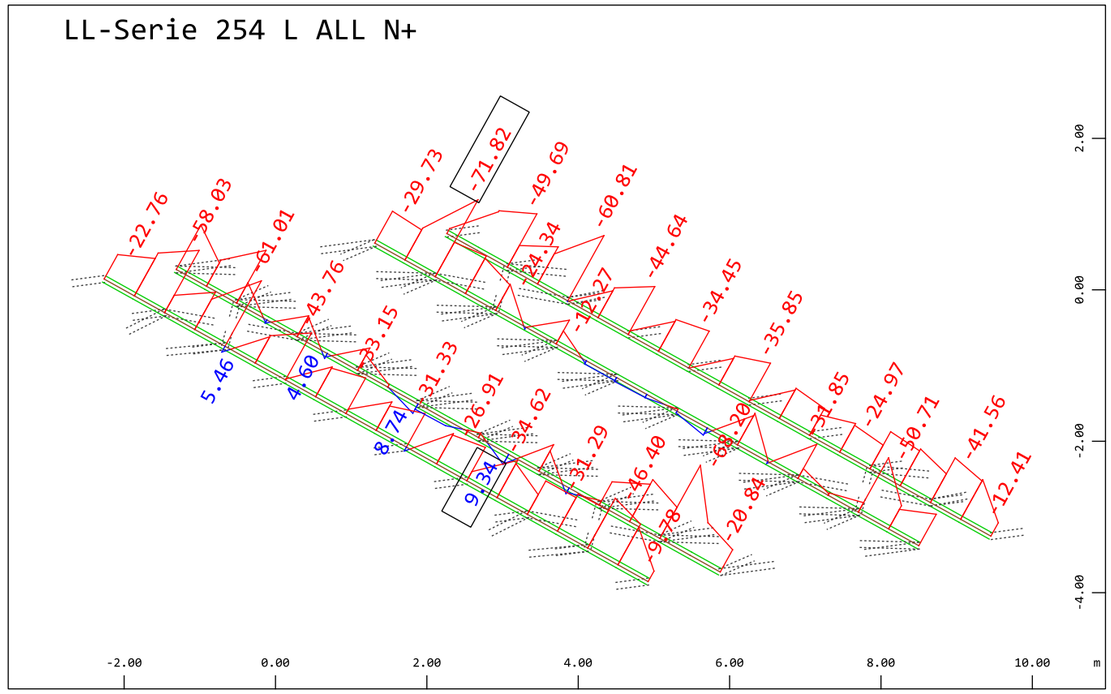
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1911 LL-Serie 257 L ALL N+, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=82.69)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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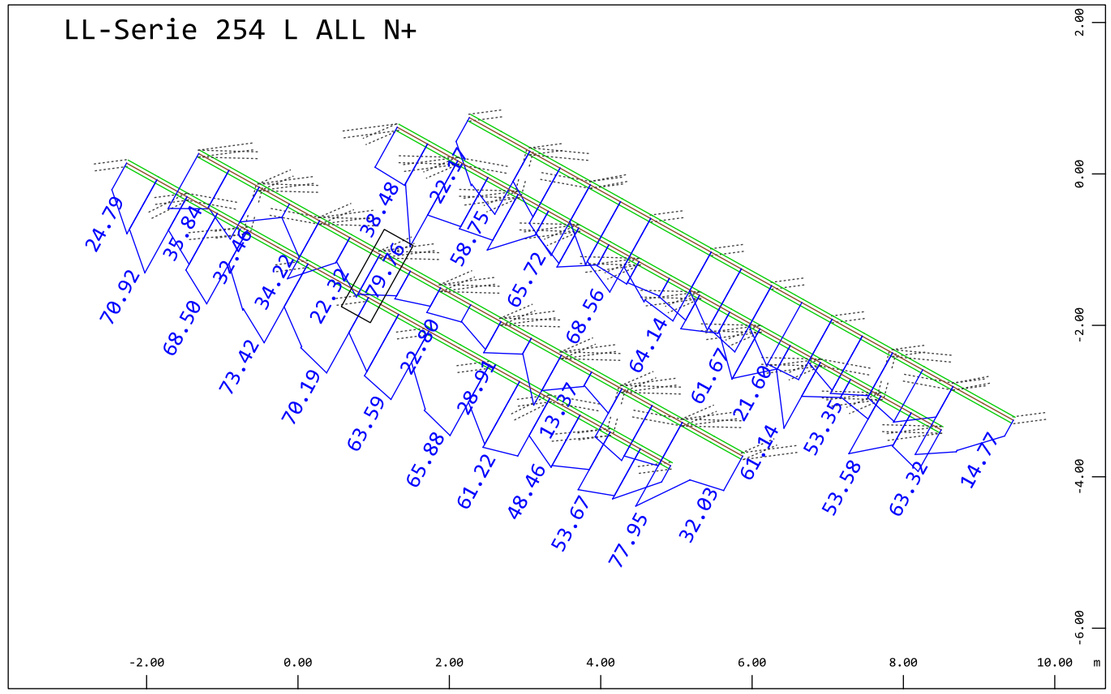
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1901 LL-Serie 254 L ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-71.82) (Max=9.34)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



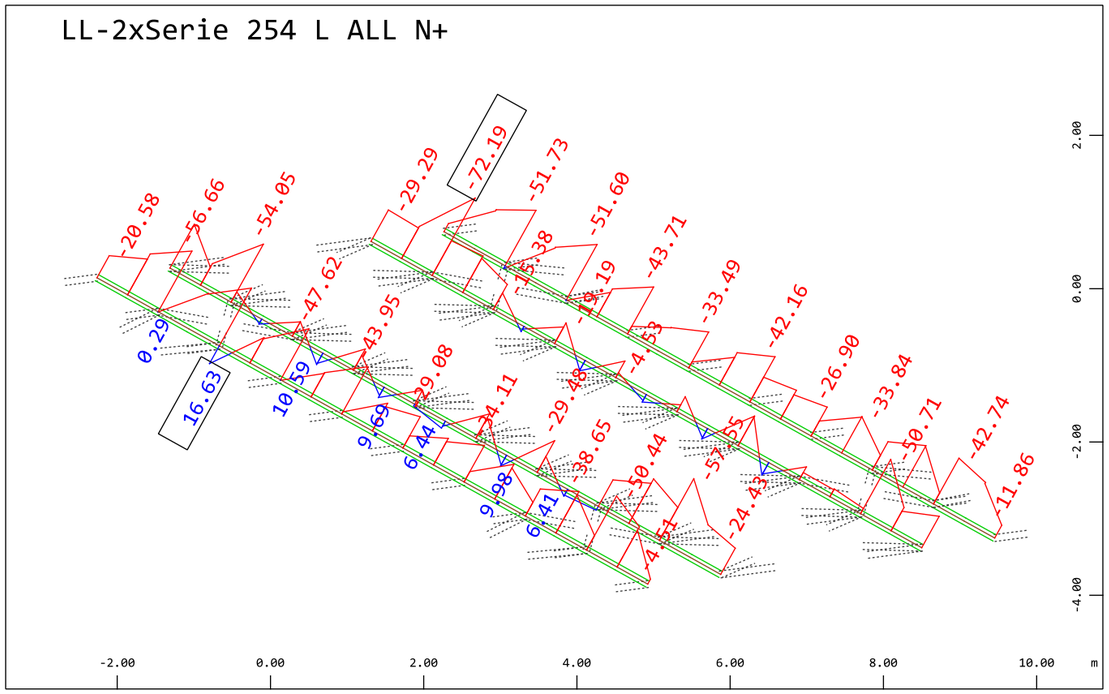

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1901 LL-Serie 254 L ALL N+, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=79.76)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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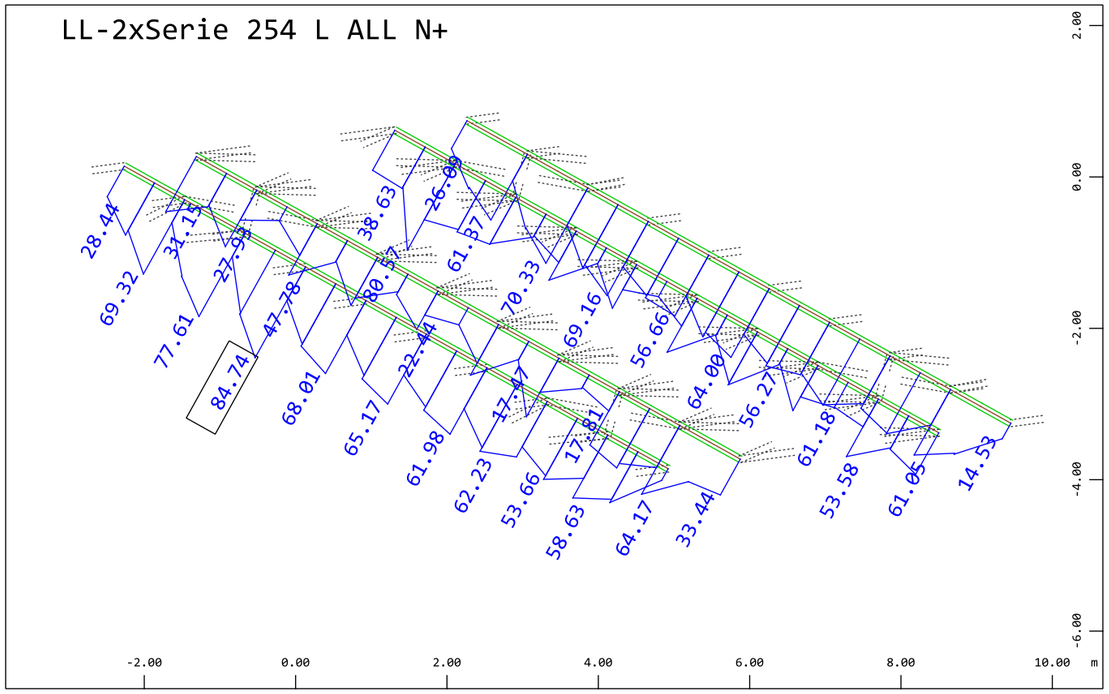
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1931 LL-2xSerie 254 L ALL N+, Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-72.19) (Max=16.63)

M 1 : 80
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

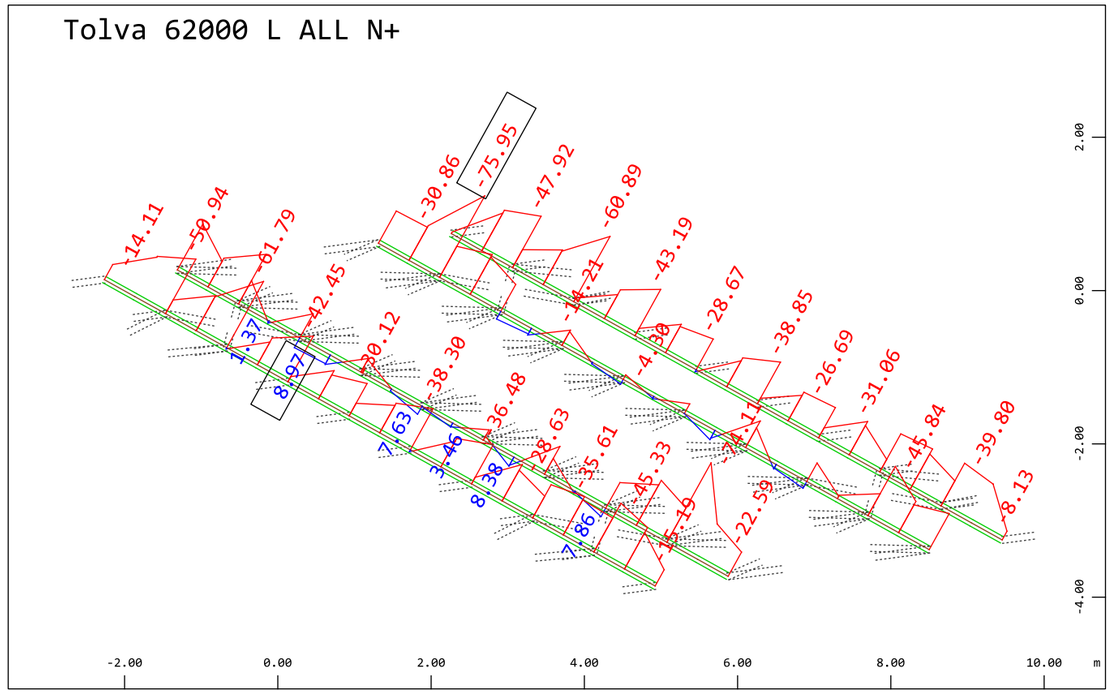
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1931 LL-2xSerie 254 L ALL N+, Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=84.74)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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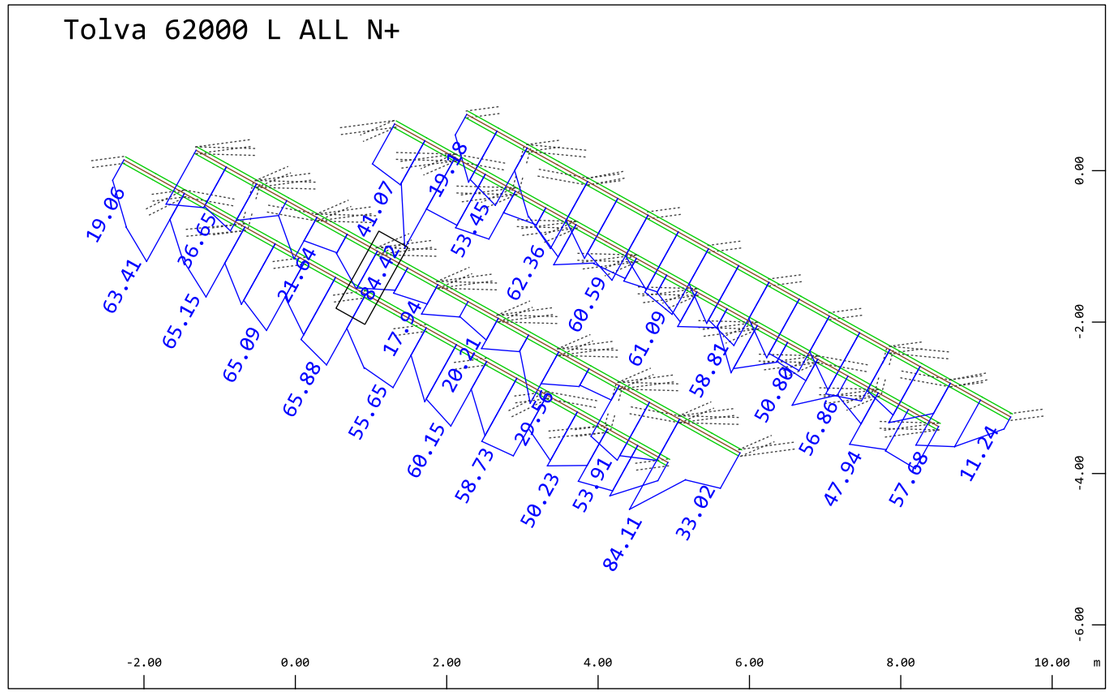
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1921 Tolva 62000 L ALL N+, Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-75.95) (Max=8.97)

M 1 : 80
X * 0.502
Y * 0.906
Z * 0.962



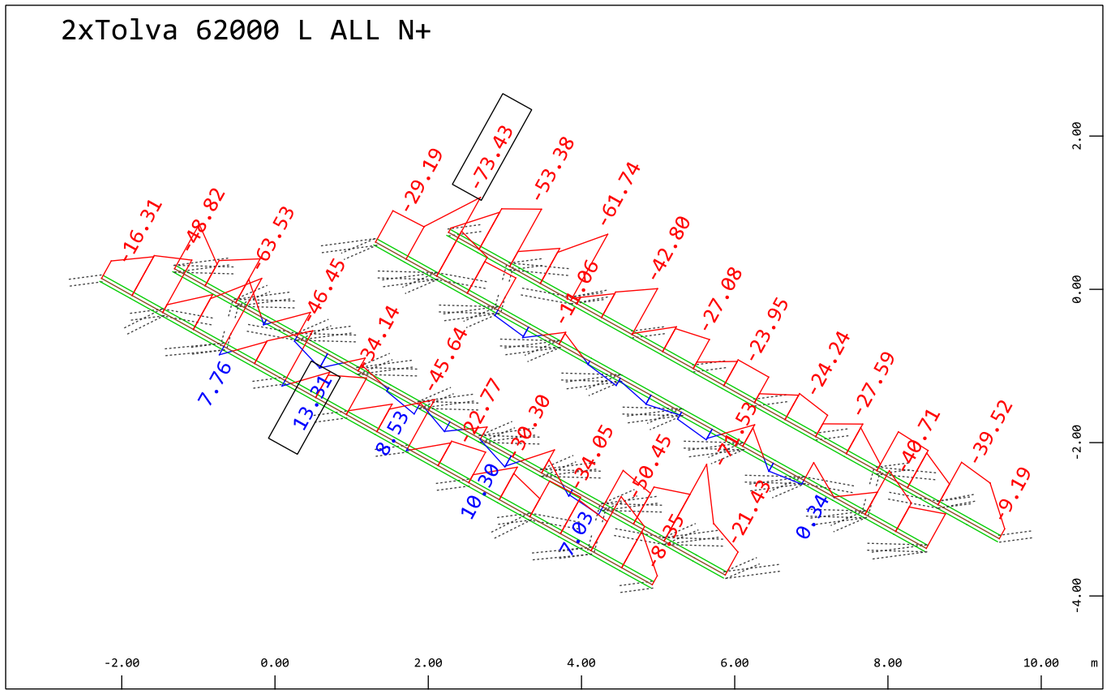

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1921 Tolva 62000 L ALL N+, Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=84.42)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

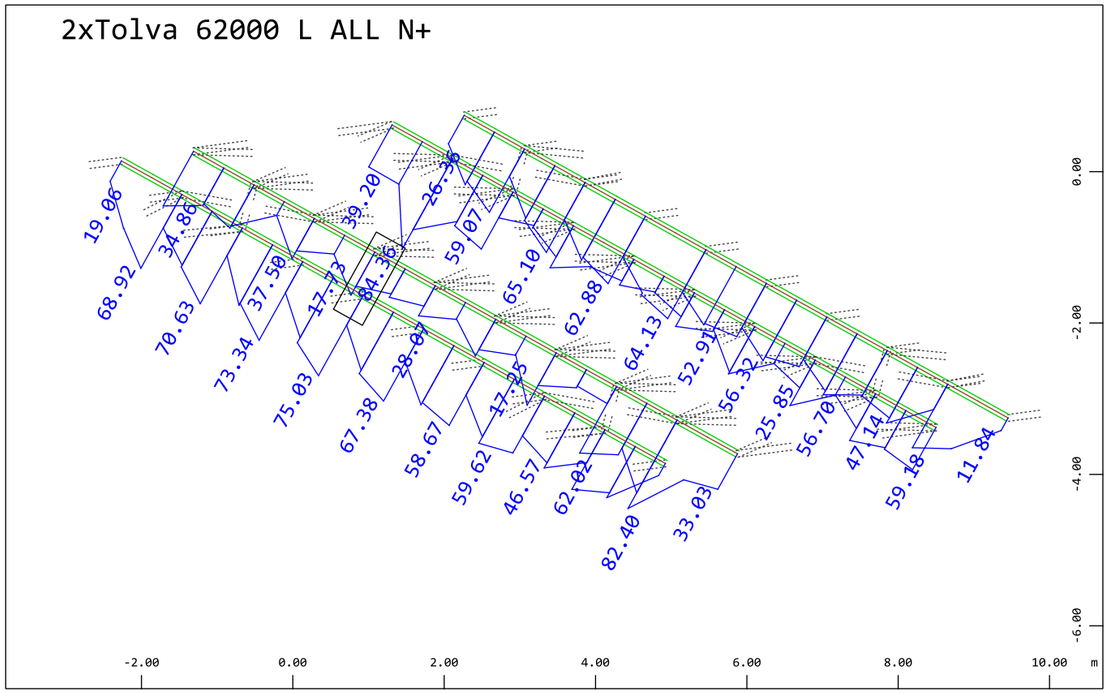
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Pont Carretera Vic
Tensiones




Z Y X Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1951 2xTolva 62000 L ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-73.43) (Max=13.31)

M 1 : 80
X * 0.502
Y * 0.906
Z * 0.962



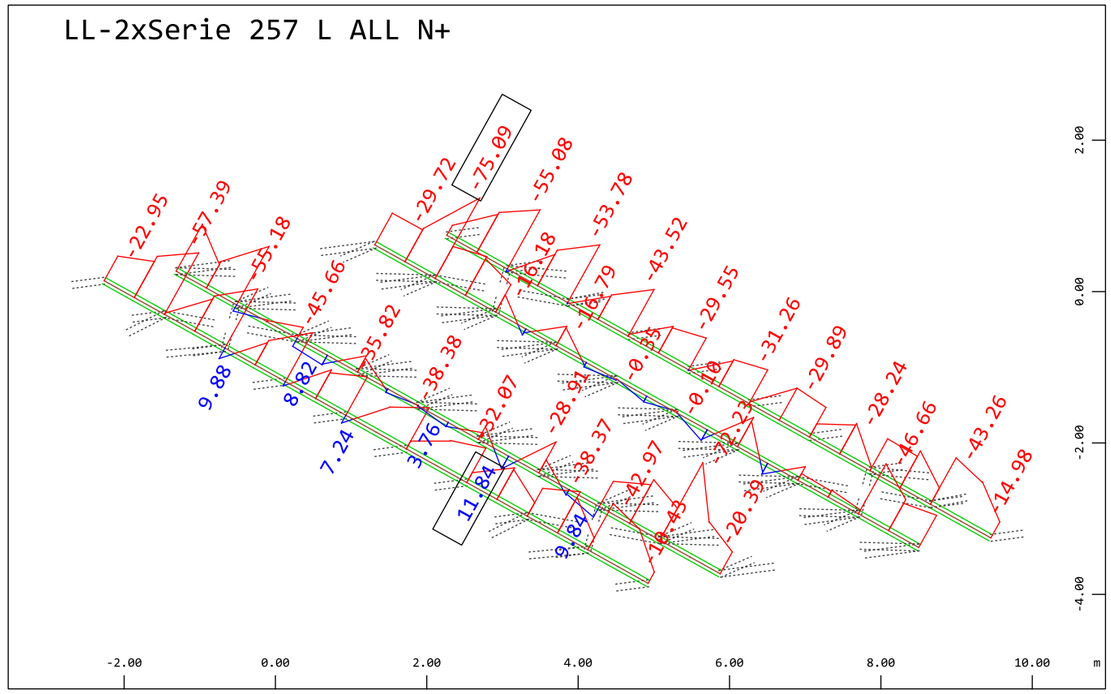

Z Y X Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1951 2xTolva 62000 L ALL N+, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=84.36)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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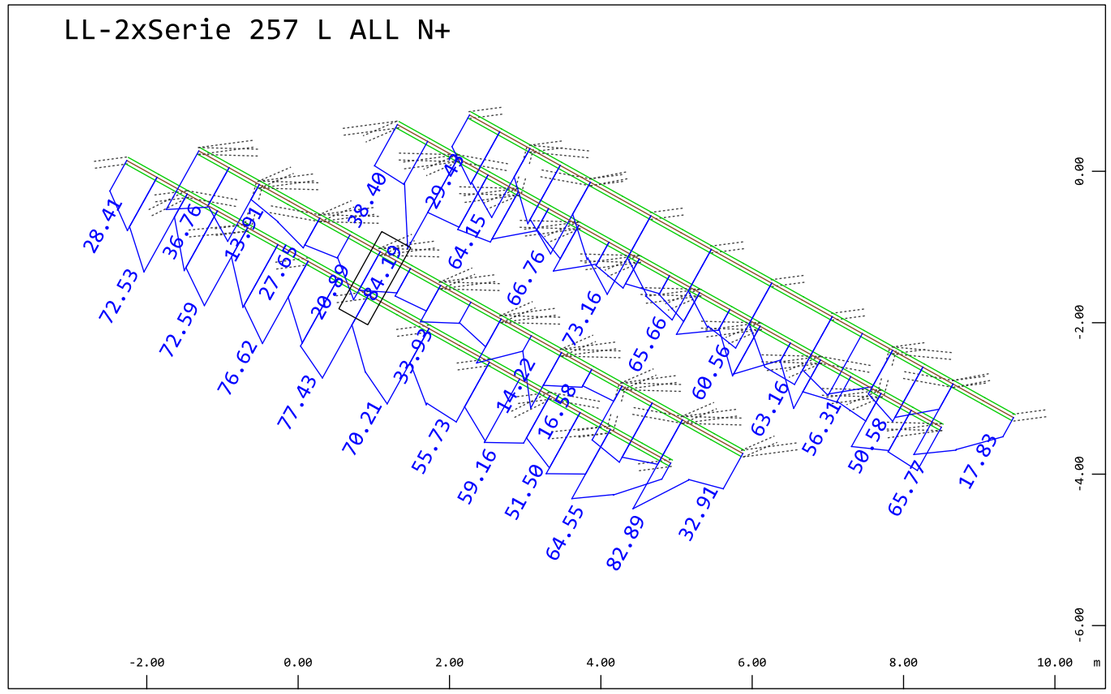


Pont Carretera Vic
Tensiones




Z Y X Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1941 LL-2xSerie 257 L ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-75.09) (Max=11.84)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

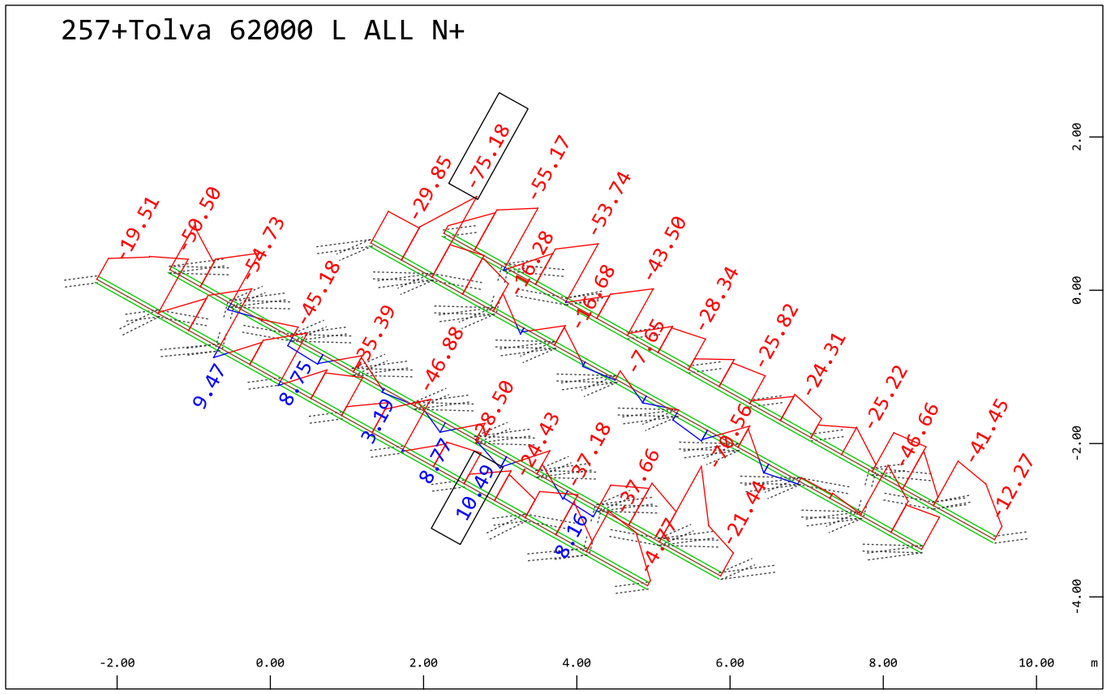



Z Y X Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1941 LL-2xSerie 257 L ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=84.19)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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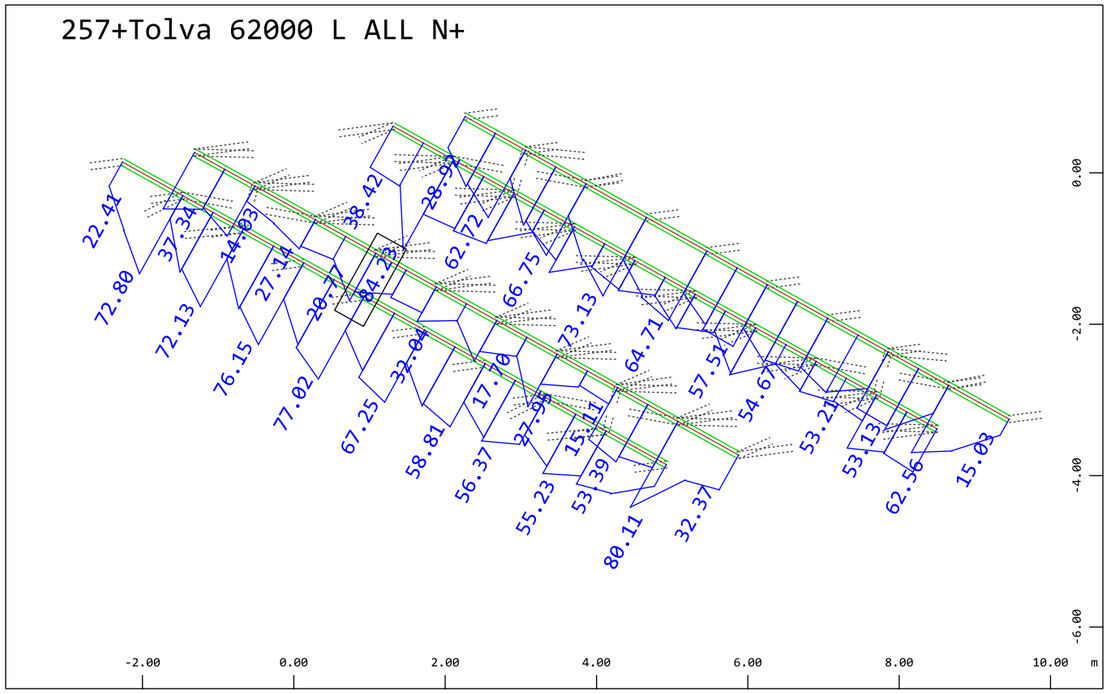
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1971 257+Tolva 62000 L ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-75.18) (Max=10.49)

M 1 : 80
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

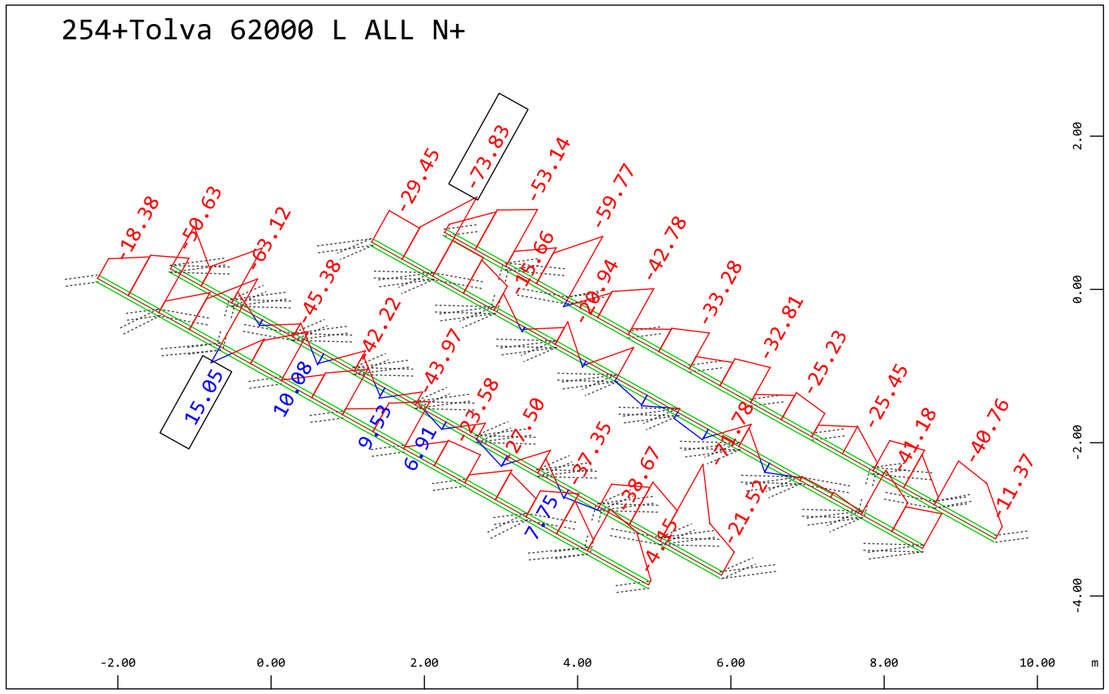
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1971 257+Tolva 62000 L ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=84.23)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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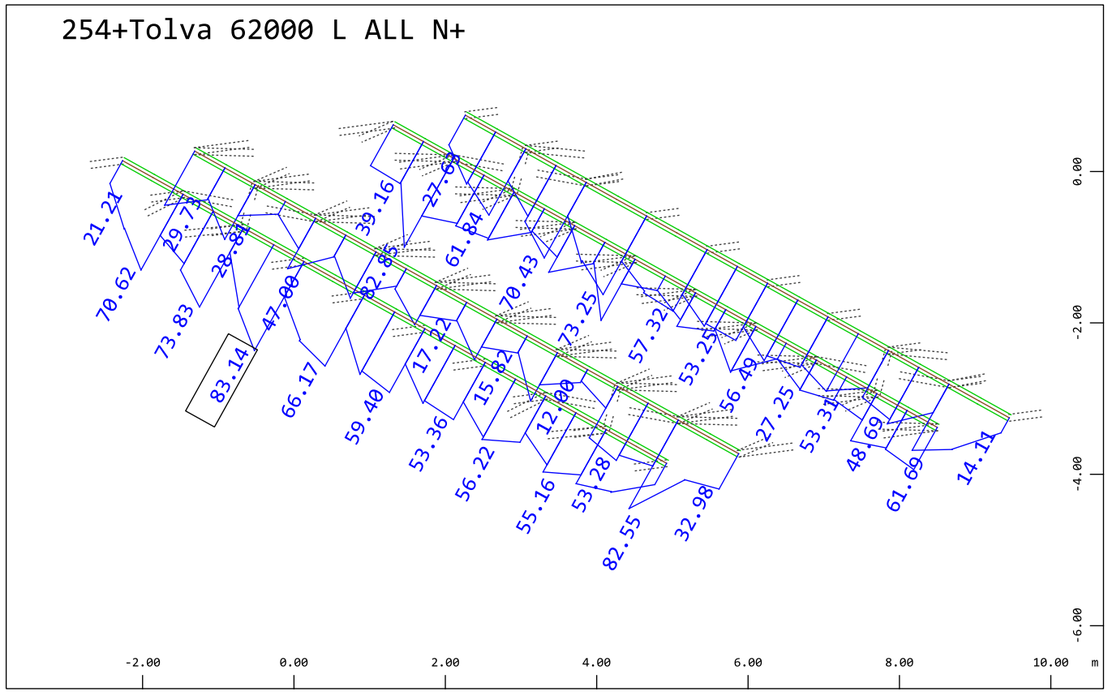
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1961 254+Tolva 62000 L ALL N+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-73.83) (Max=15.05)

M 1 : 80
X * 0.502
Y * 0.906
Z * 0.962



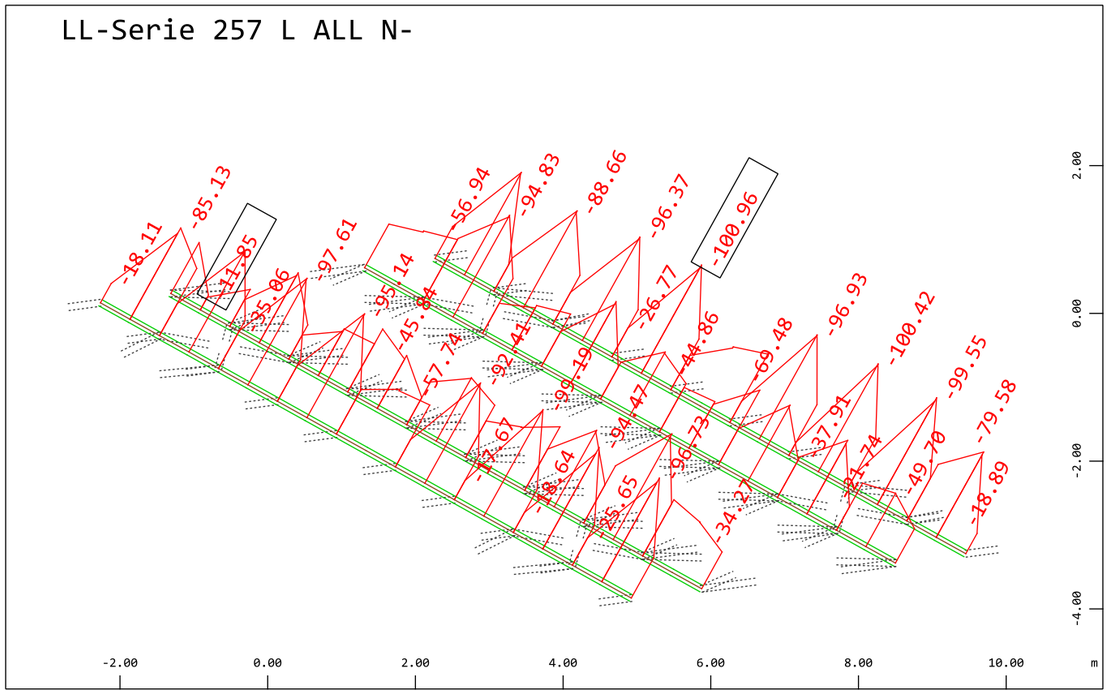

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1961 254+Tolva 62000 L ALL N+, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=83.14)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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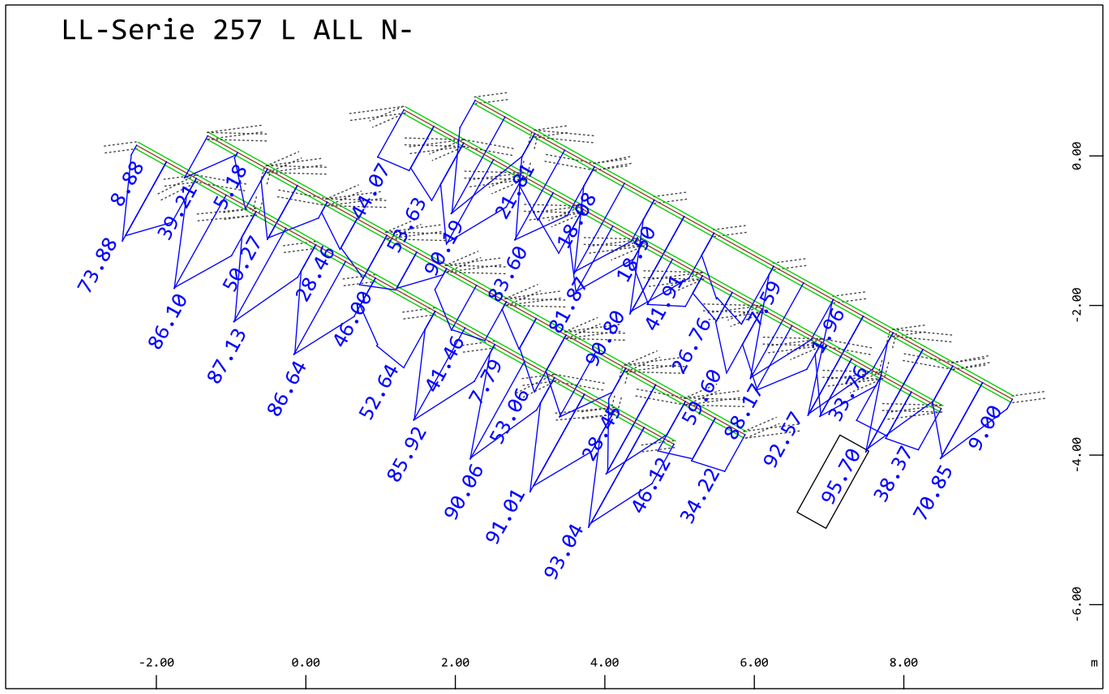
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1912 LL-Serie 257 L ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-100.96) (Max=-11.85)

M 1 : 83
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

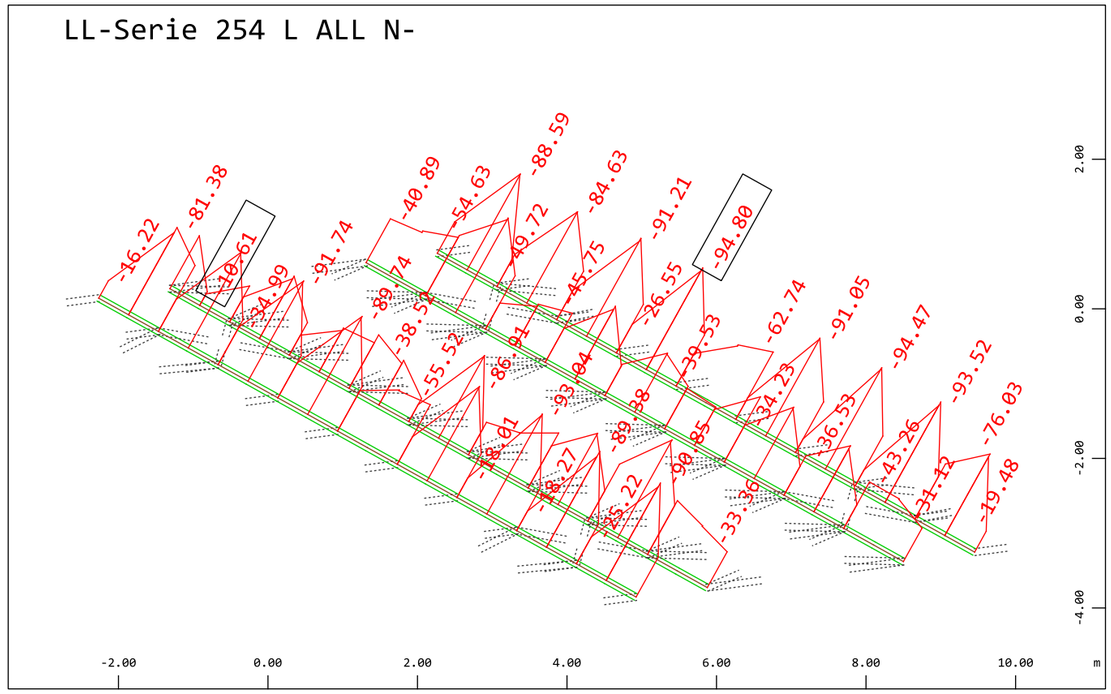
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1912 LL-Serie 257 L ALL N-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=95.70)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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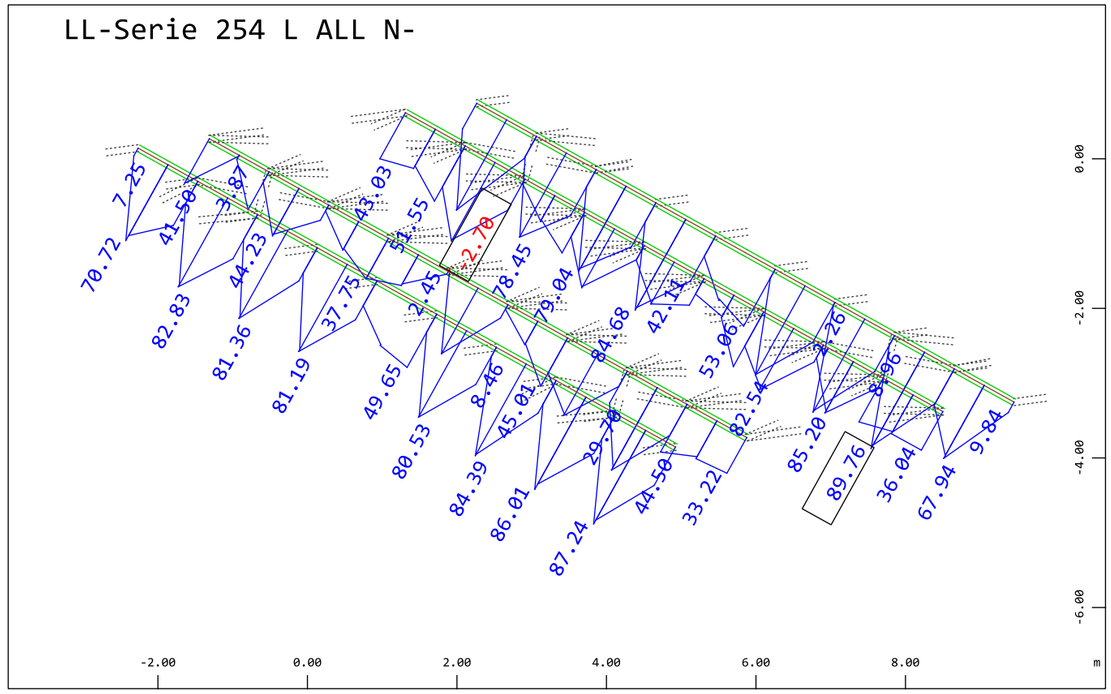
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1902 LL-Serie 254 L ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-94.80) (Max=-10.61)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962



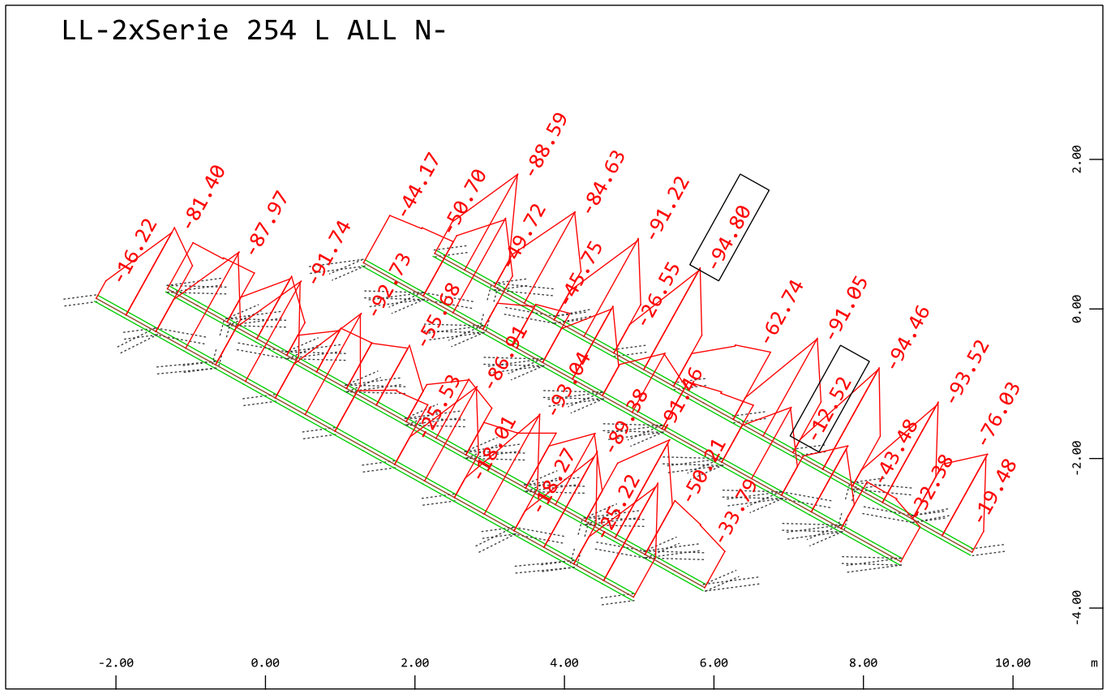

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1902 LL-Serie 254 L ALL N-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-2.70) (Max=89.76)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

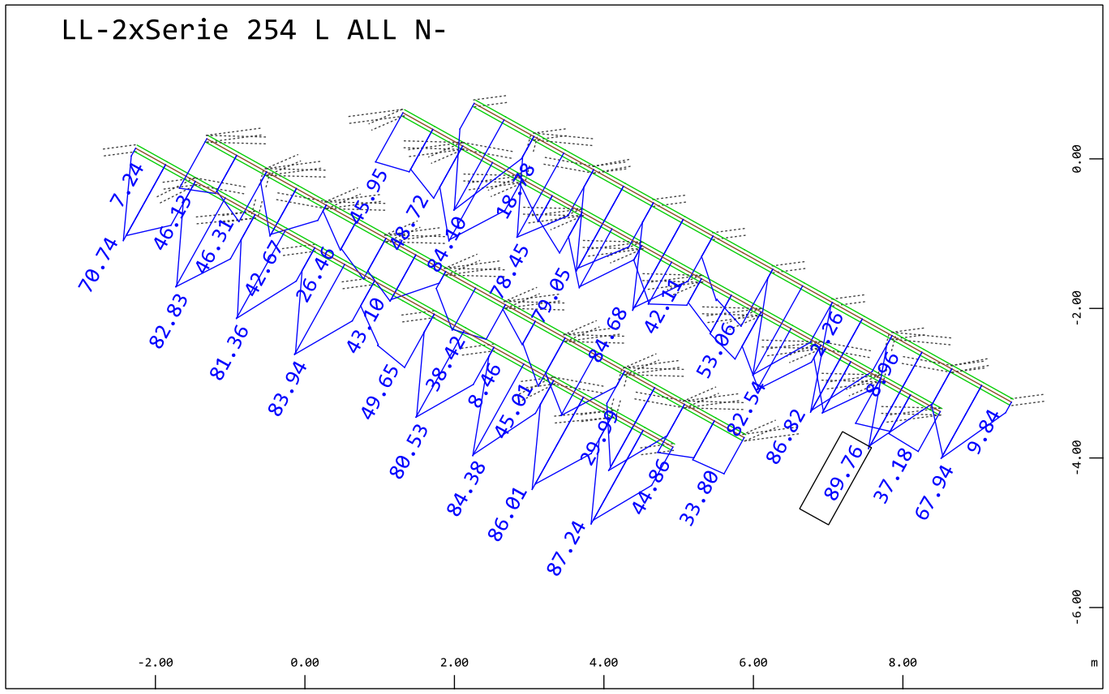
SOFiSTiK AG - www.sofistik.de

Pont Carretera Vic
Tensiones




Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1932 LL-2xSerie 254 L ALL N-, Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-94.80) (Max=-12.52)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962



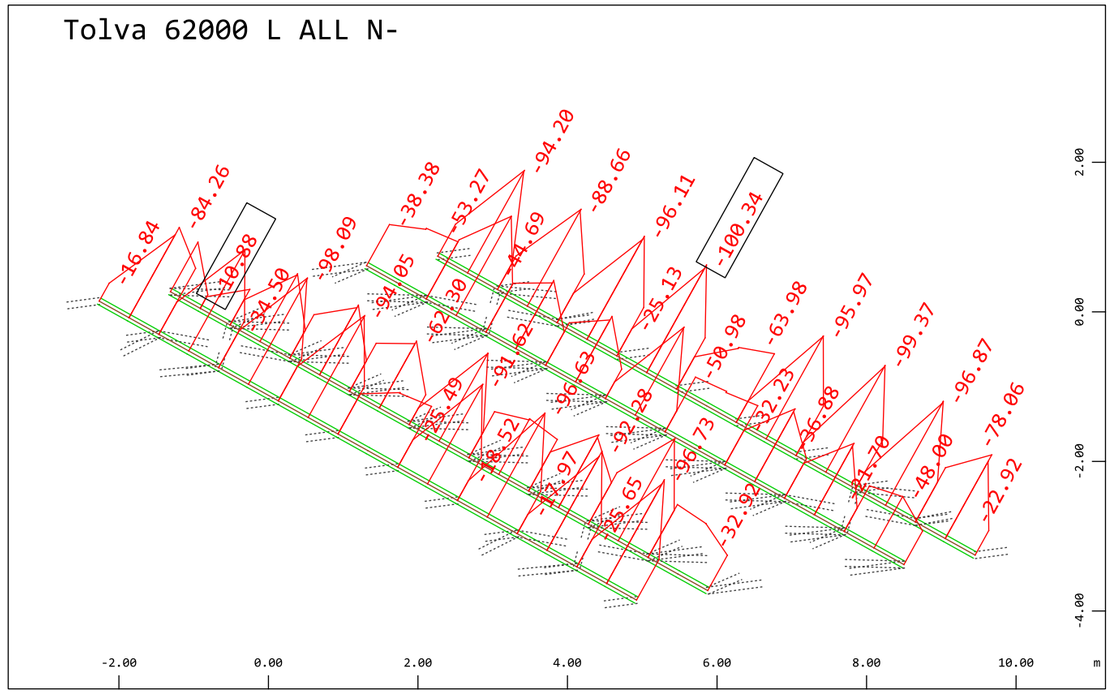

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1932 LL-2xSerie 254 L ALL N-, Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=89.76)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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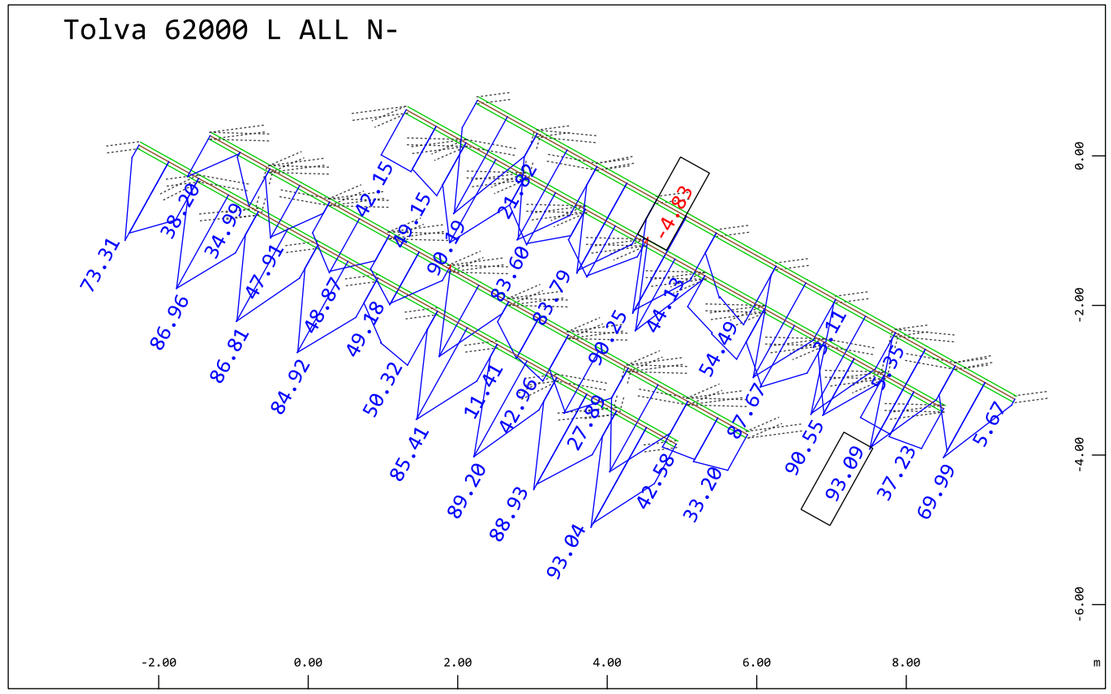


Pont Carretera Vic
Tensiones




Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1922 Tolva 62000 L ALL N-, Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-100.34) (Max=-10.88)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

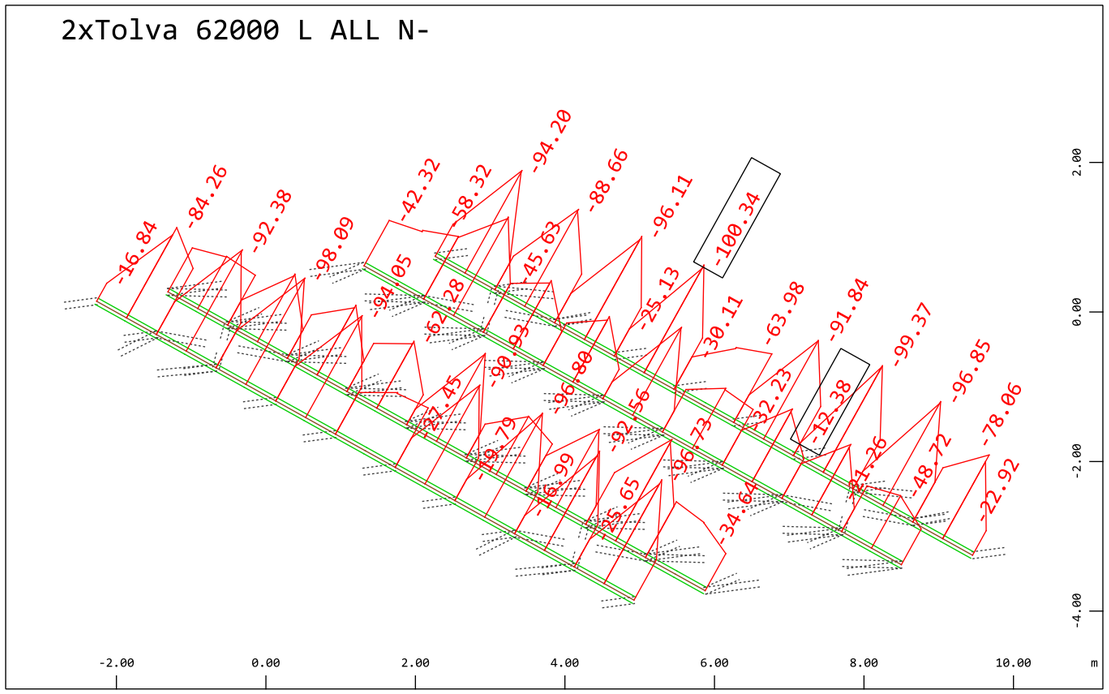



Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1922 Tolva 62000 L ALL N-, Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-4.83) (Max=93.09)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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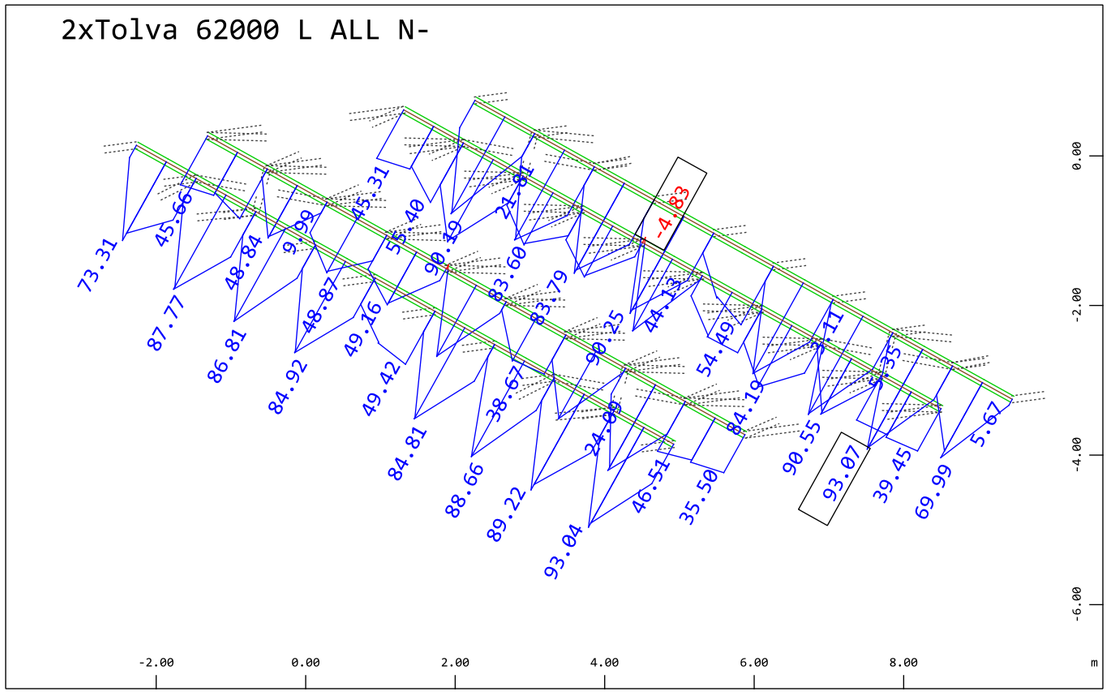
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1952 2xTolva 62000 L ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-100.34) (Max=-12.38)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

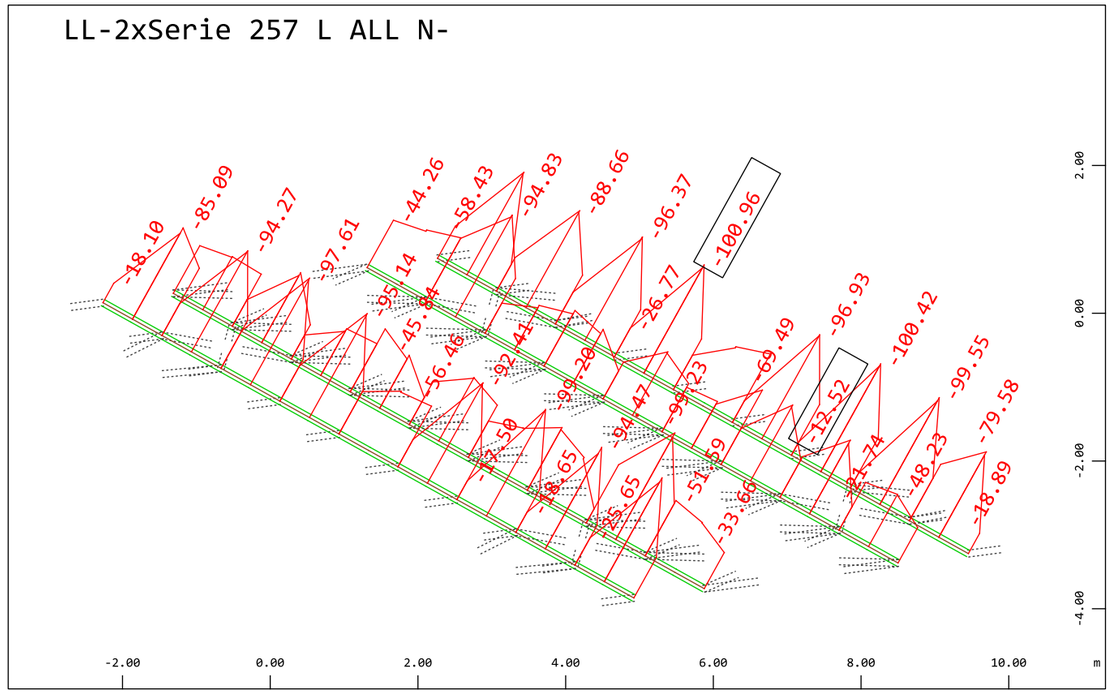
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1952 2xTolva 62000 L ALL N-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-4.83) (Max=93.07)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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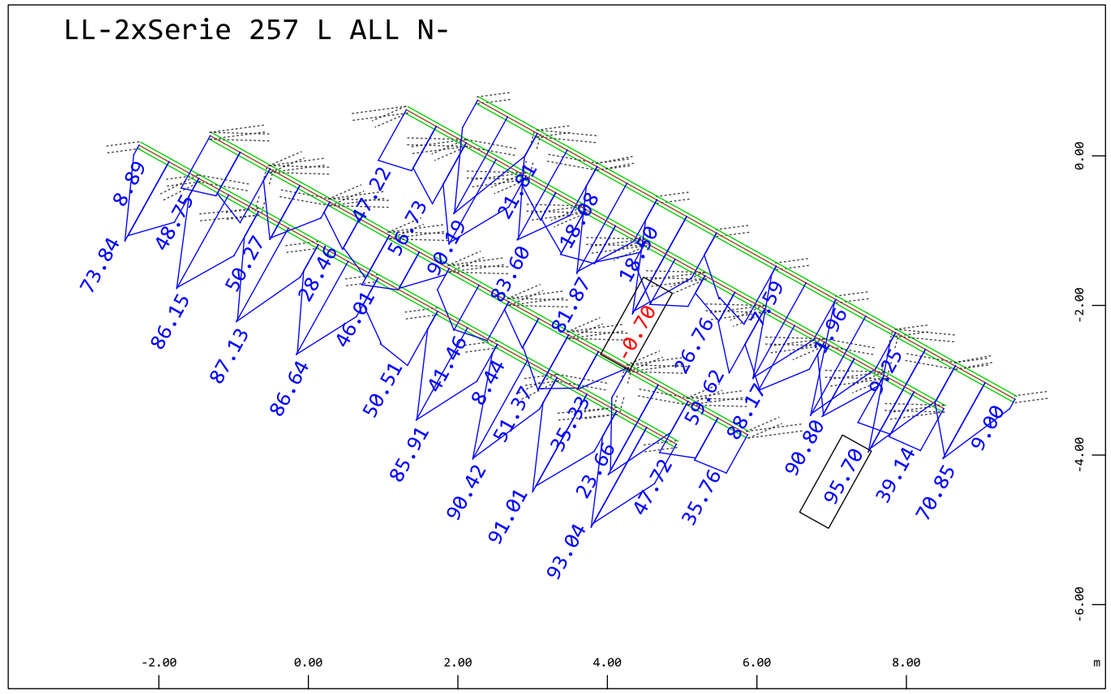
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1942 LL-2xSerie 257 L ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-100.96) (Max=-12.52)

M 1 : 83
X * 0.502
Y * 0.906
Z * 0.962



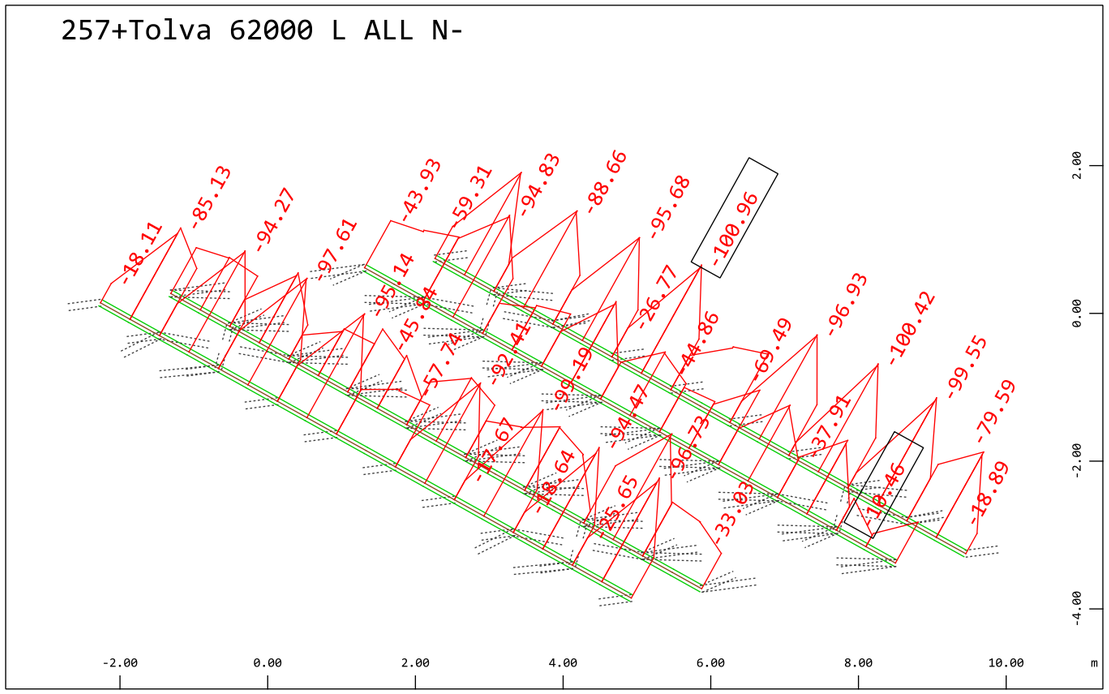

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1942 LL-2xSerie 257 L ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-0.70) (Max=95.70)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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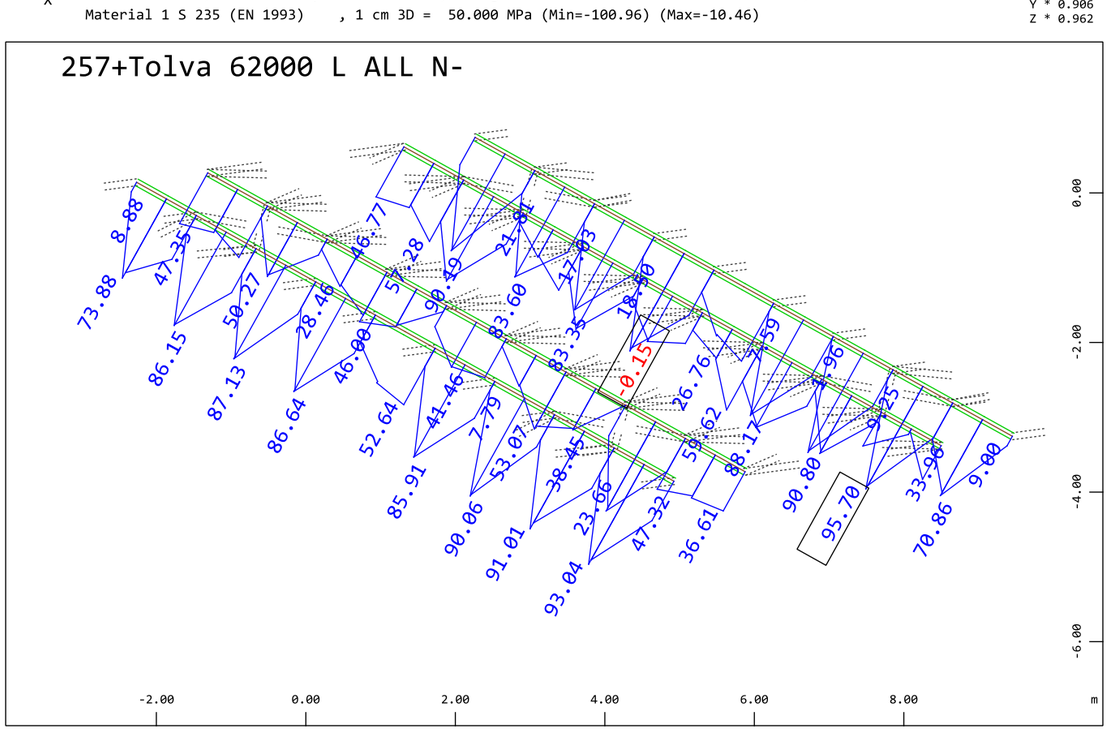
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1972 257+Tolva 62000 L ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-100.96) (Max=-10.46)

M 1 : 83
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

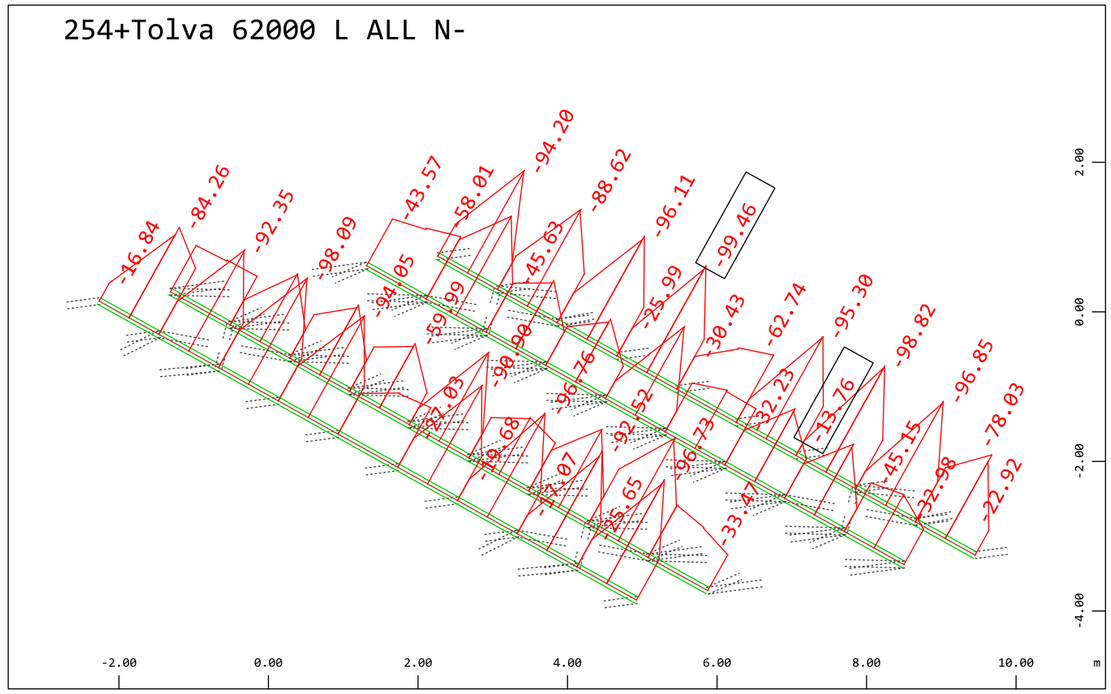
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1972 257+Tolva 62000 L ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-0.15) (Max=95.70)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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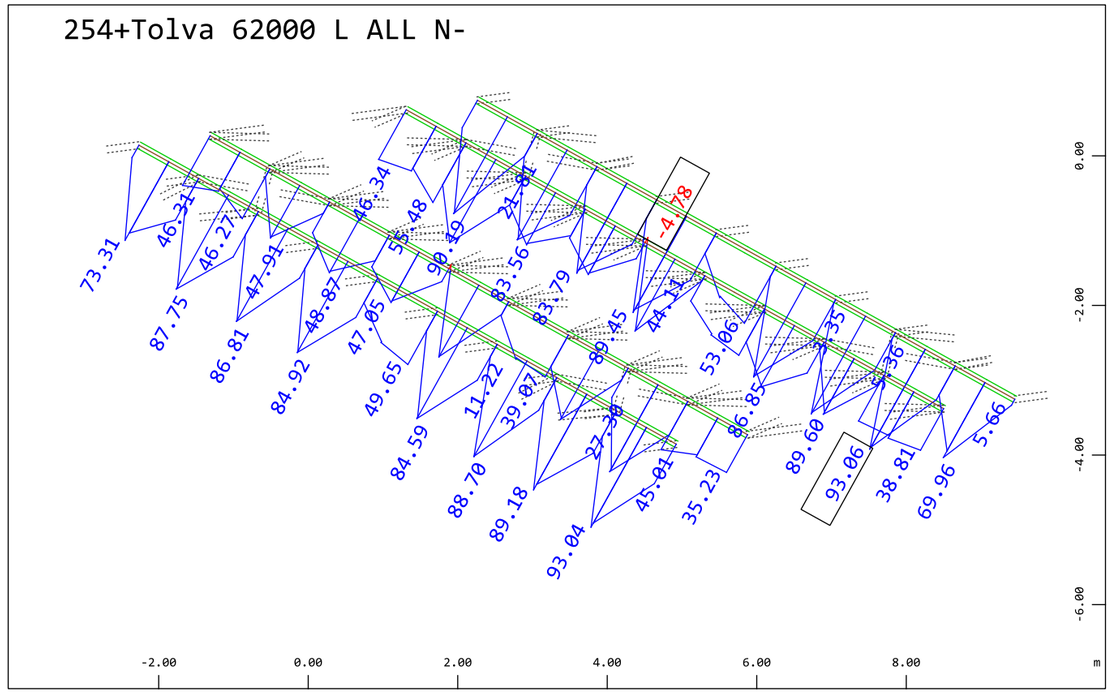
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1962 254+Tolva 62000 L ALL N-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-99.46) (Max=-13.76)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962



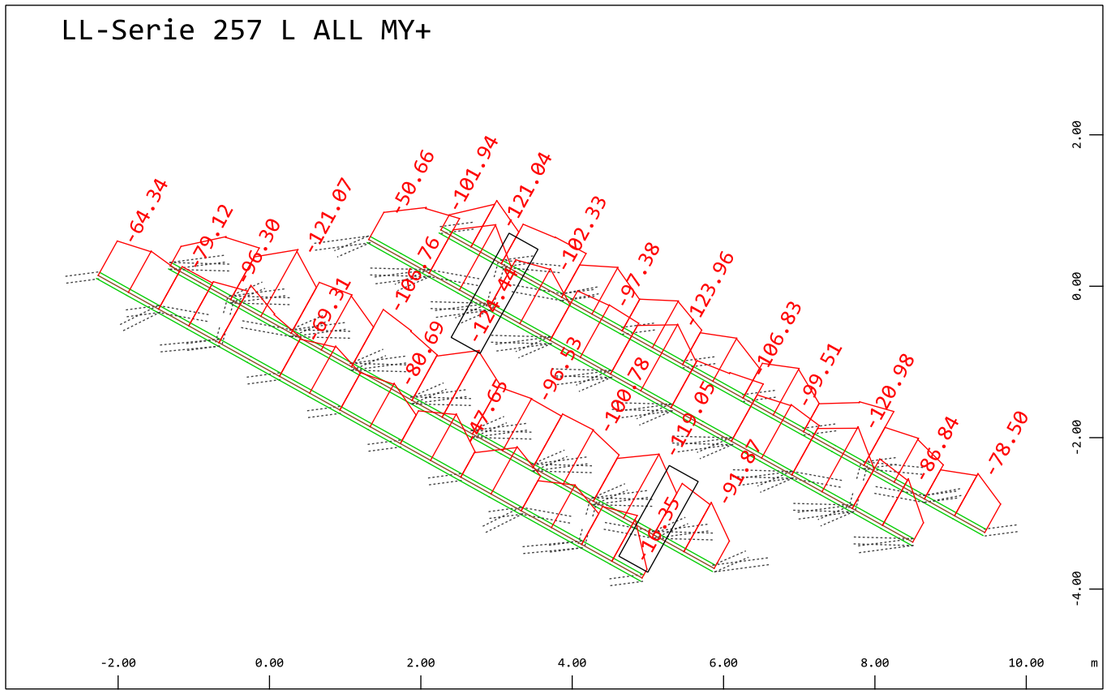

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1962 254+Tolva 62000 L ALL N-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-4.78) (Max=93.06)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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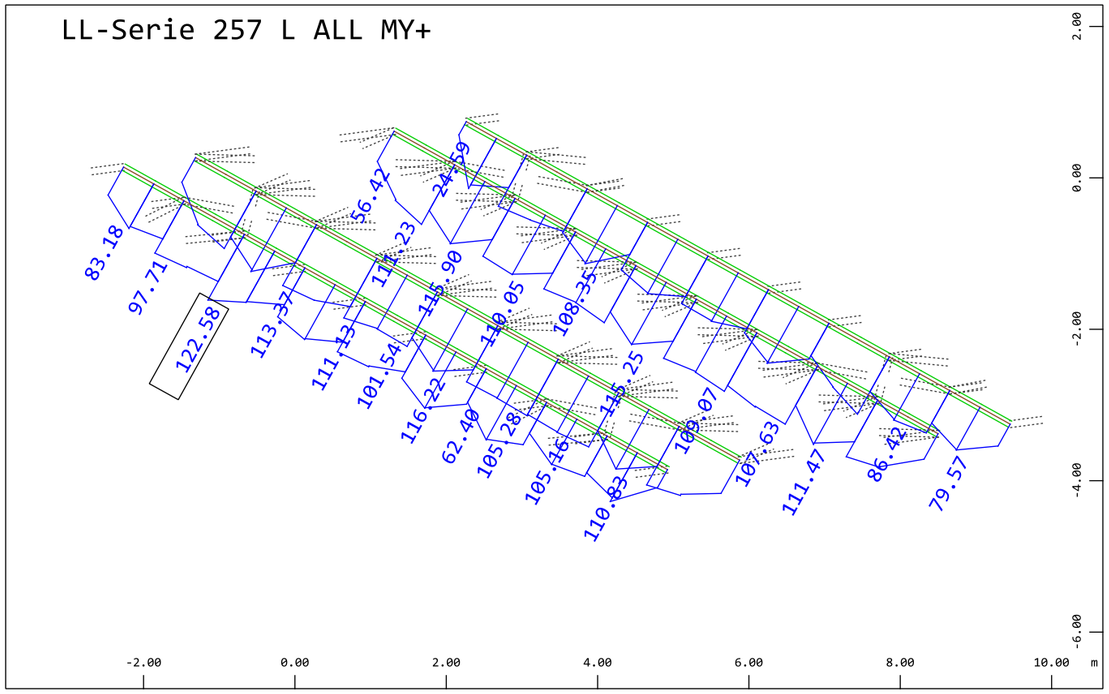
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1913 LL-Serie 257 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-124.44) (Max=-16.35)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

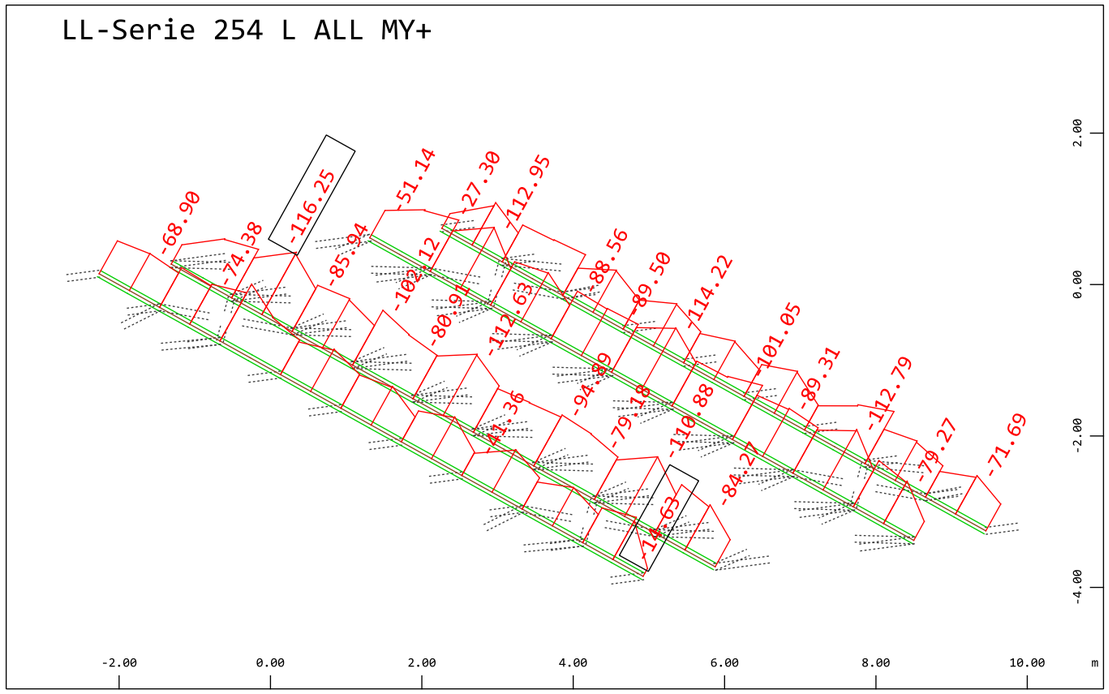
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1913 LL-Serie 257 L ALL MY+, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=122.58)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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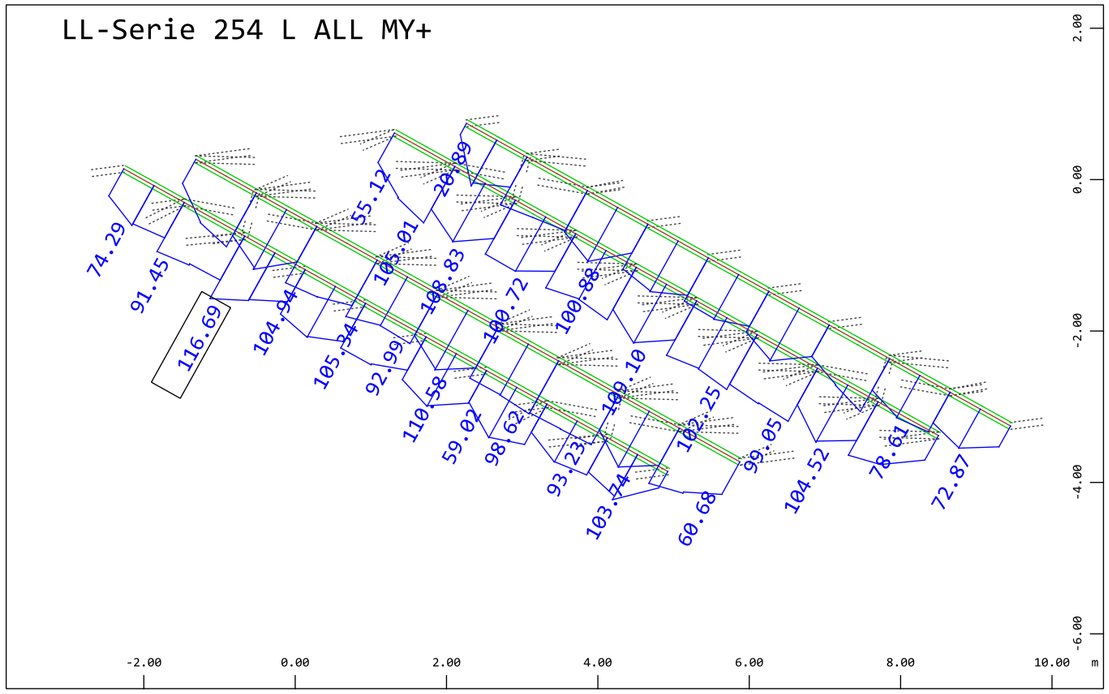
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1903 LL-Serie 254 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-116.25) (Max=-14.63)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



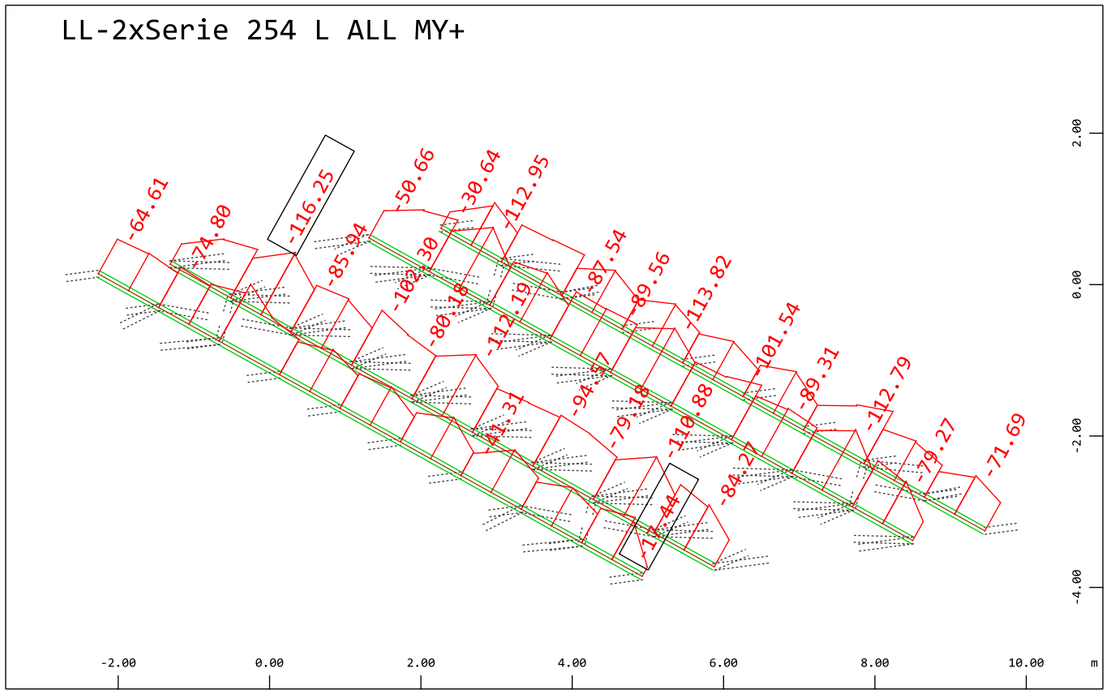

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1903 LL-Serie 254 L ALL MY+, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=116.69)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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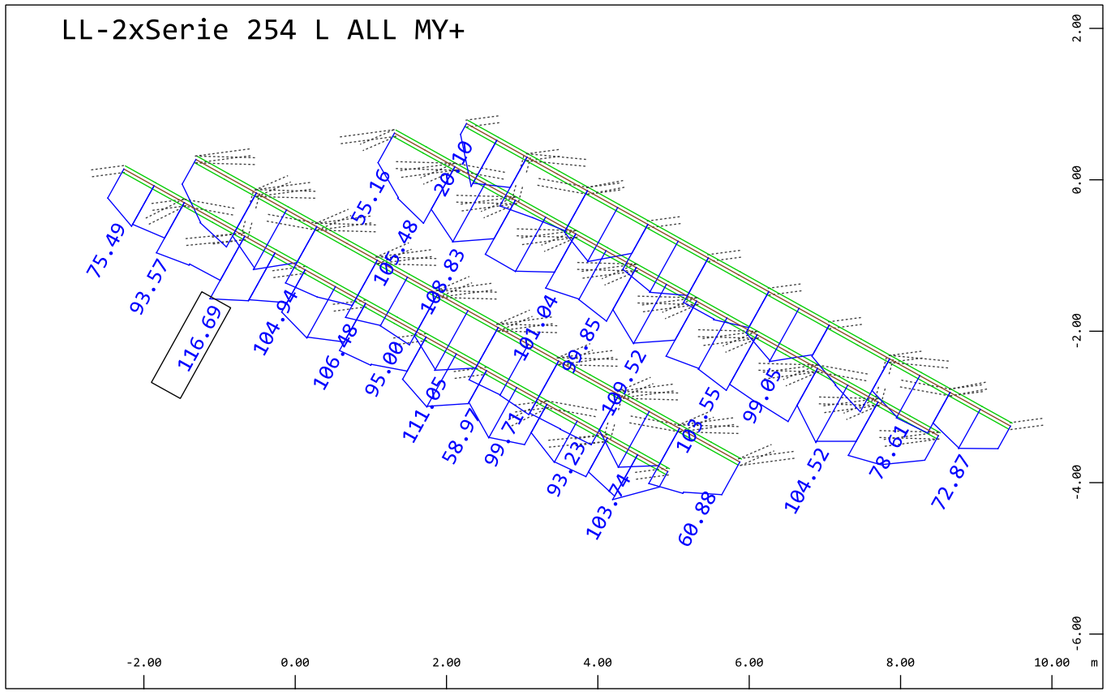
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1933 LL-2xSerie 254 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-116.25) (Max=-17.44)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

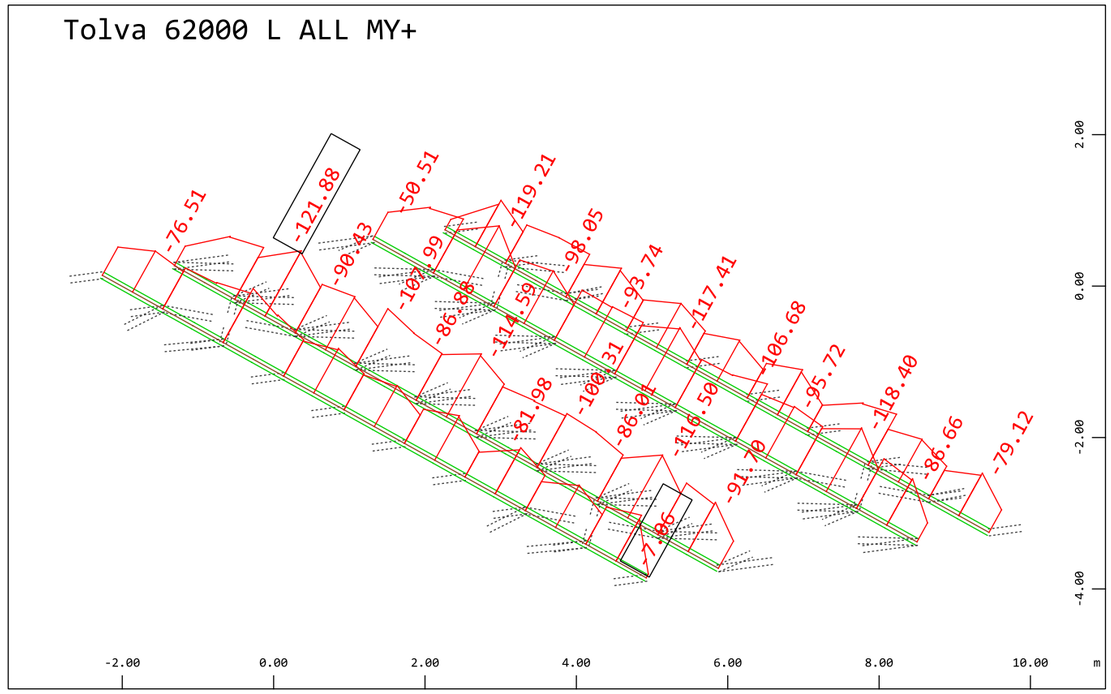
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1933 LL-2xSerie 254 L ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=116.69)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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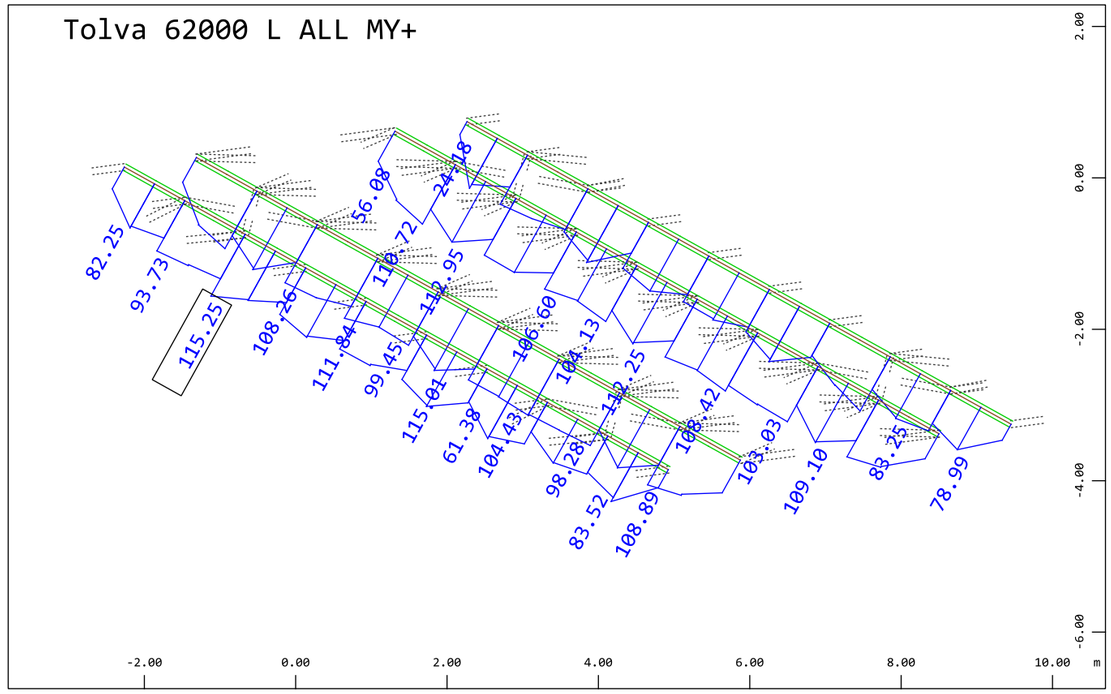
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1923 Tolva 62000 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-121.88) (Max=-7.06)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



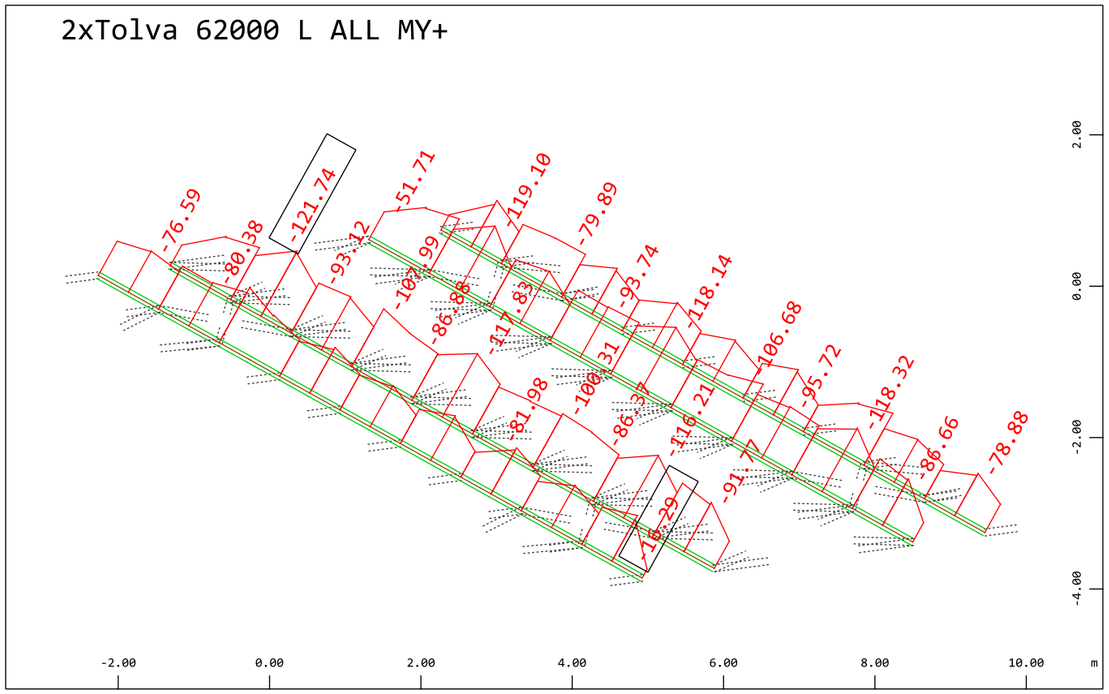

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1923 Tolva 62000 L ALL MY+, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=115.25)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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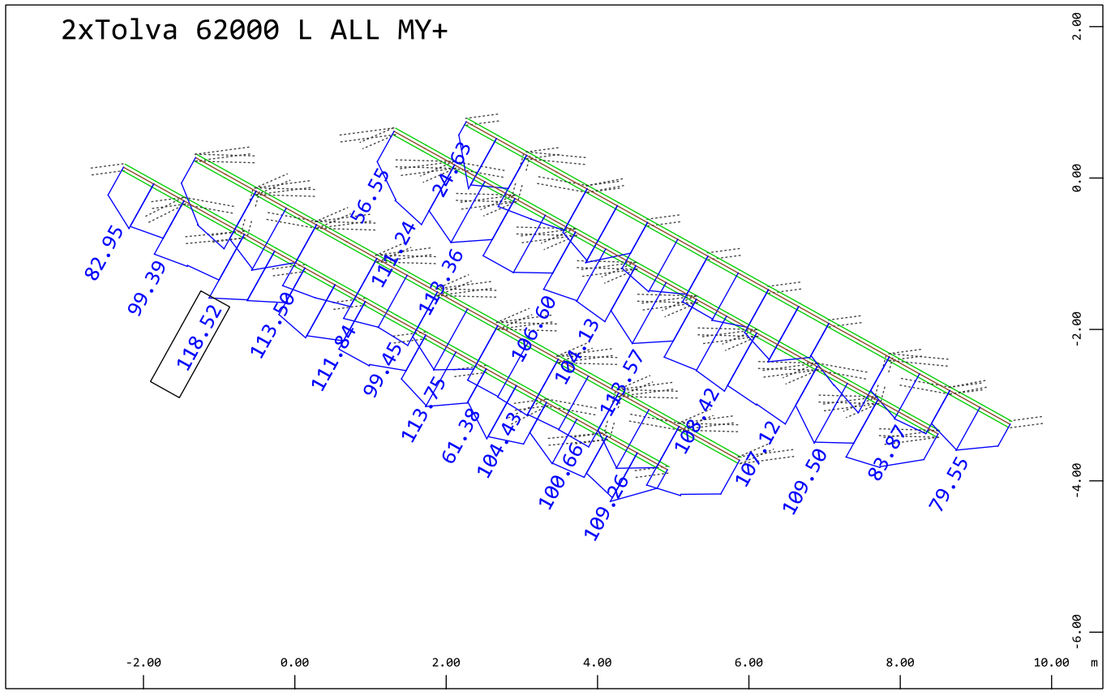
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1953 2xTolva 62000 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-121.74) (Max=-16.29)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

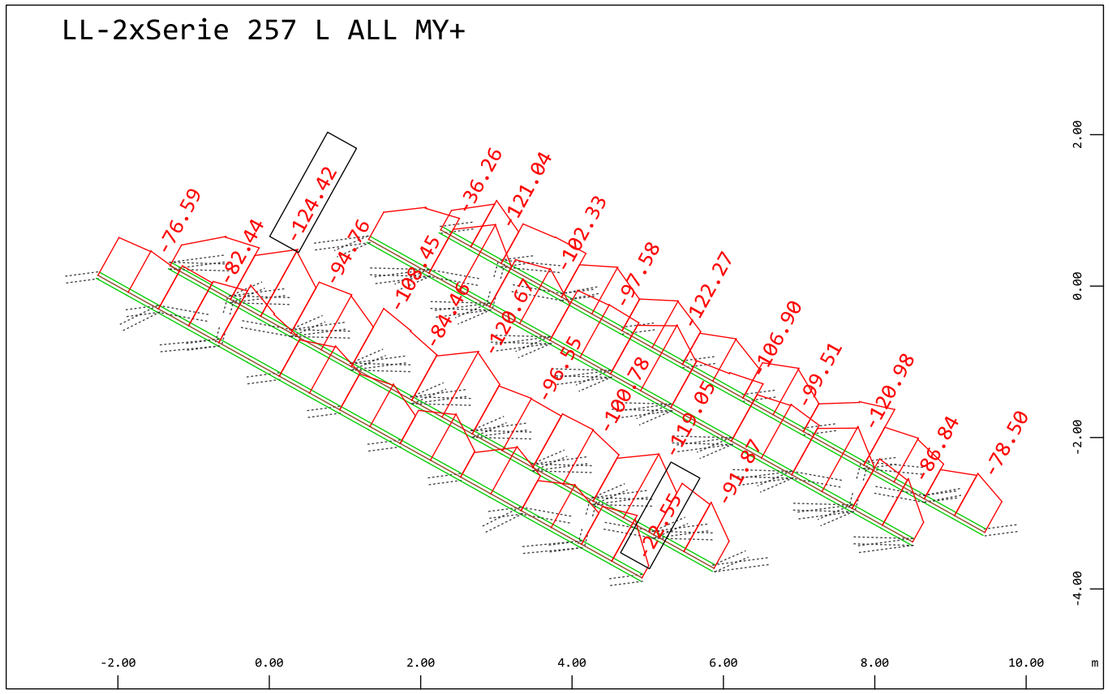
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1953 2xTolva 62000 L ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=118.52)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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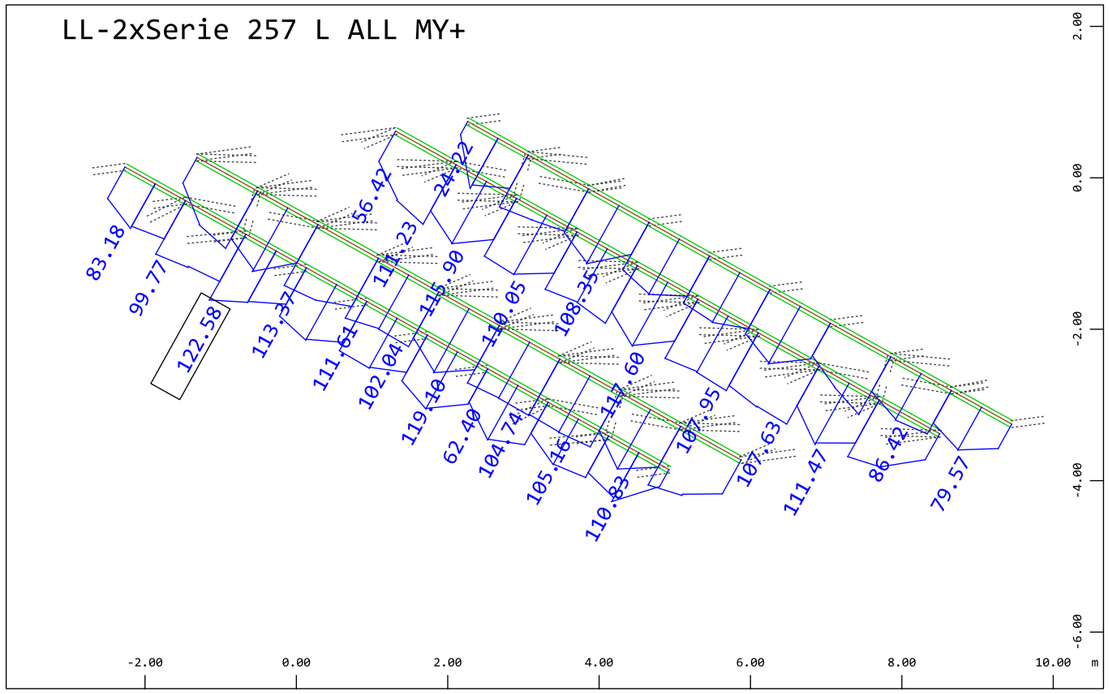
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1943 LL-2xSerie 257 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-124.42) (Max=-22.55)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



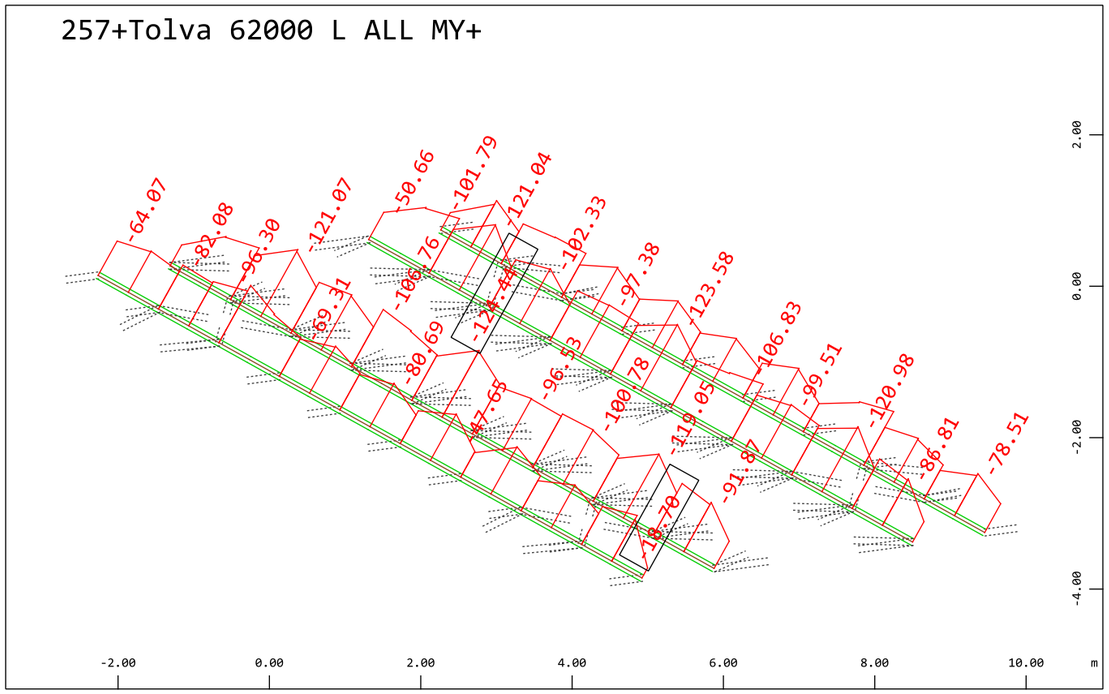

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1943 LL-2xSerie 257 L ALL MY+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=122.58)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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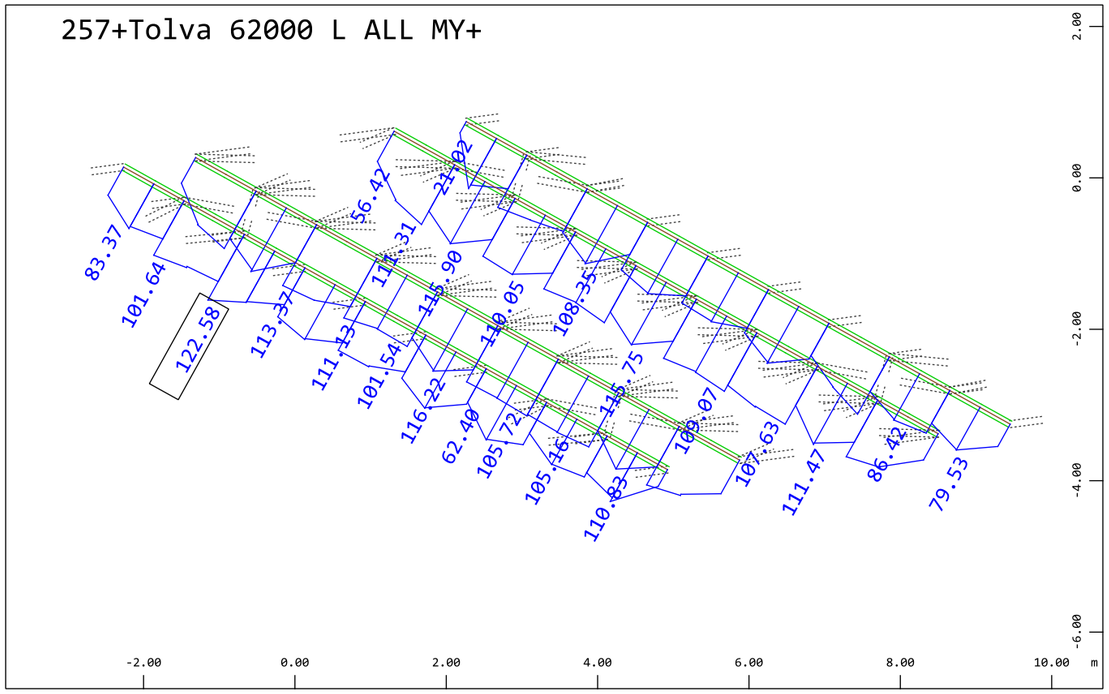
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1973 257+Tolva 62000 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-124.44) (Max=-18.70)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

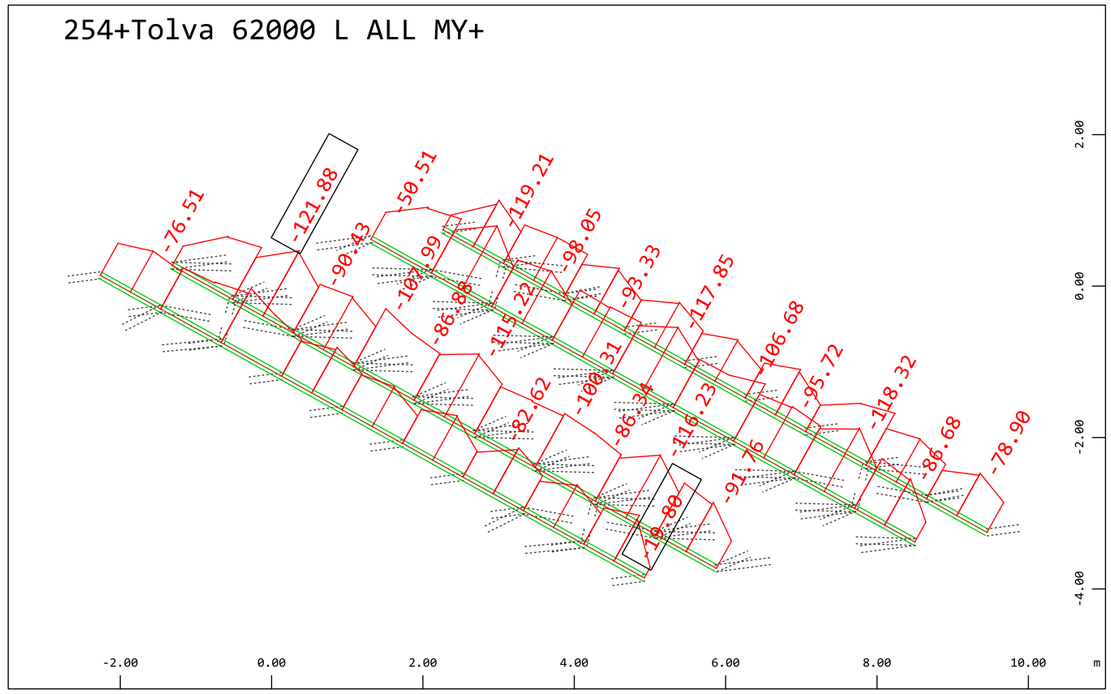
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1973 257+Tolva 62000 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=122.58)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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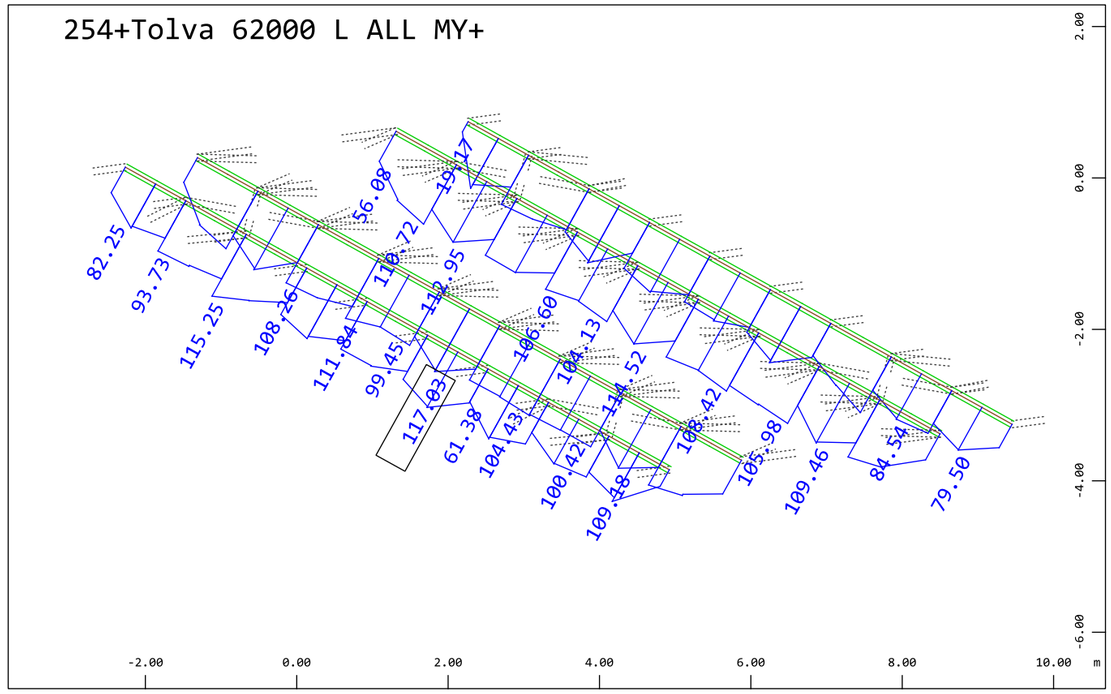
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1963 254+Tolva 62000 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-121.88) (Max=-19.80)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



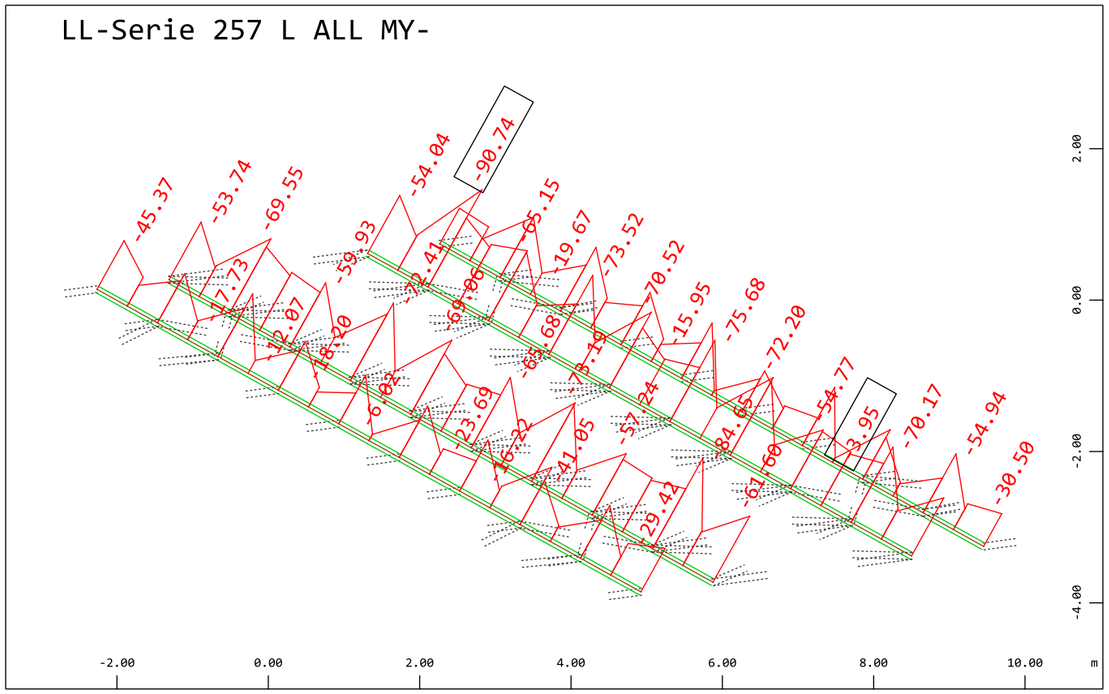

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1963 254+Tolva 62000 L ALL MY+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=117.03)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

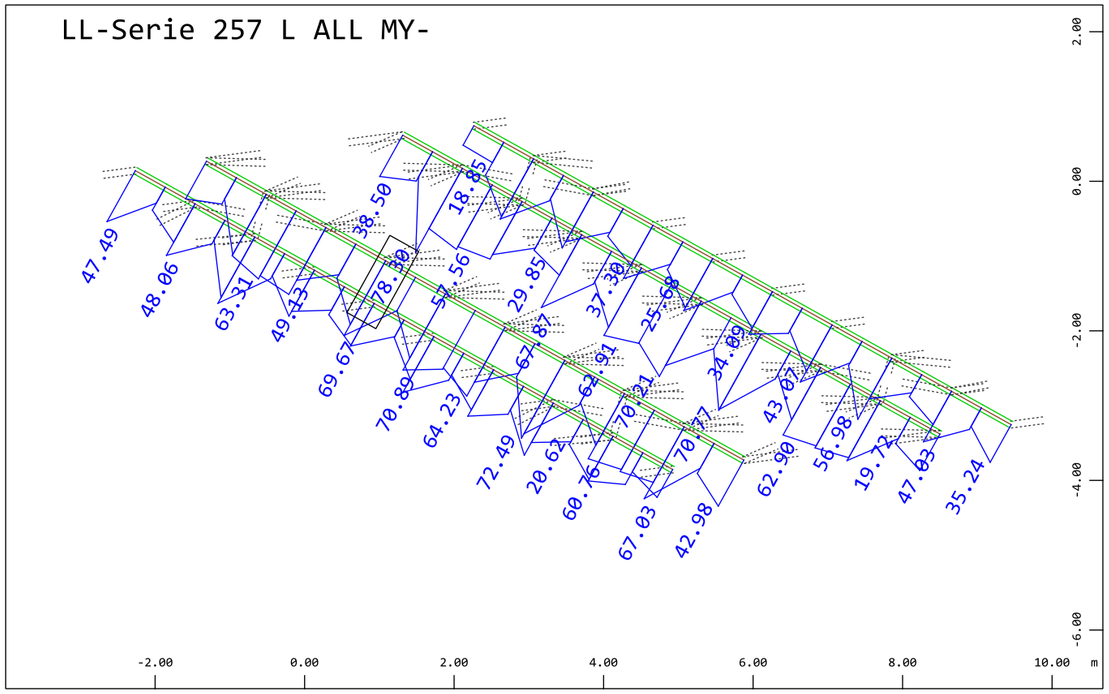
SOFiSTiK AG - www.sofistik.de

Pont Carretera Vic
Tensiones




Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1914 LL-Serie 257 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-90.74) (Max=-3.95)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



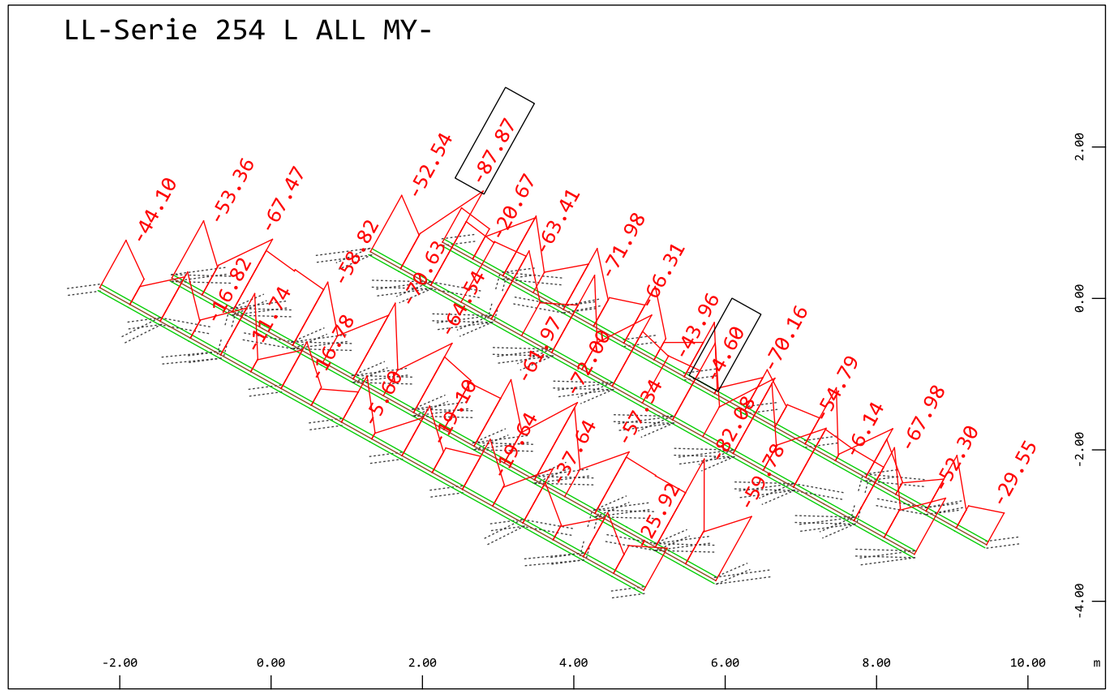

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1914 LL-Serie 257 L ALL MY-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=78.30)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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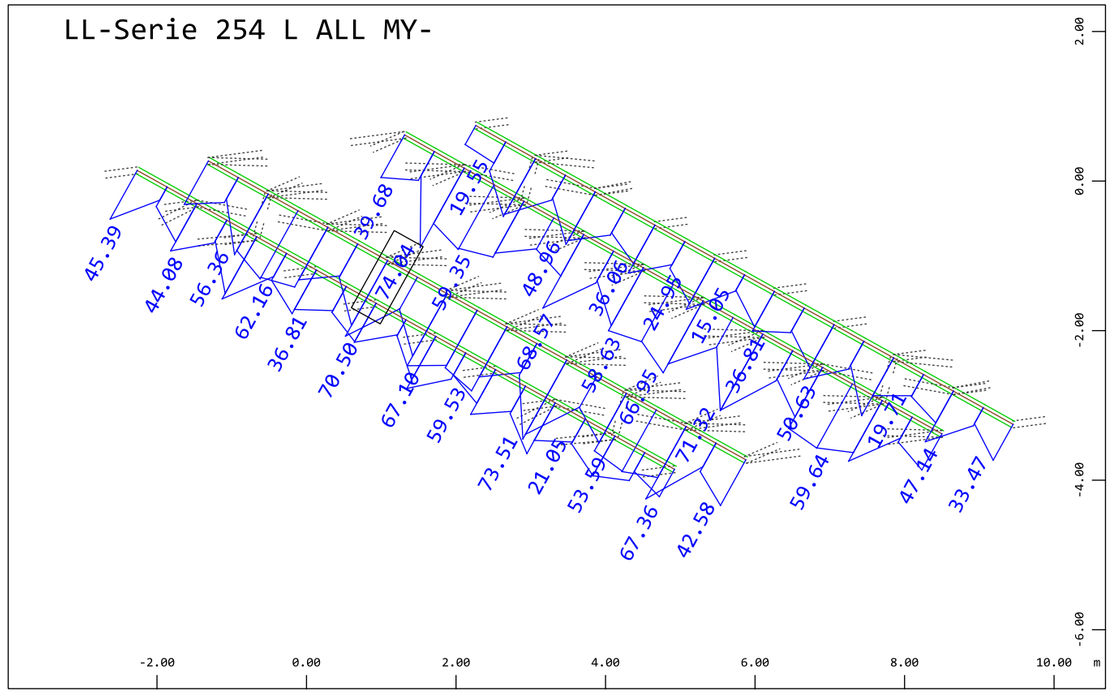


Pont Carretera Vic
Tensiones




Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1904 LL-Serie 254 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-87.87) (Max=-4.60)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

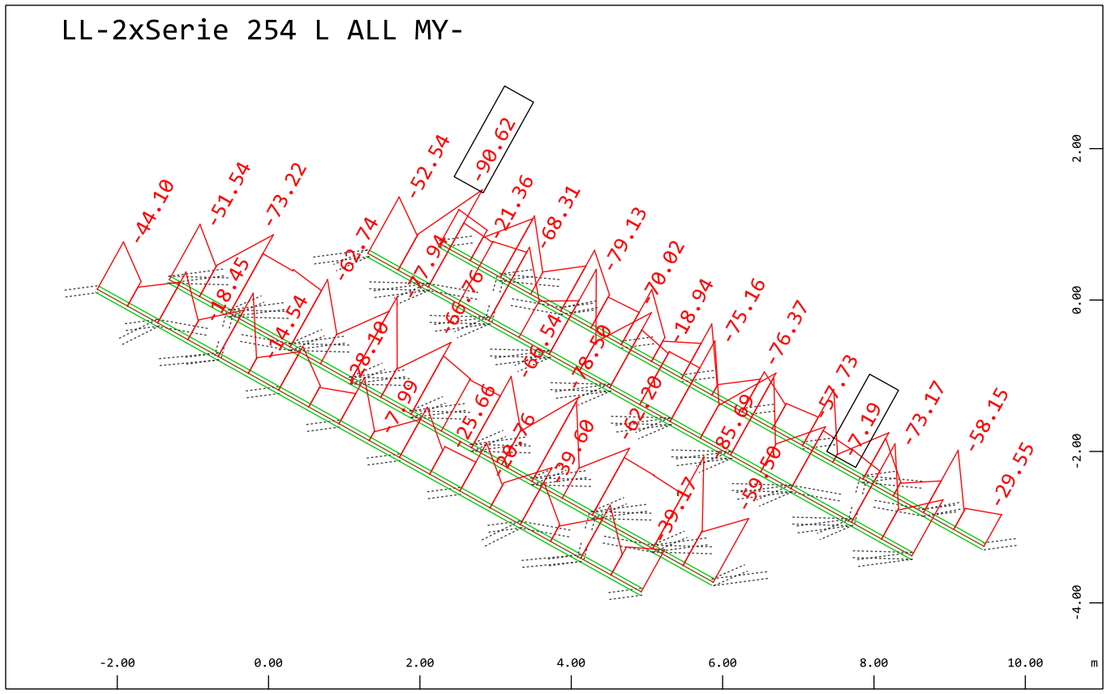



Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1904 LL-Serie 254 L ALL MY-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=74.04)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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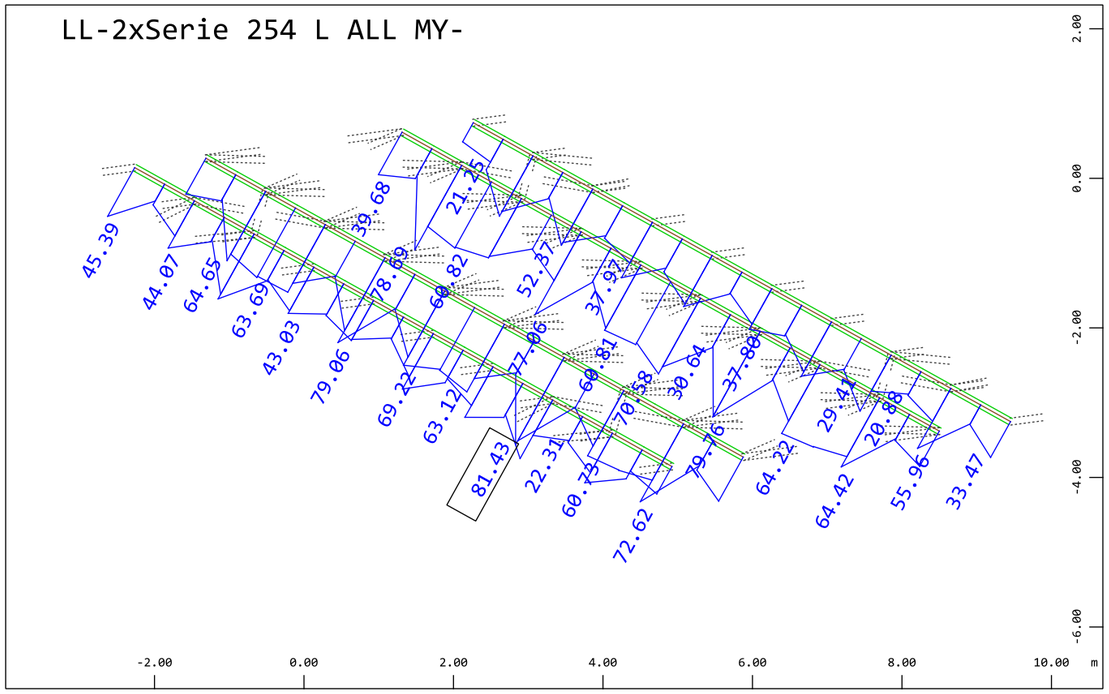
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1934 LL-2xSerie 254 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-90.62) (Max=-7.19)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

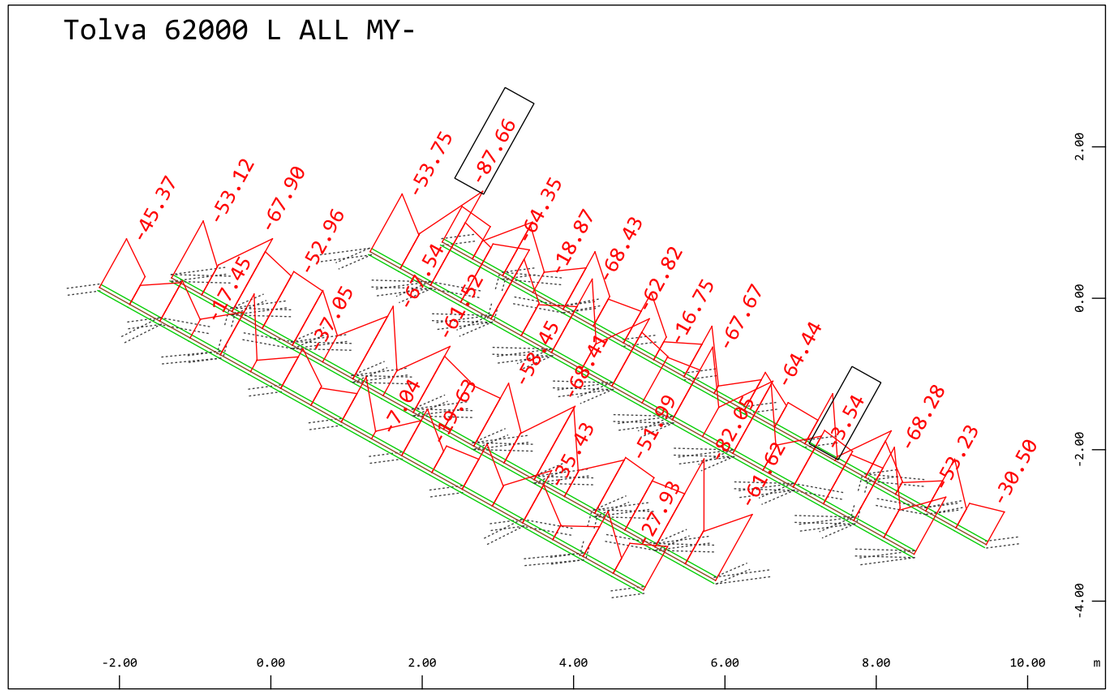
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1934 LL-2xSerie 254 L ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=81.43)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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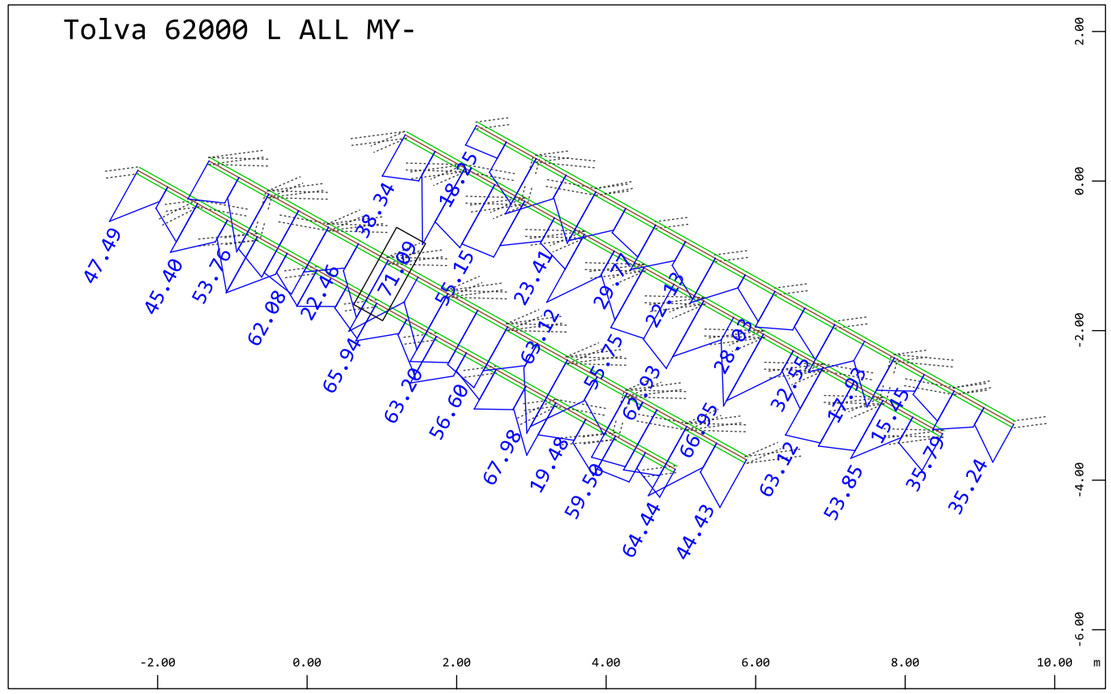
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1924 Tolva 62000 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-87.66) (Max=-3.54)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



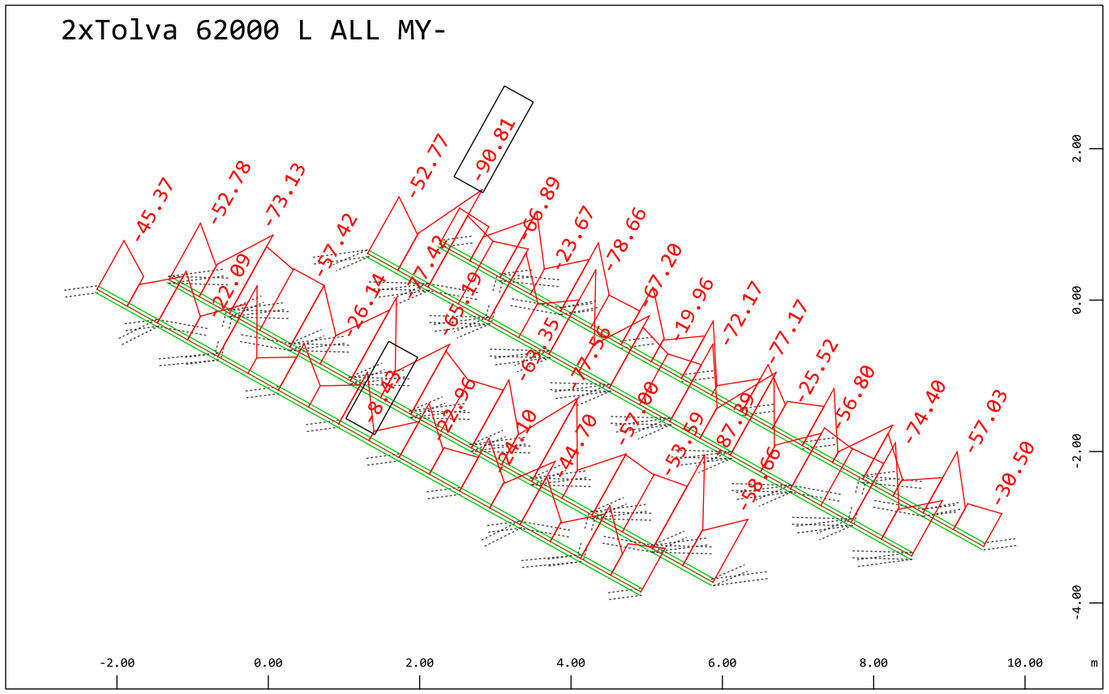

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1924 Tolva 62000 L ALL MY-, Material 1
S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=71.09)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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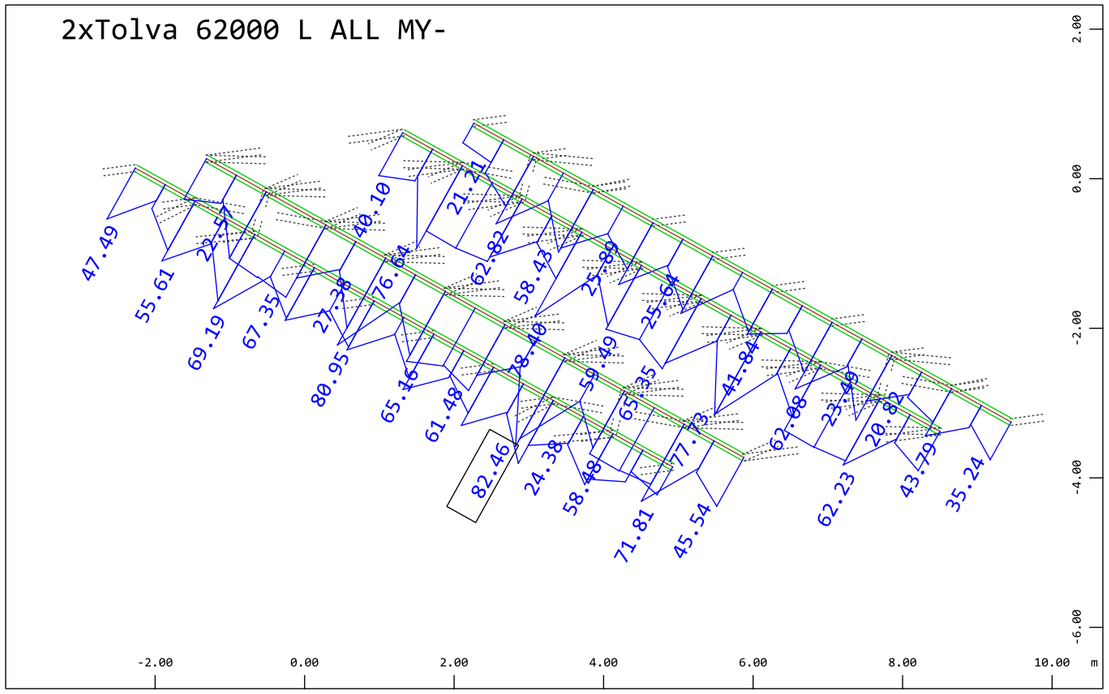
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1954 2xTolva 62000 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-90.81) (Max=-8.43)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

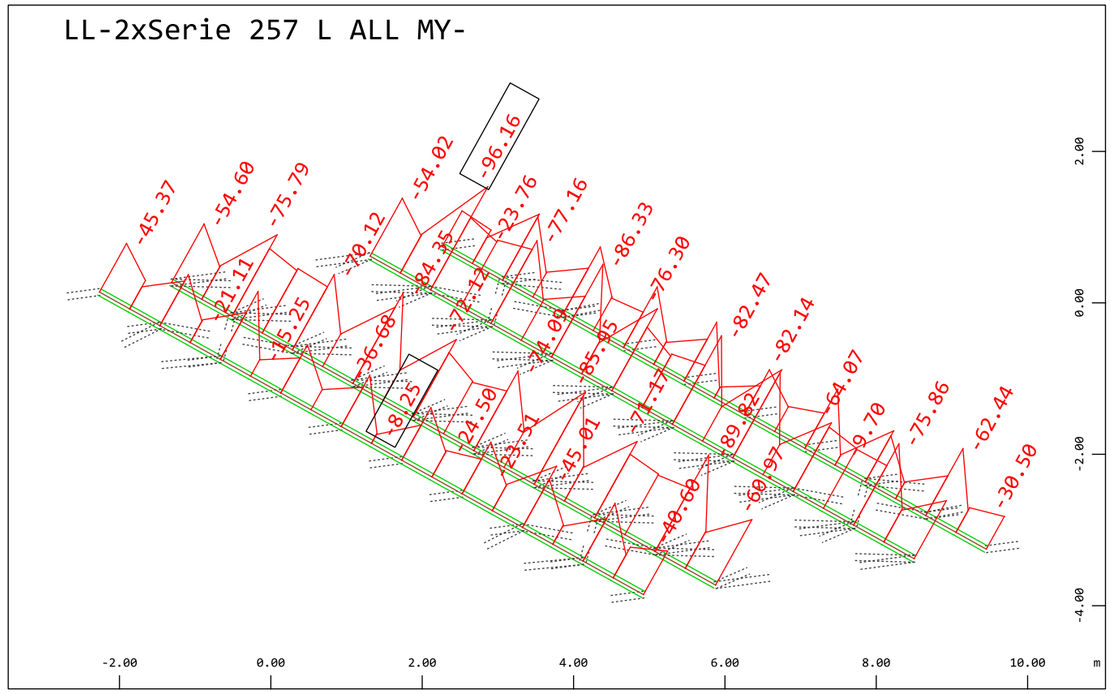
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1954 2xTolva 62000 L ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=82.46)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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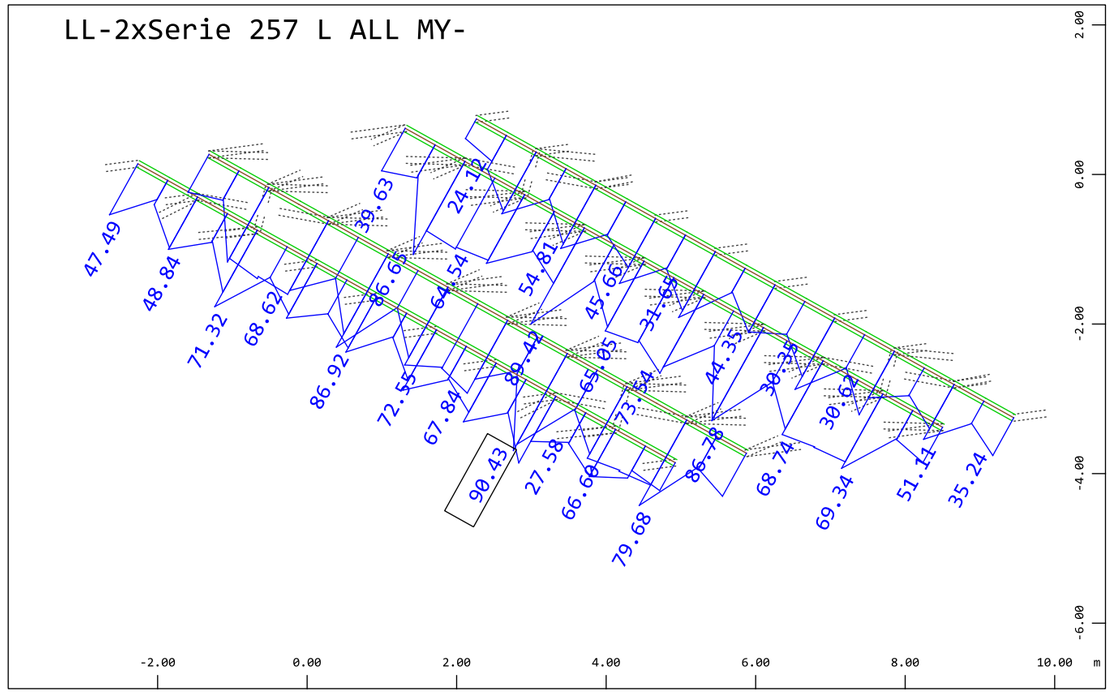
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1944 LL-2xSerie 257 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-96.16) (Max=-8.25)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



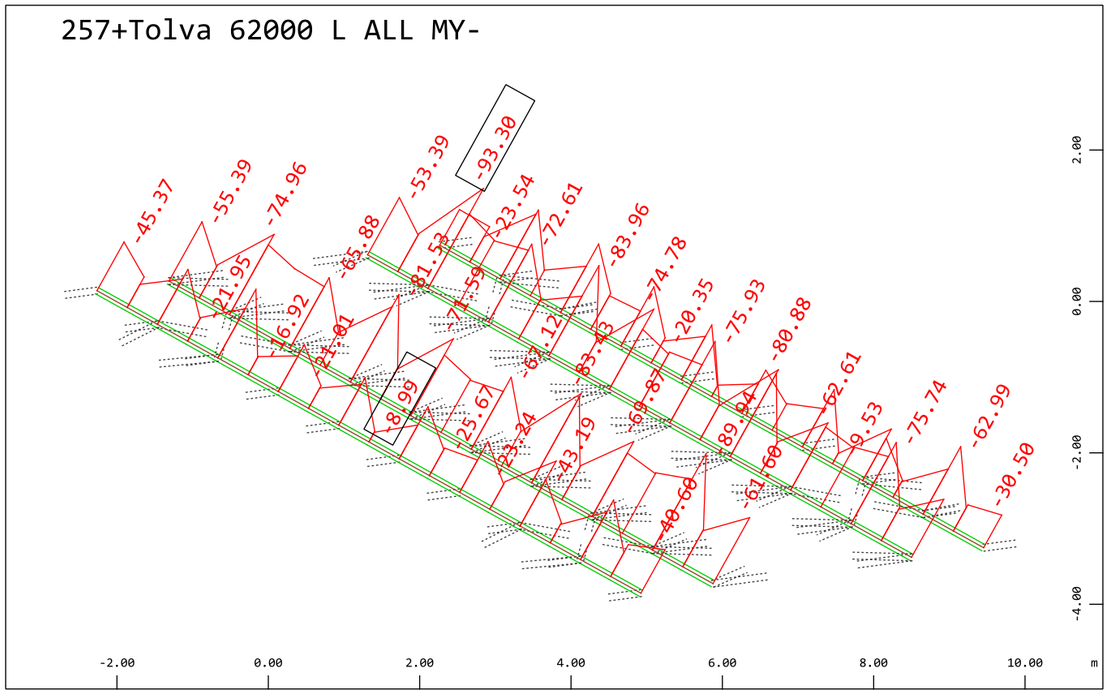

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1944 LL-2xSerie 257 L ALL MY-, Material
1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=90.43)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

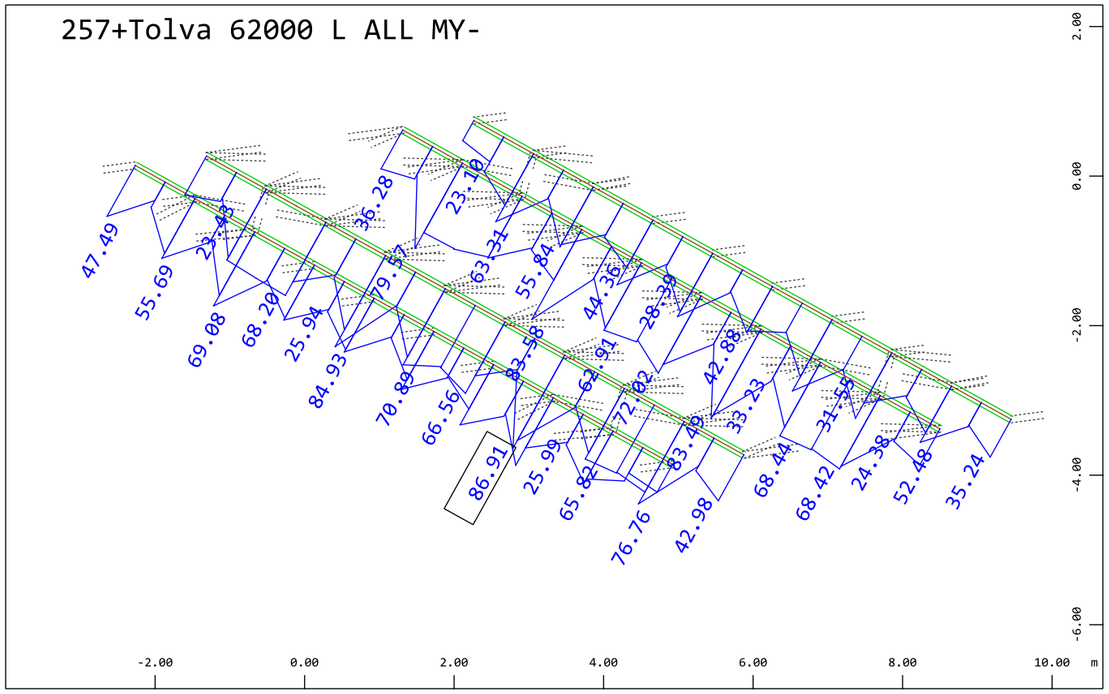
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Pont Carretera Vic
Tensiones




Z Y X
Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1974 257+Tolva 62000 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.30) (Max=-8.99)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



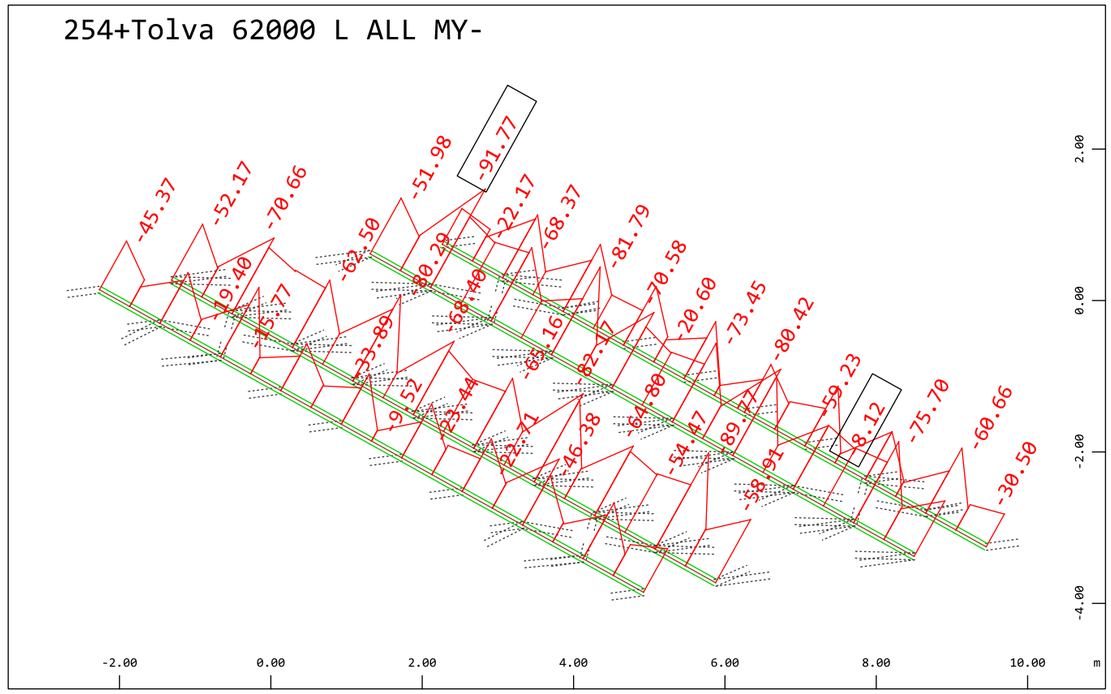

Z Y X
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1974 257+Tolva 62000 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=86.91)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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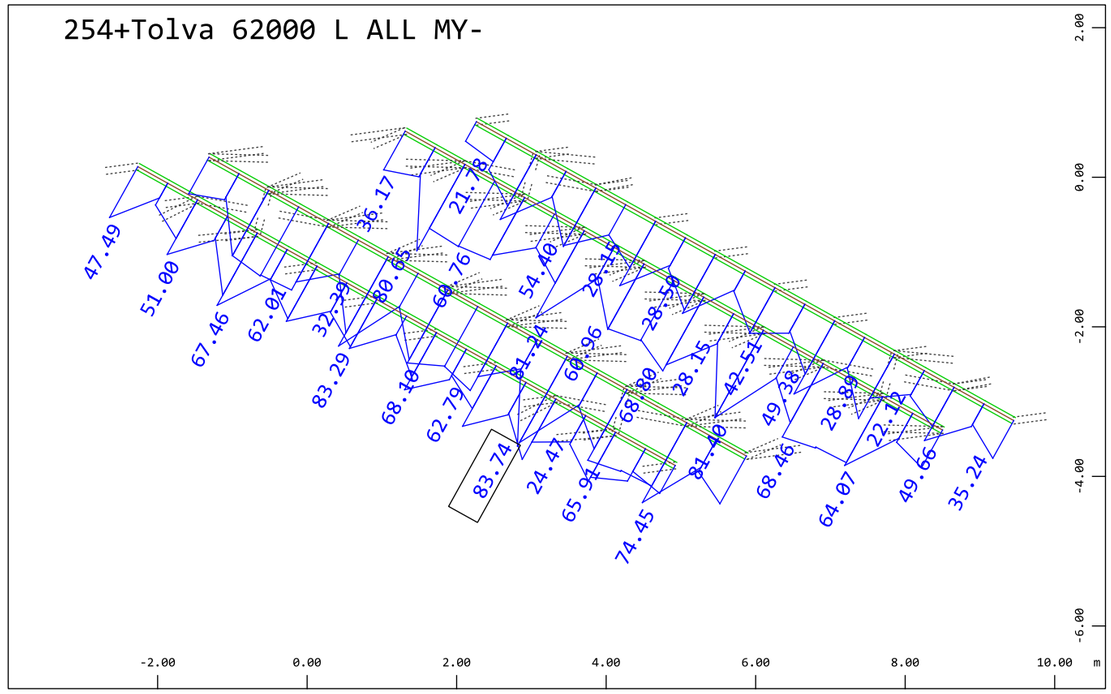


Pont Carretera Vic
Tensiones




Z Y X
Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1964 254+Tolva 62000 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-91.77) (Max=-8.12)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

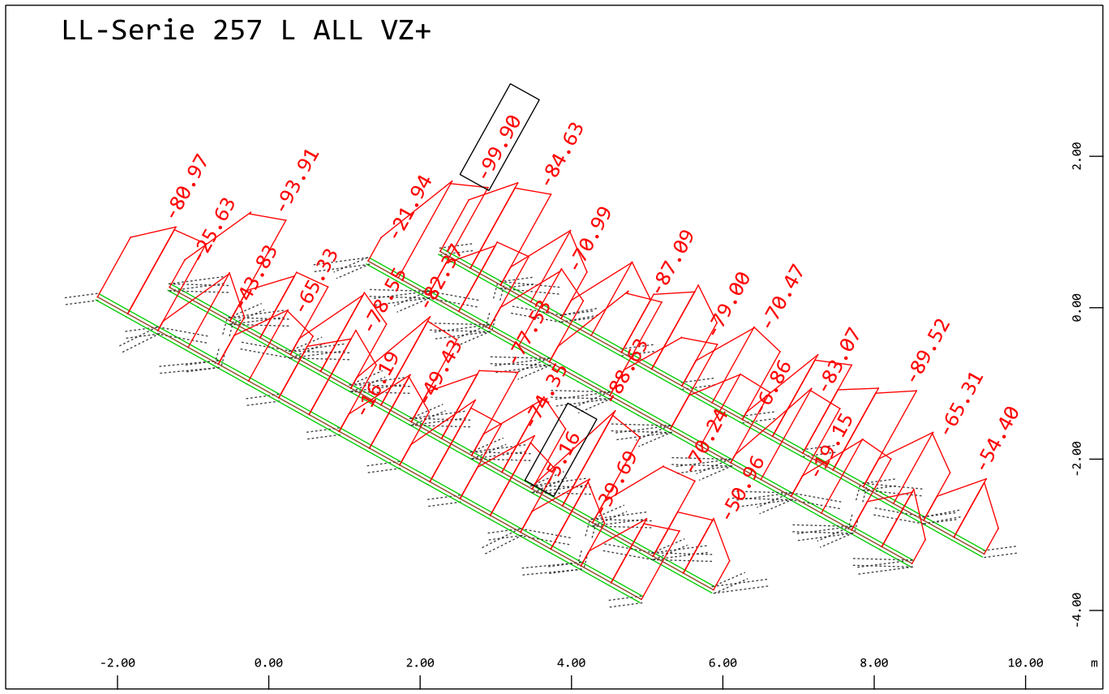



Z Y X
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1964 254+Tolva 62000 L ALL MY-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Max=83.74)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

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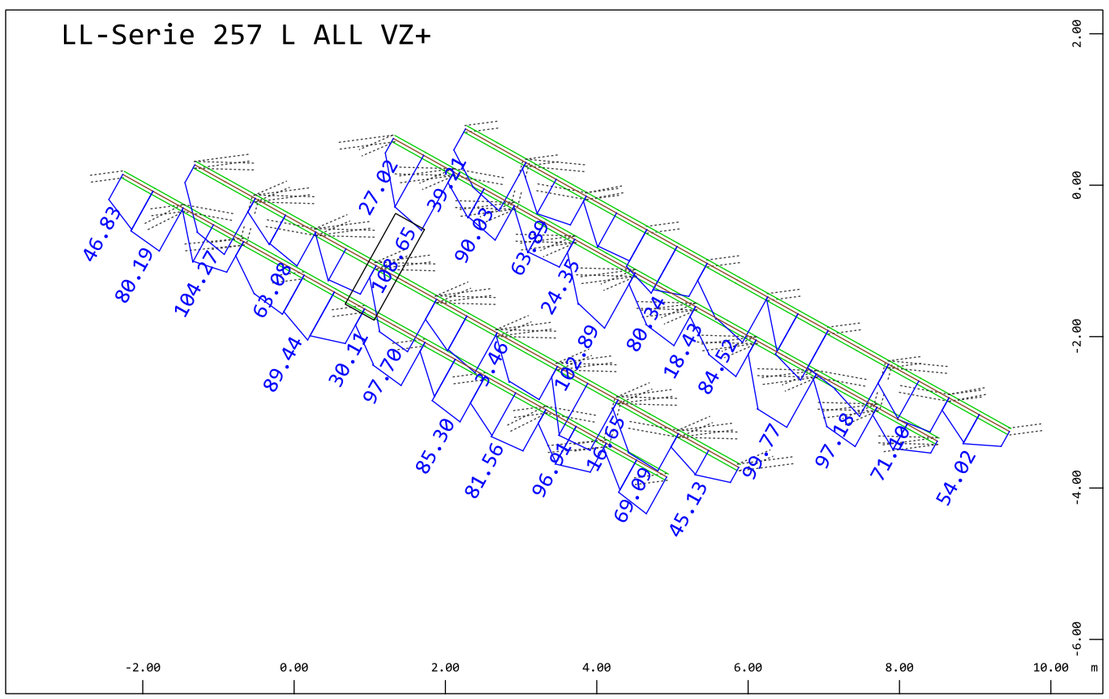
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1915 LL-Serie 257 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-99.90) (Max=-5.16)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

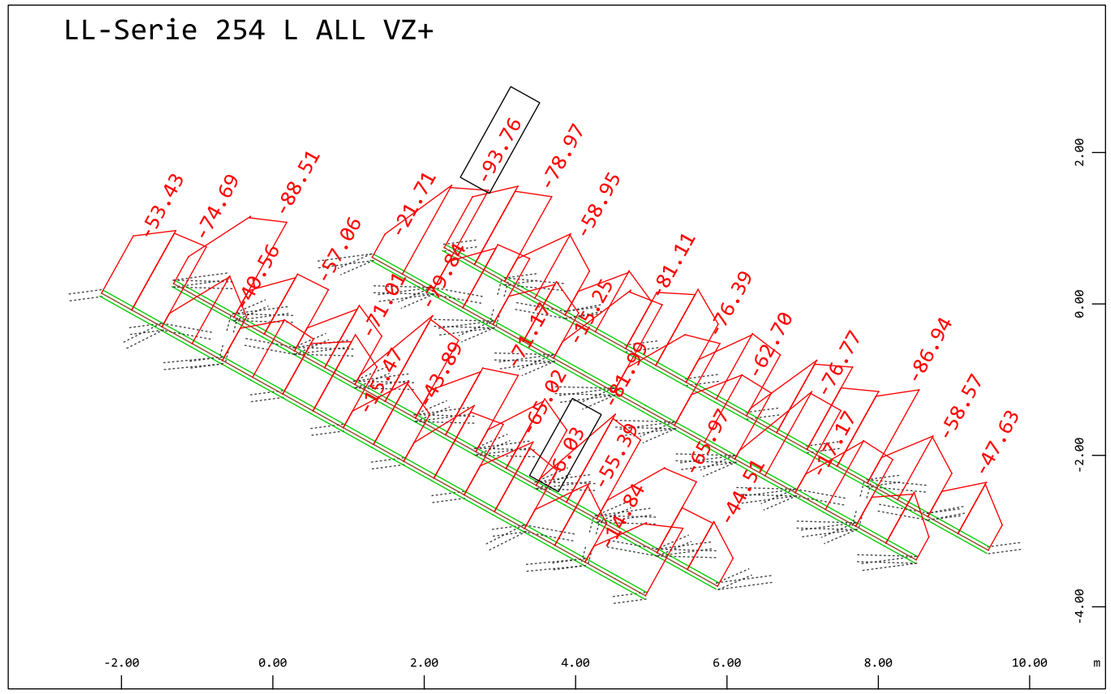
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1915 LL-Serie 257 L ALL VZ+, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=108.65)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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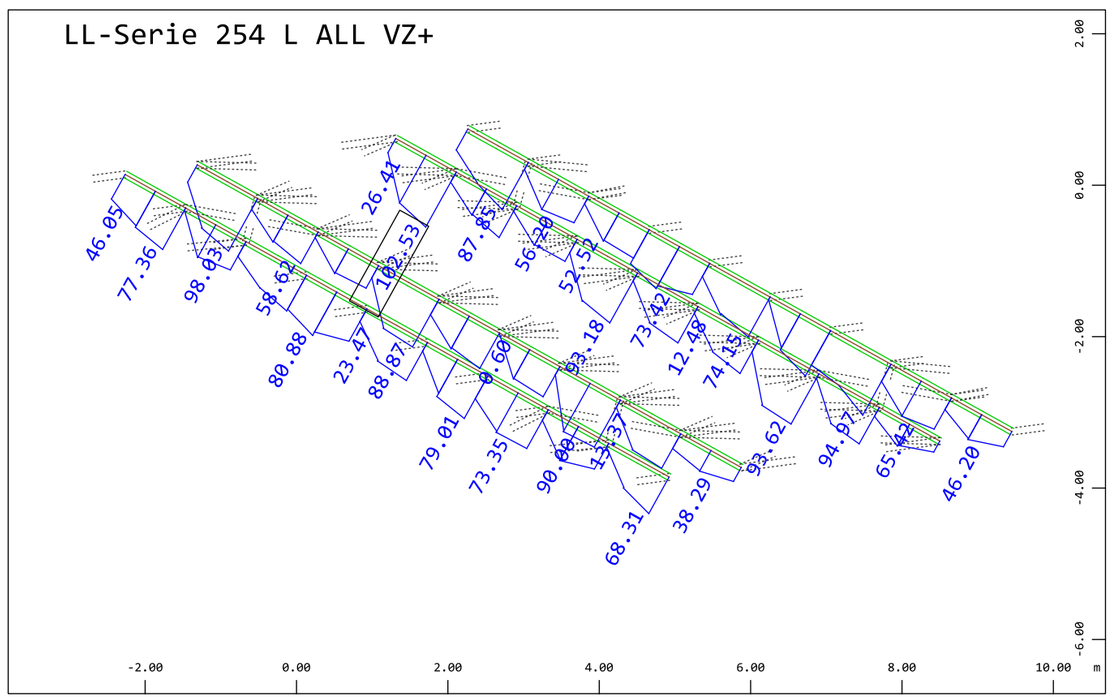
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1905 LL-Serie 254 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.76) (Max=-6.03)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



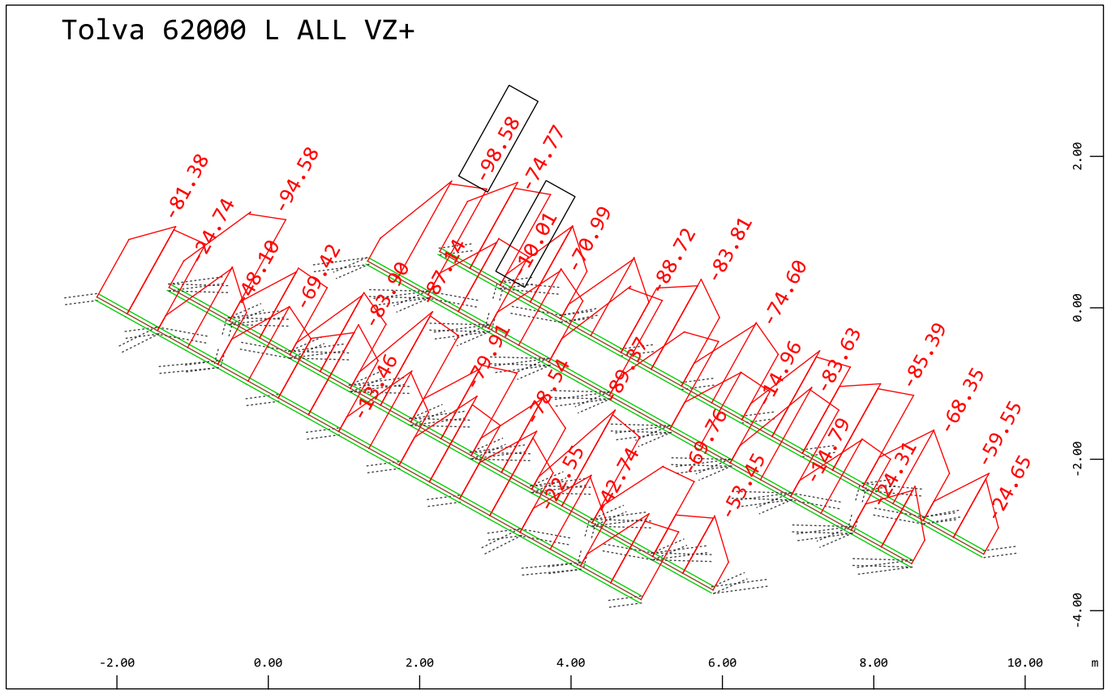

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1905 LL-Serie 254 L ALL VZ+, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=102.53)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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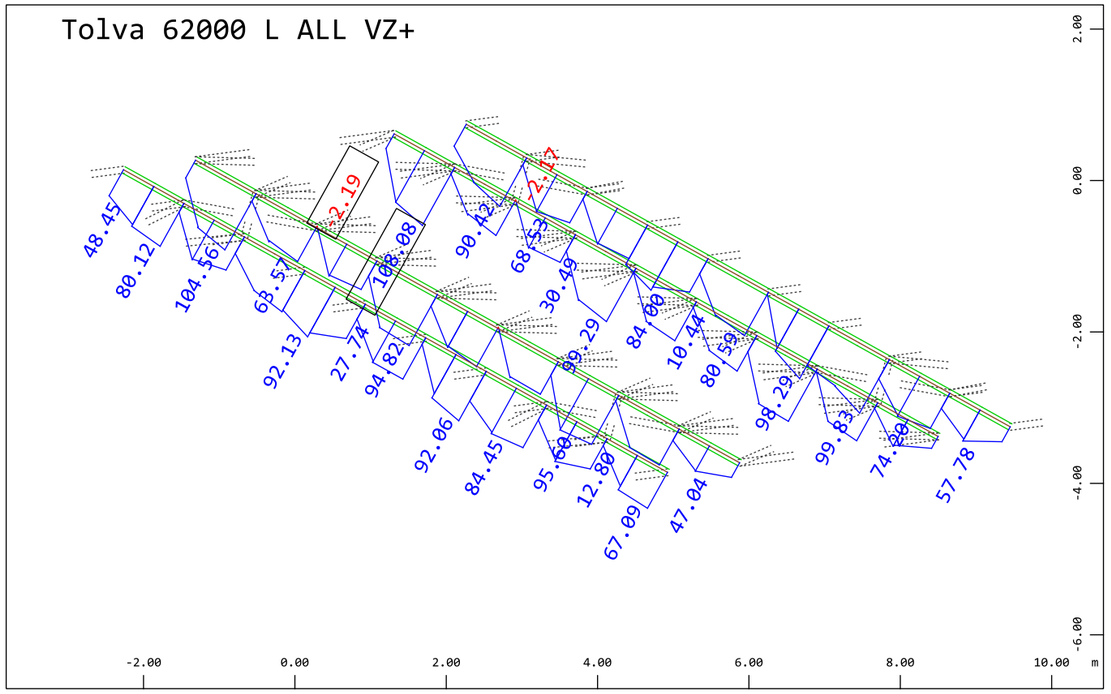
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1925 Tolva 62000 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-98.58) (Max=-10.01)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

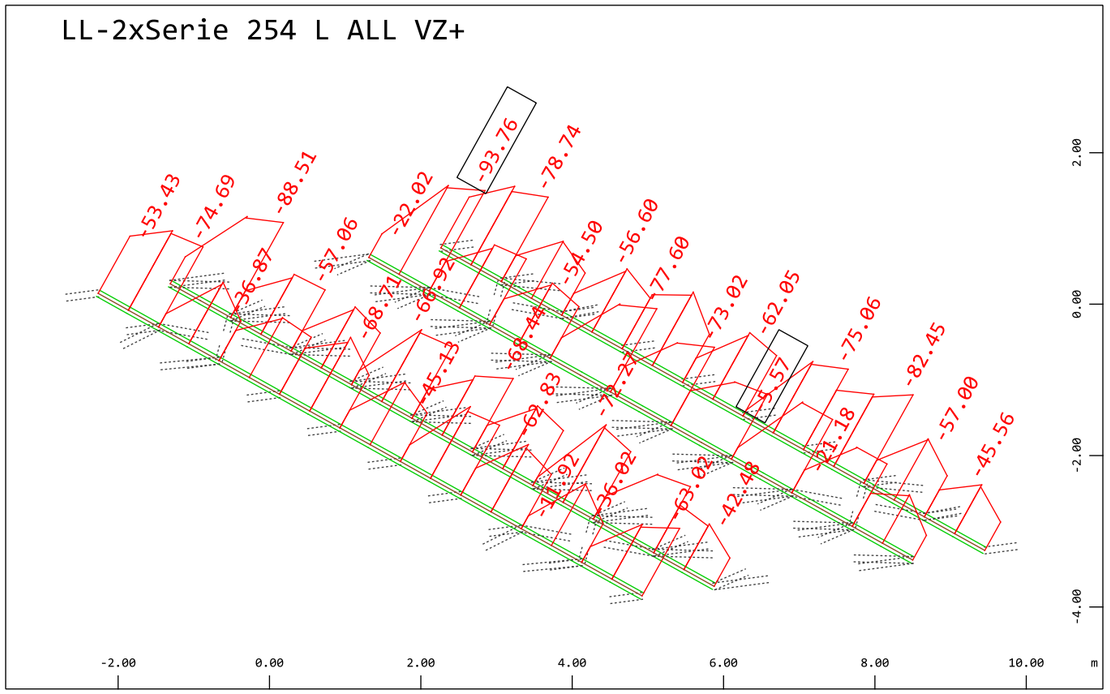
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1925 Tolva 62000 L ALL VZ+, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-2.19) (Max=108.08)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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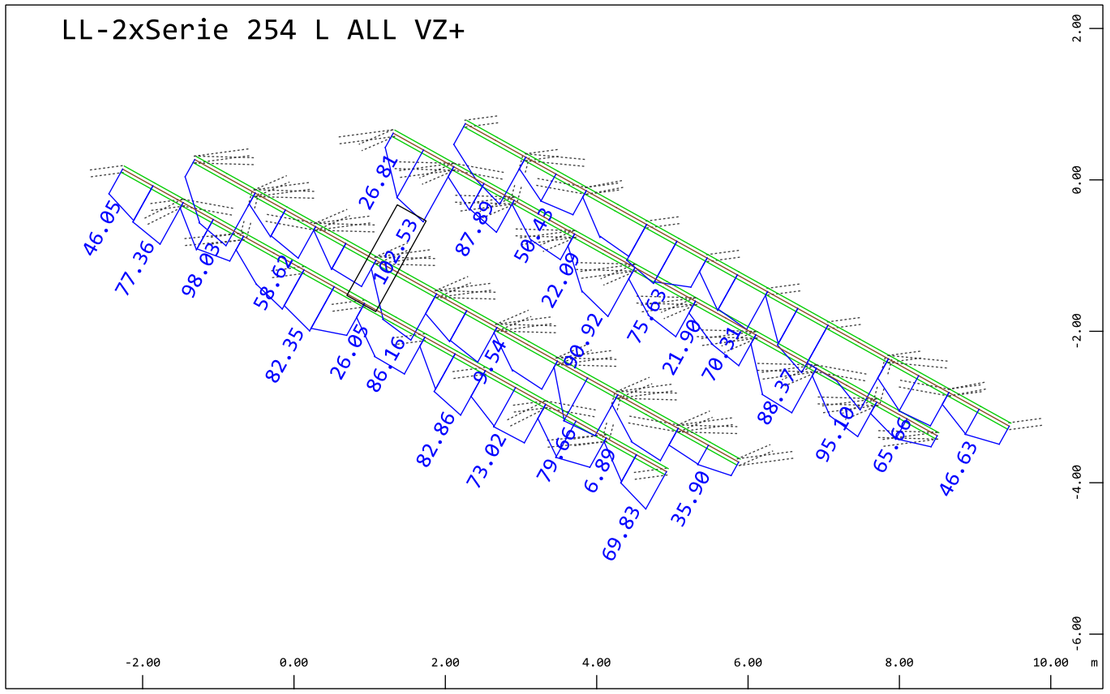
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1935 LL-2xSerie 254 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.76) (Max=-5.57)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



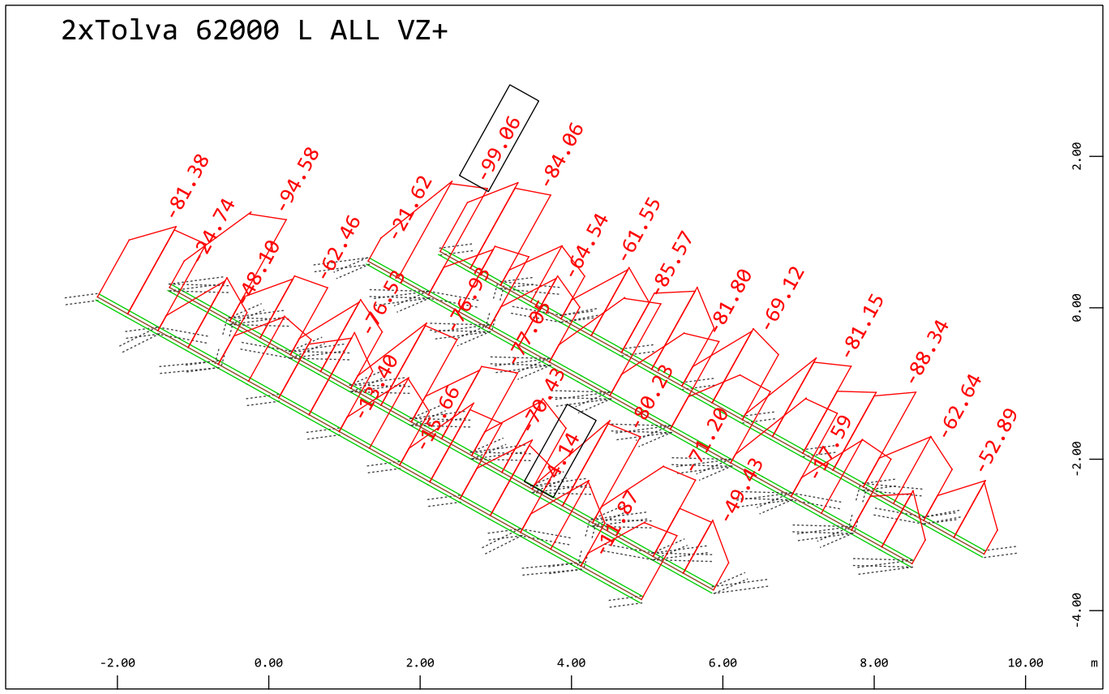

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1935 LL-2xSerie 254 L ALL VZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=102.53)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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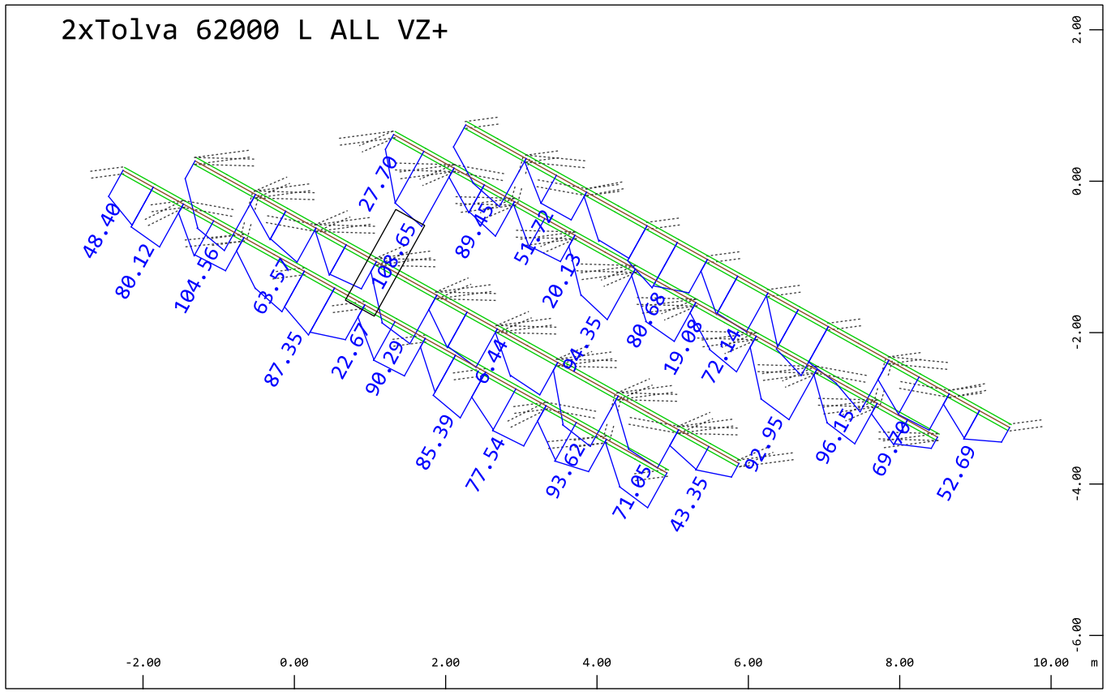
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1955 2xTolva 62000 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-99.06) (Max=-4.14)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



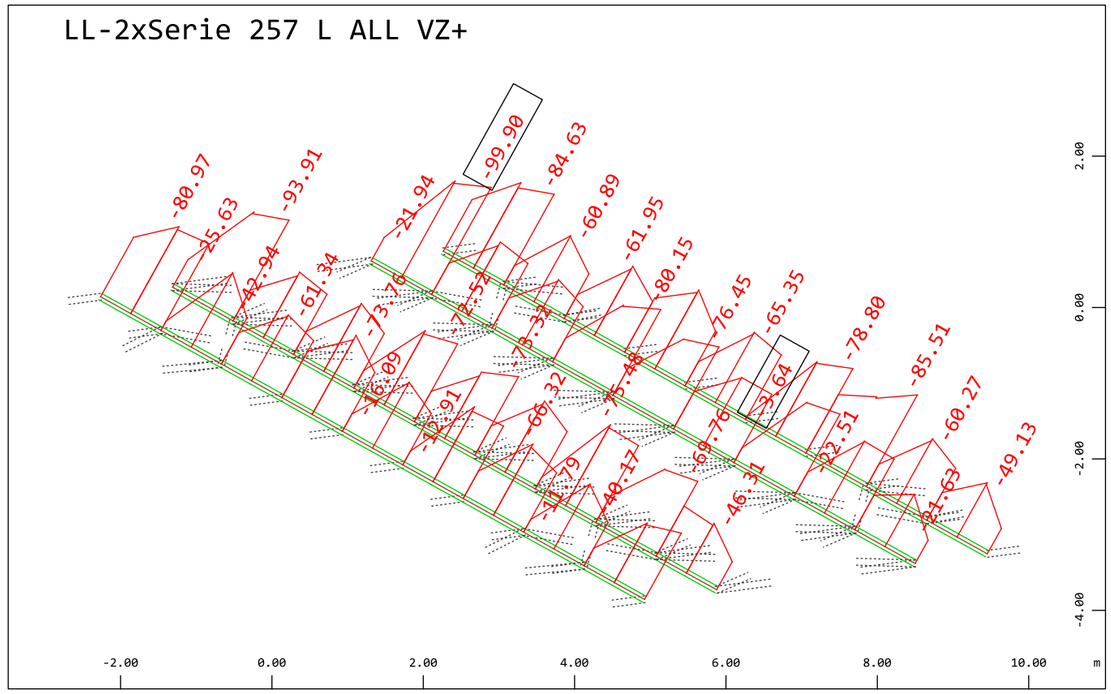

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1955 2xTolva 62000 L ALL VZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=108.65)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



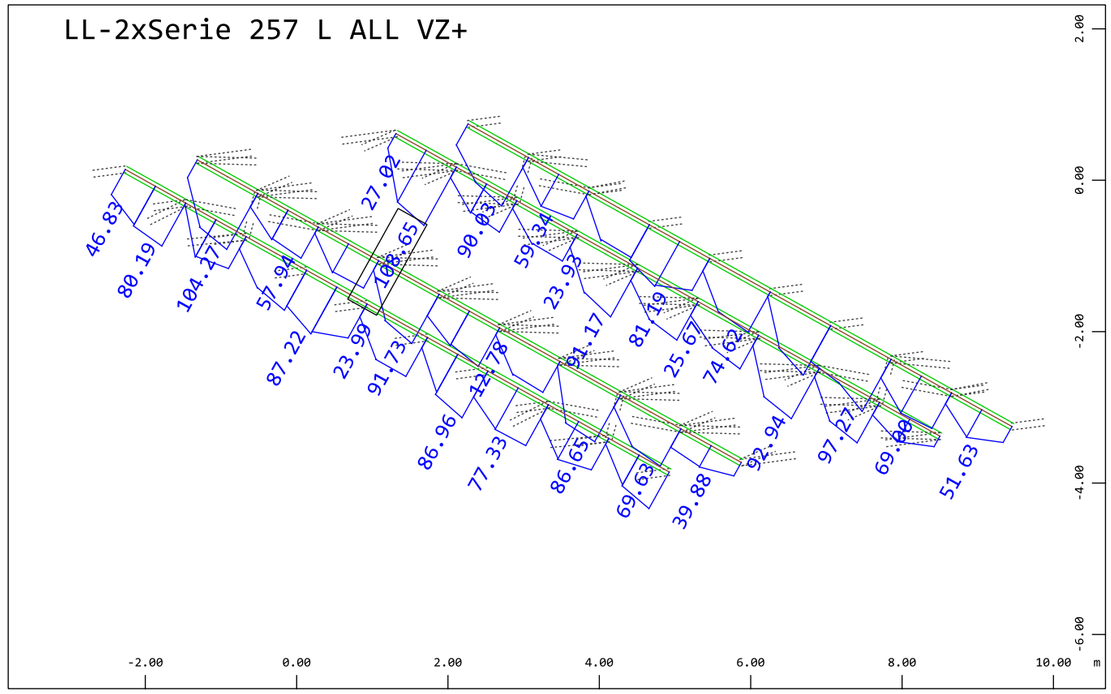
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1945 LL-2xSerie 257 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-99.90) (Max=-3.64)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



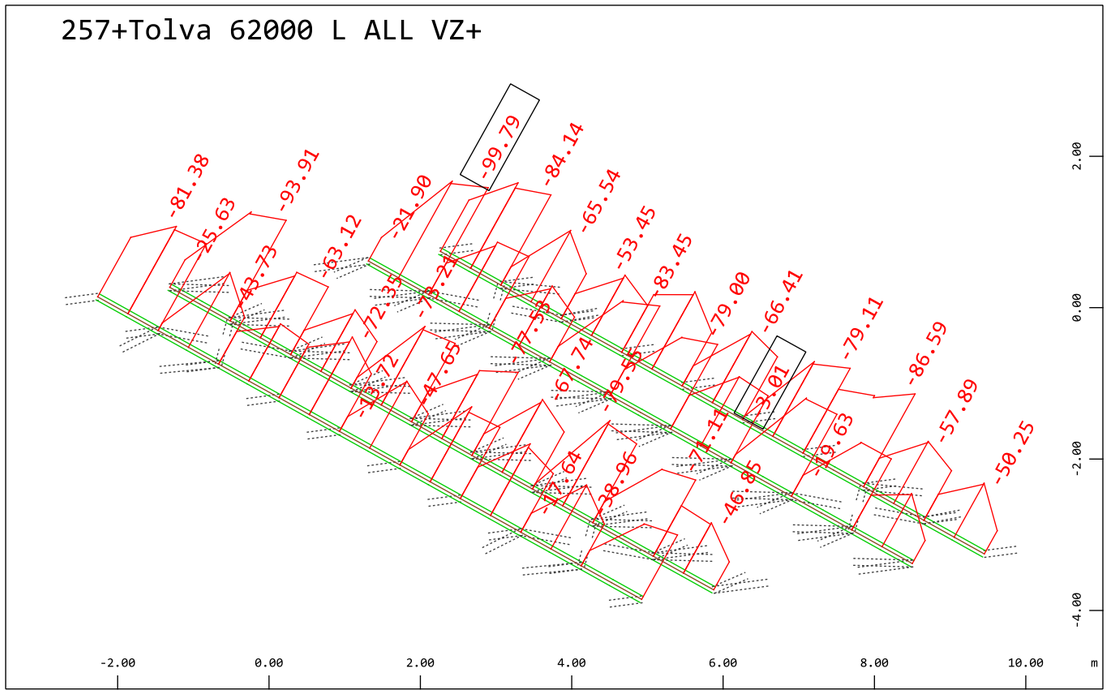

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1945 LL-2xSerie 257 L ALL VZ+, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=108.65)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

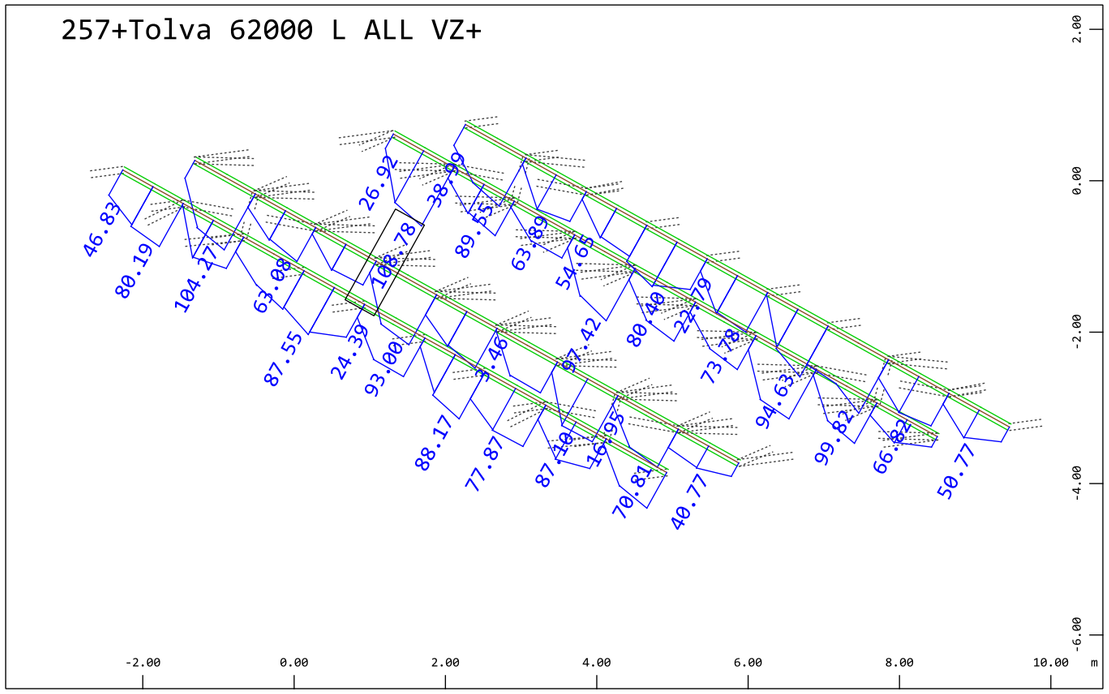
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Pont Carretera Vic
Tensiones




Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1975 257+Tolva 62000 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-99.79) (Max=-3.01)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962



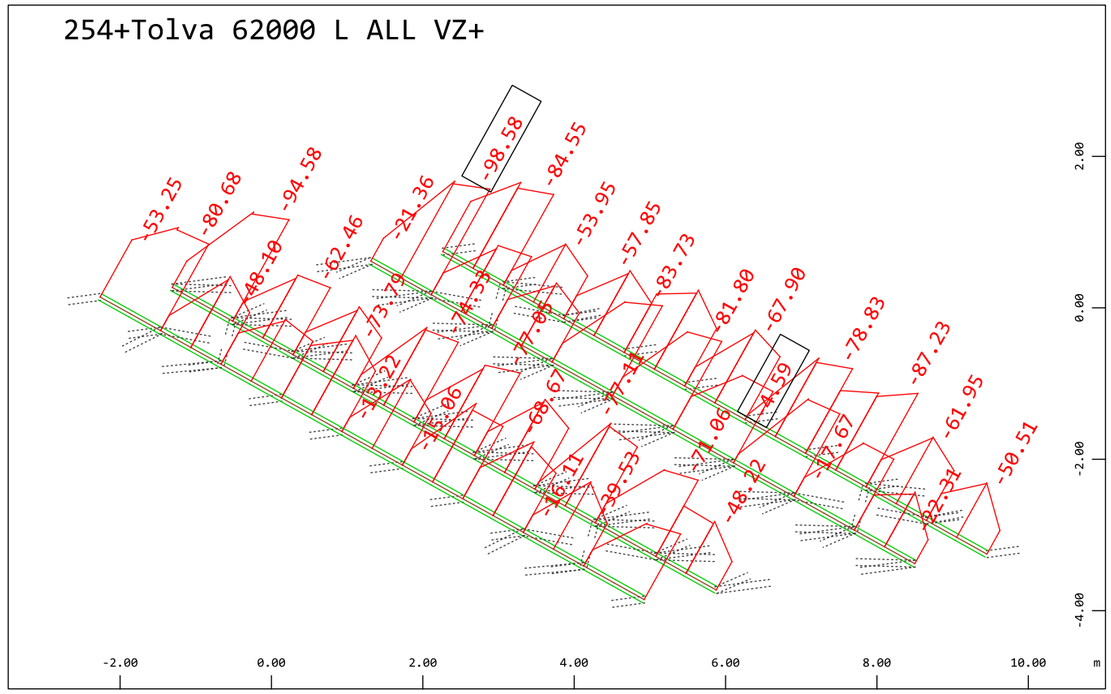

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1975 257+Tolva 62000 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=108.78)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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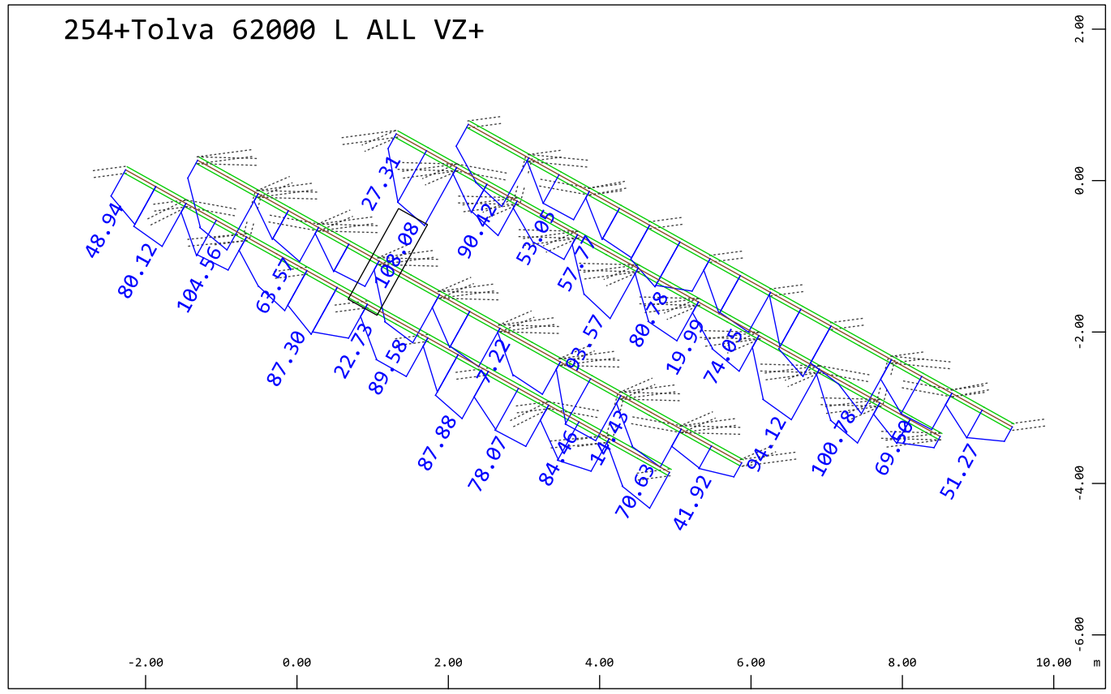


Pont Carretera Vic
Tensiones




Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1965 254+Tolva 62000 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-98.58) (Max=-4.59)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

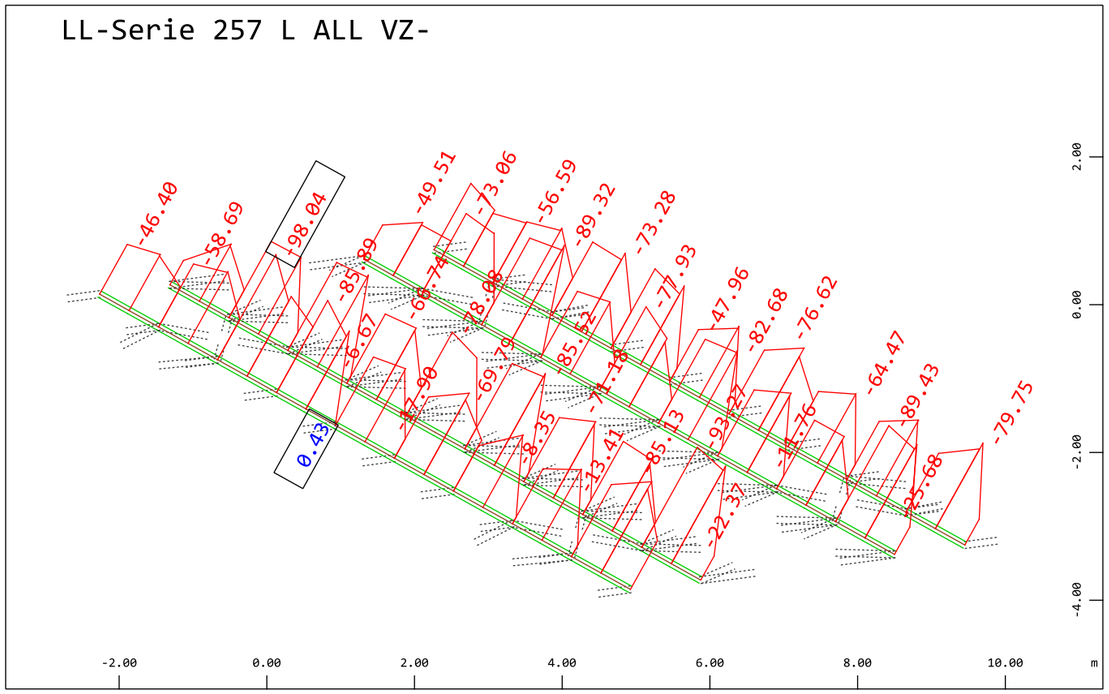



Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1965 254+Tolva 62000 L ALL VZ+,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=108.08)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

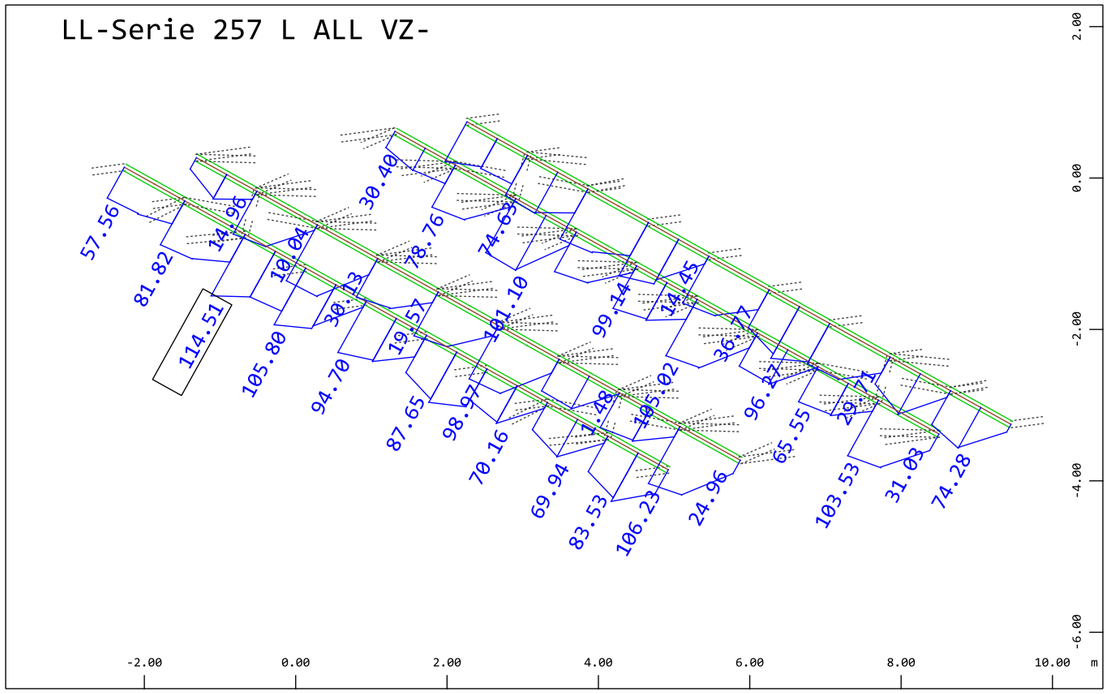
SOFiSTiK AG - www.sofistik.de

Pont Carretera Vic
Tensiones




Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1916 LL-Serie 257 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-98.04) (Max=0.43)

M 1 : 83
X * 0.502
Y * 0.906
Z * 0.962



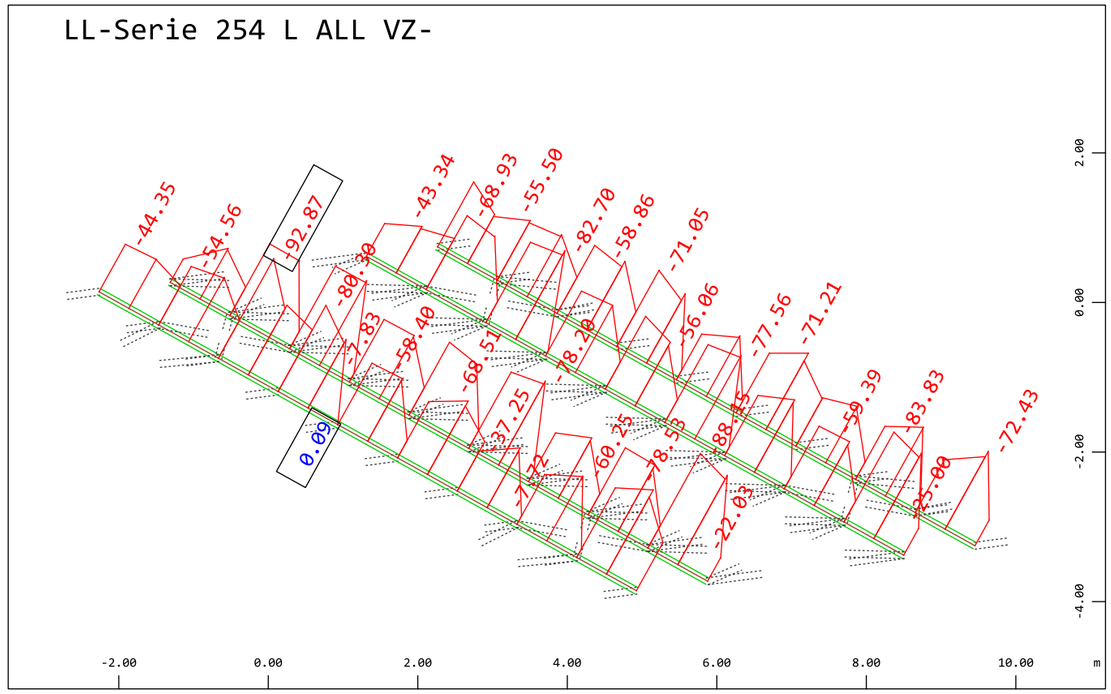

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1916 LL-Serie 257 L ALL VZ-, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=114.51)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

SOFiSTiK AG - www.sofistik.de

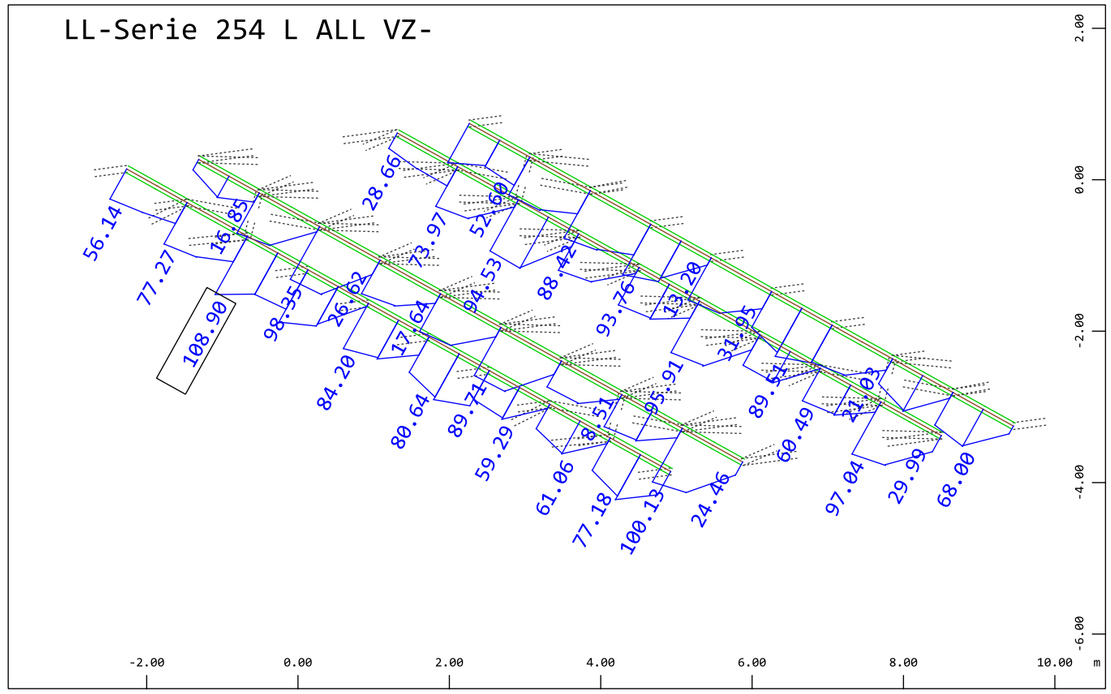


Pont Carretera Vic
Tensiones




Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1906 LL-Serie 254 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-92.87) (Max=0.09)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962

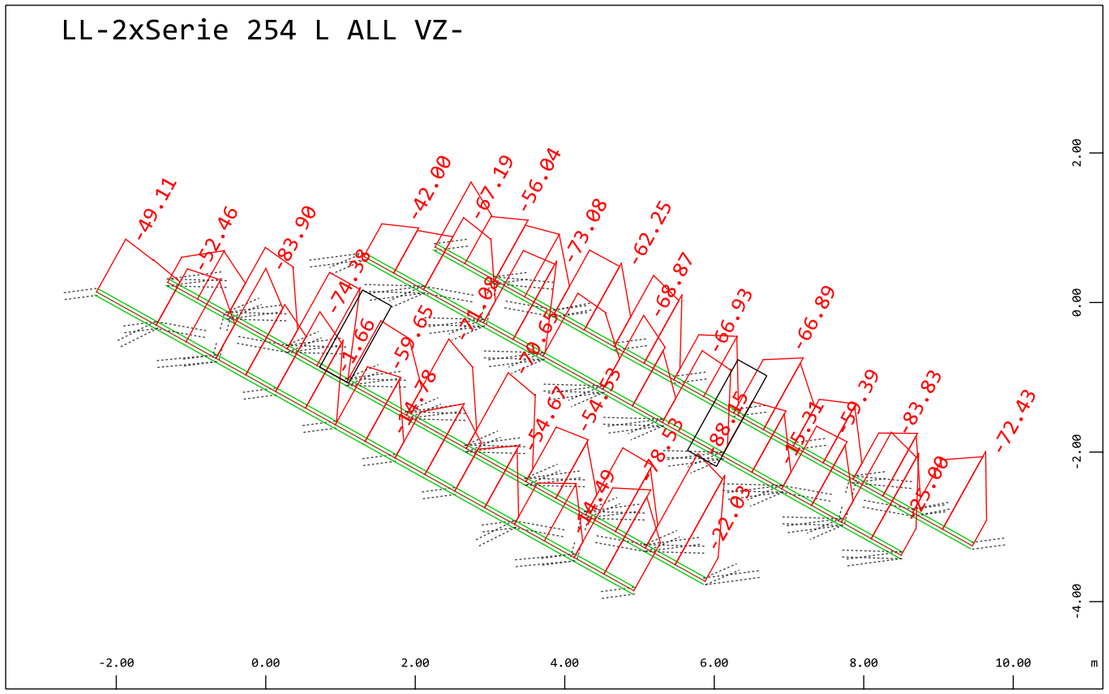



Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1906 LL-Serie 254 L ALL VZ-, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=108.90)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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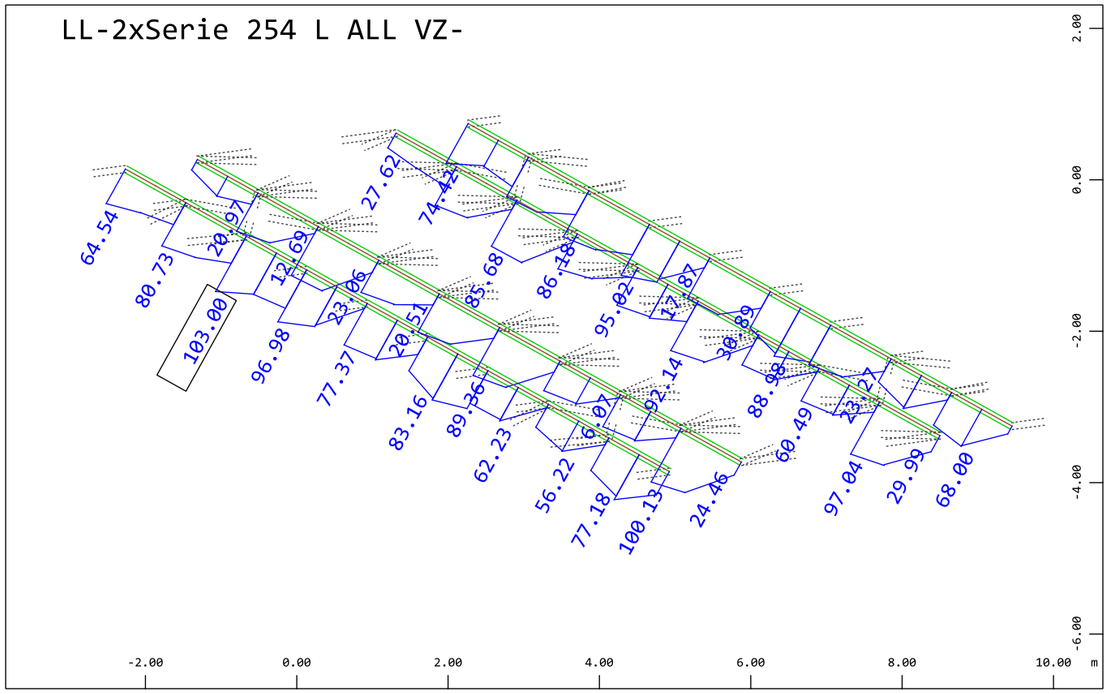
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1936 LL-2xSerie 254 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-88.15) (Max=-1.66)

M 1 : 82
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

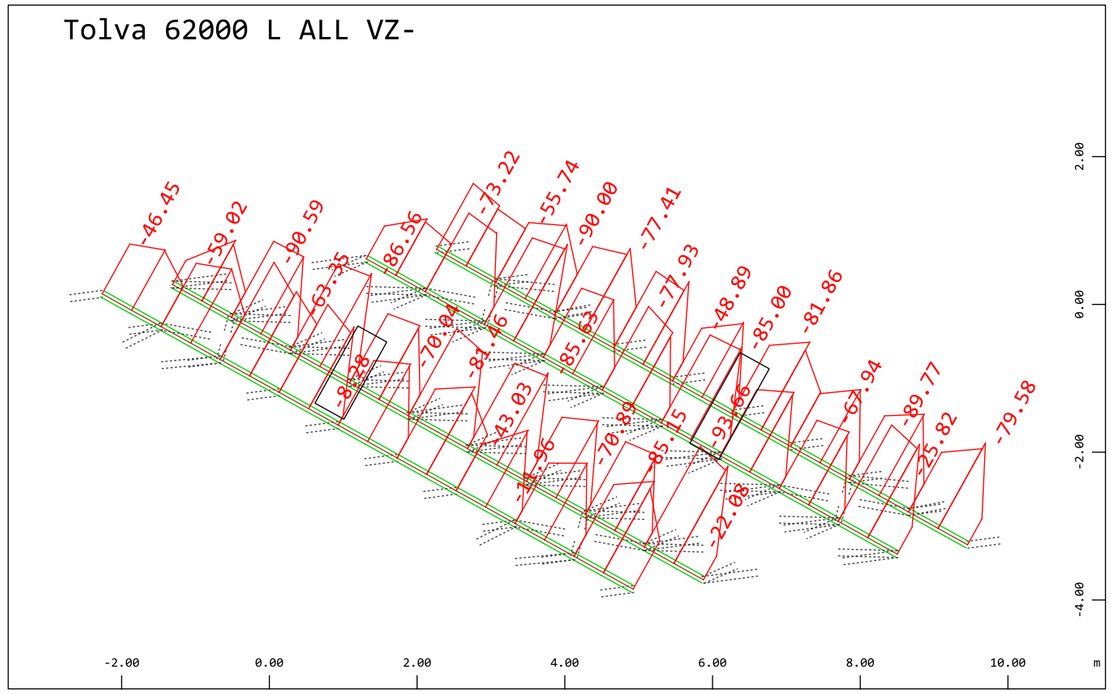
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1936 LL-2xSerie 254 L ALL VZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=103.00)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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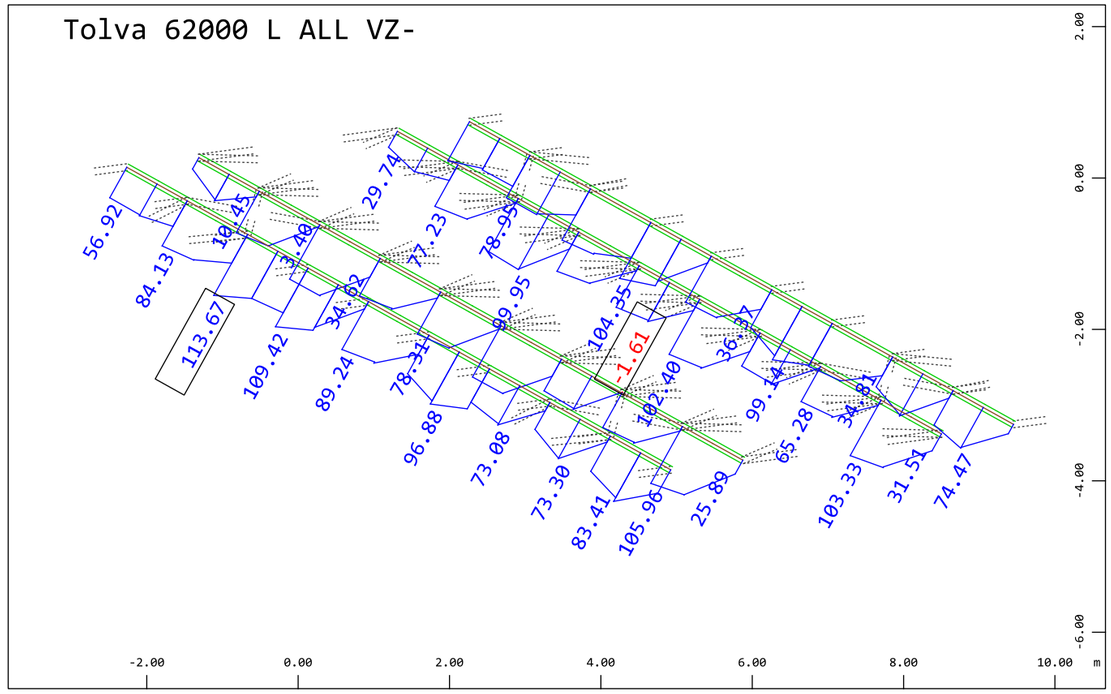
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1926 Tolva 62000 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.66) (Max=-8.28)

M 1 : 83
X * 0.502
Y * 0.906
Z * 0.962



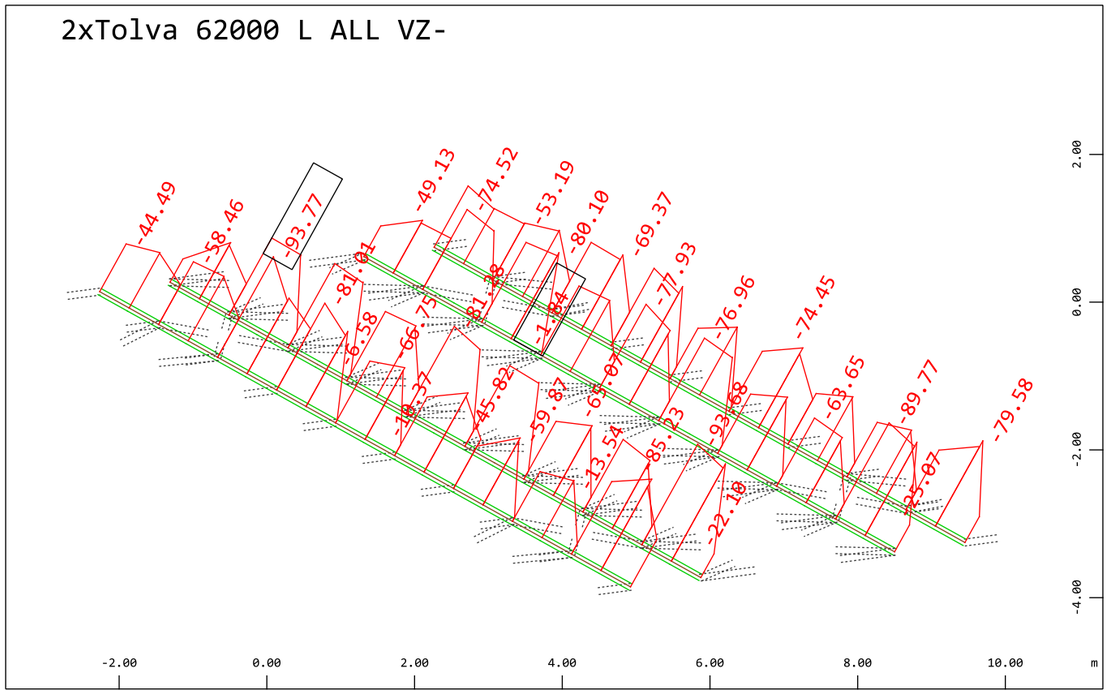

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1926 Tolva 62000 L ALL VZ-, Material 1
S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Min=-1.61) (Max=113.67)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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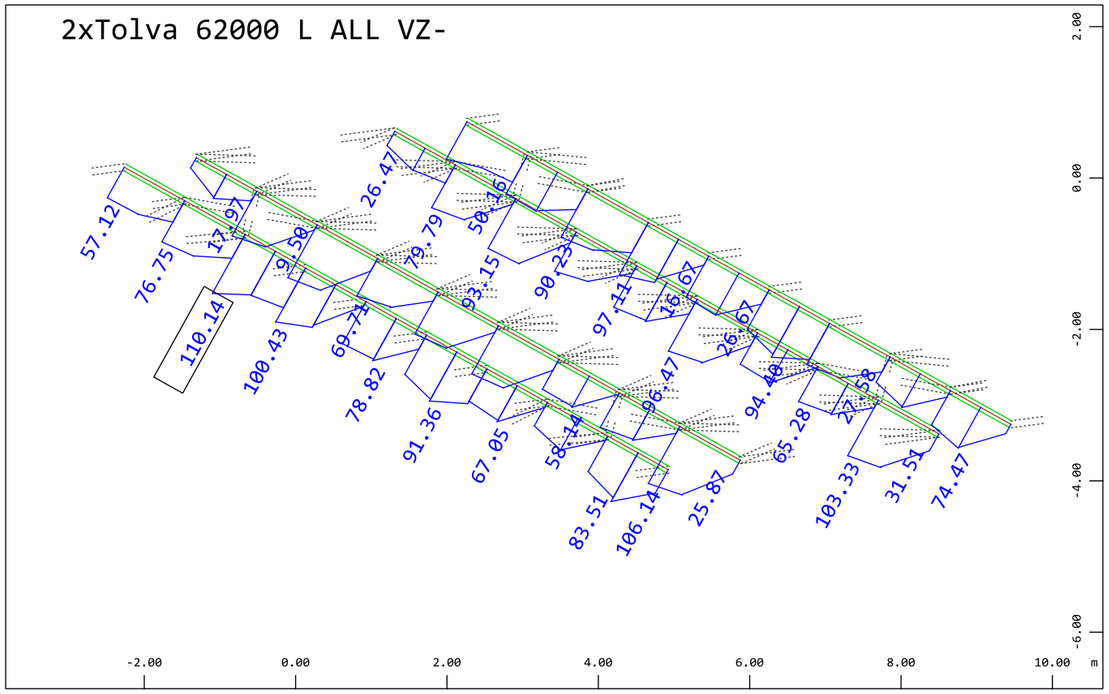
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1956 2xTolva 62000 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.77) (Max=-1.84)

M 1 : 83
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

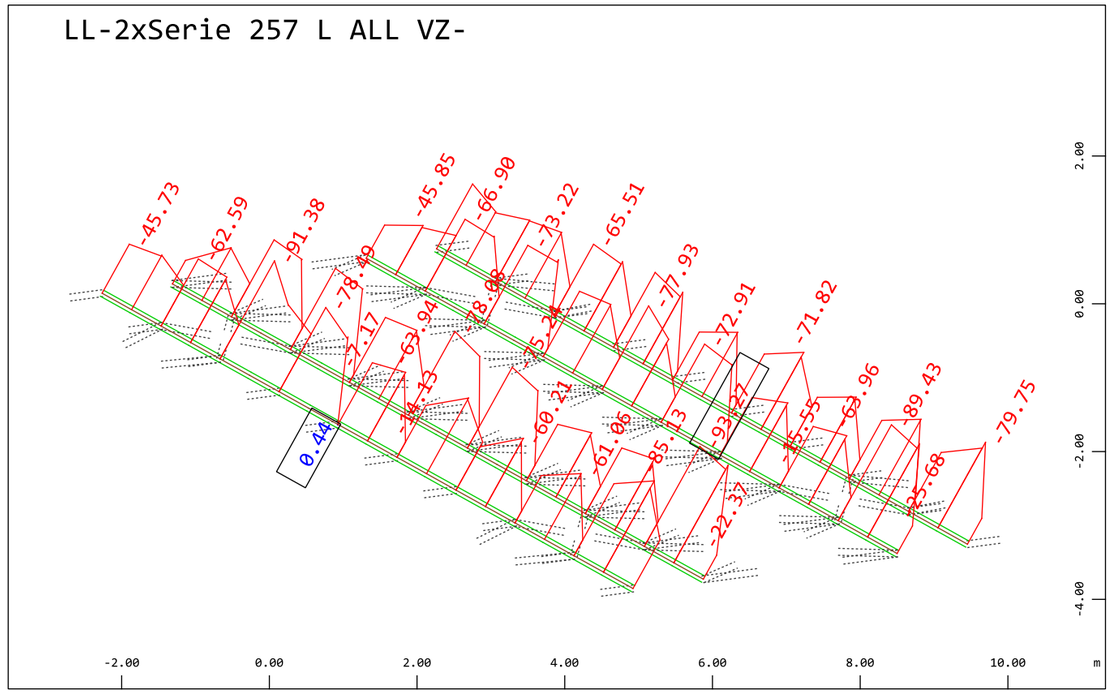
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1956 2xTolva 62000 L ALL VZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=110.14)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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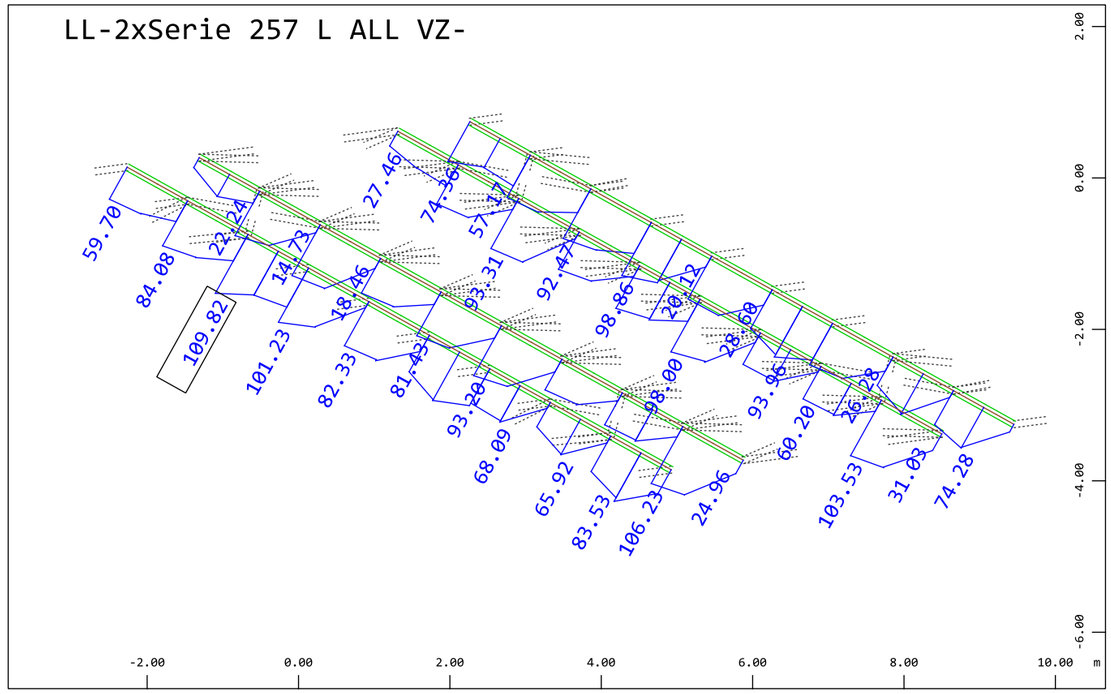
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1946 LL-2xSerie 257 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.27) (Max=0.44)

M 1 : 83
X * 0.502
Y * 0.906
Z * 0.962



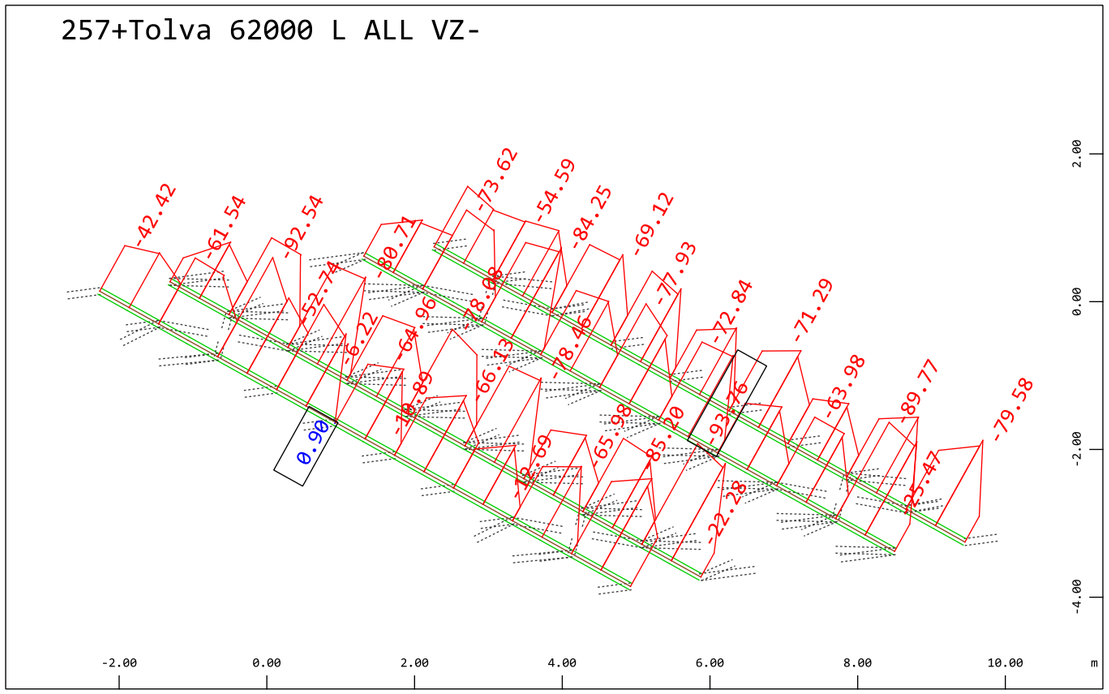

Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1946 LL-2xSerie 257 L ALL VZ-, Material
1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=109.82)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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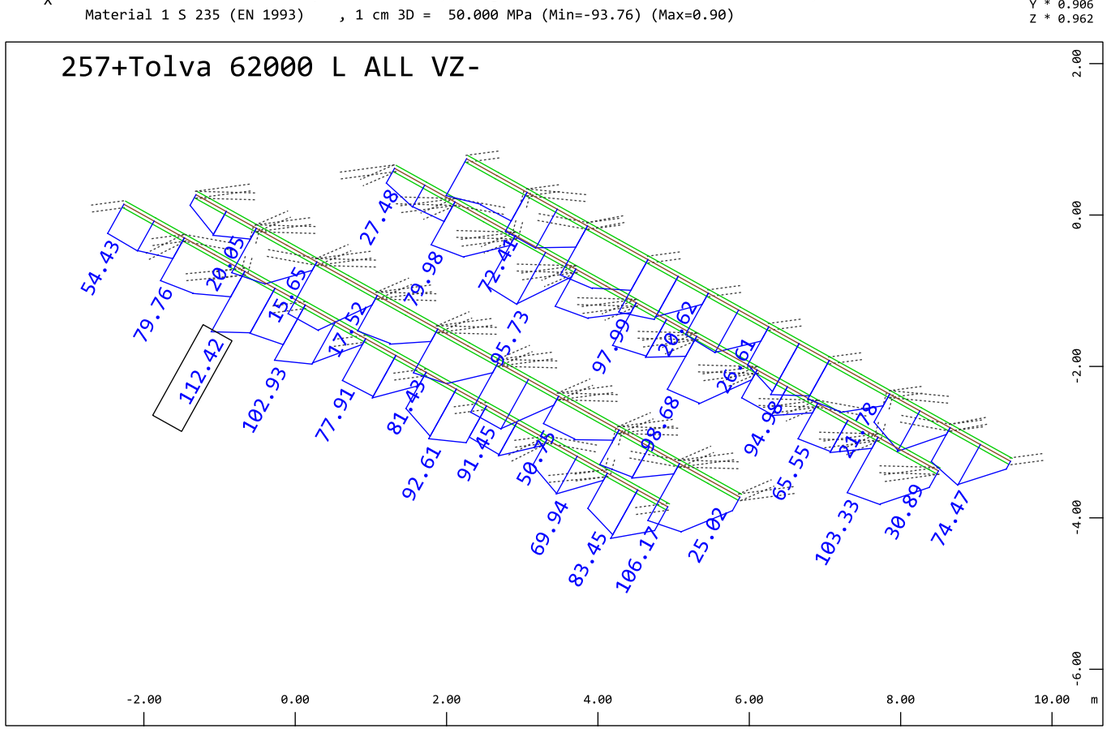
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1976 257+Tolva 62000 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.76) (Max=0.90)

M 1 : 83
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

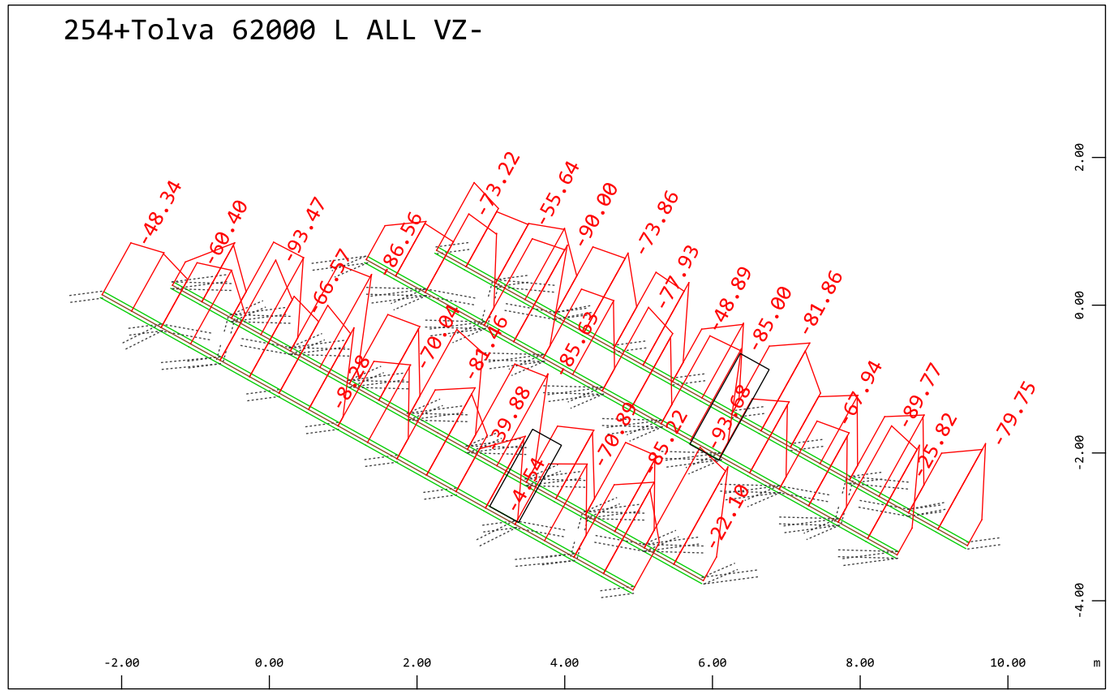
Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1976 257+Tolva 62000 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=112.42)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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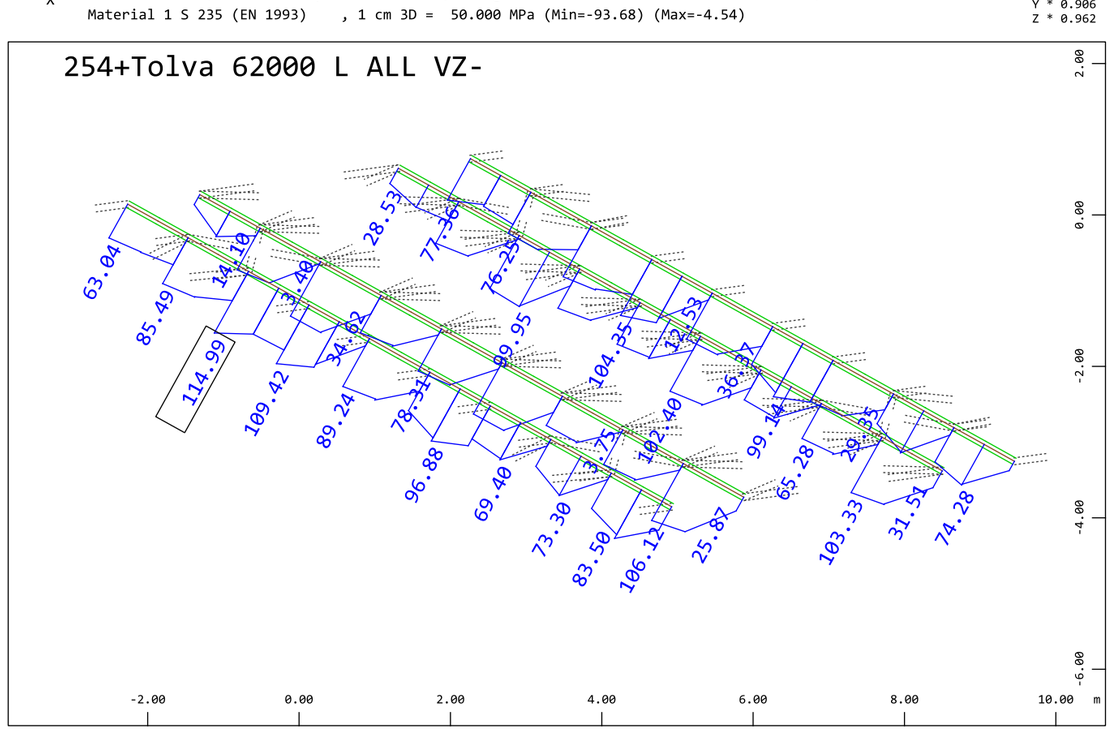
Pont Carretera Vic
Tensiones




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum compression stress, Design Case 1966 254+Tolva 62000 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 50.000 MPa (Min=-93.68) (Max=-4.54)

M 1 : 83
X * 0.502
Y * 0.906
Z * 0.962




Z
Y
X

Sector of system Group 31:Largueros
Beam Elements , Maximum tensile stress, Design Case 1966 254+Tolva 62000 L ALL VZ-,
Material 1 S 235 (EN 1993) , 1 cm 3D = 100.00 MPa (Max=114.99)

M 1 : 81
X * 0.502
Y * 0.906
Z * 0.962

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# APÈNDIX 3: FATIGA

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1924-1991

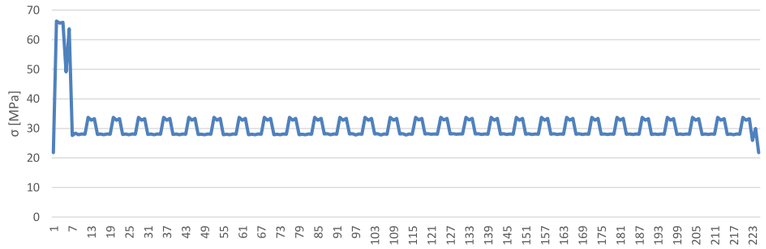
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

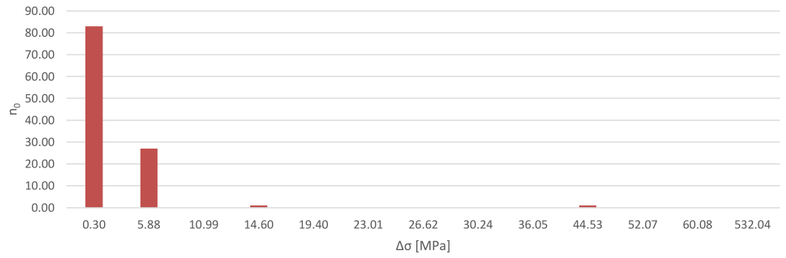
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.30 | 83.00 | 6089295 | - |
| 4.4 - 8.8 | - | 5.88 | 27.00 | 1980855 | - |
| 8.8 - 13.19 | - | 10.99 | 0.00 | 0 | - |
| 13.19 - 17.59 | - | 14.60 | 1.00 | 73365 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.53 | 1.00 | 73365 | 1861777 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.039 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1633 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1924-1991

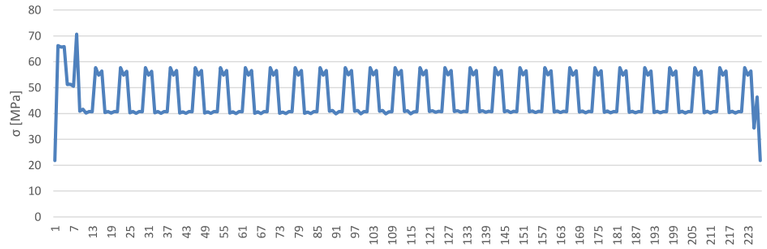
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

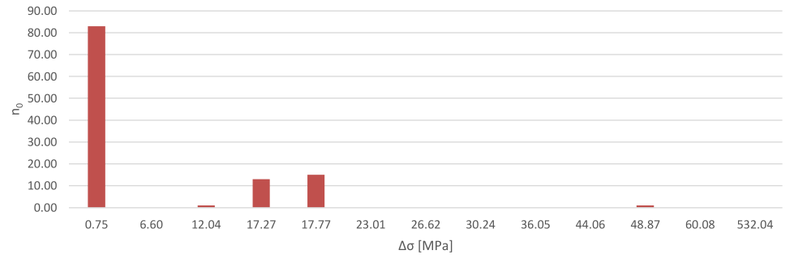
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.75 | 83.00 | 6089295 | - |
| 4.4 - 8.8 | - | 6.60 | 0.00 | 0 | - |
| 8.8 - 13.19 | - | 12.04 | 1.00 | 73365 | - |
| 13.19 - 17.59 | - | 17.27 | 13.00 | 953745 | - |
| 17.59 - 21.2 | 5 | 17.77 | 15.00 | 1100475 | 95441664 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 48.87 | 1.00 | 73365 | 1408597 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.064 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 986 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1924-1991

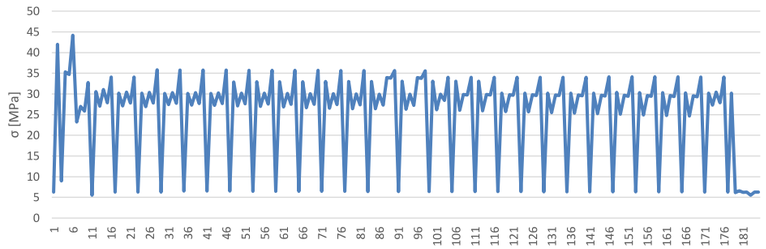
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

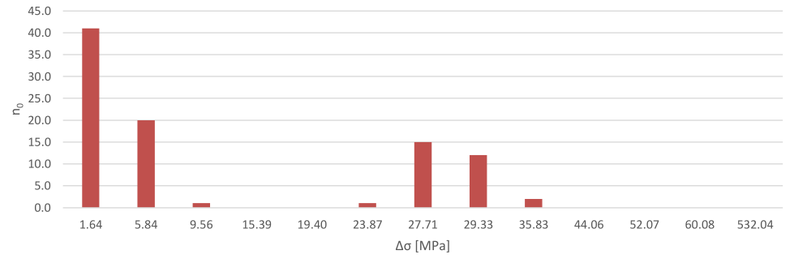
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 1.64 | 41.0 | 3007965 | - |
| 4.4 - 8.8 | - | 5.84 | 20.0 | 1467300 | - |
| 8.8 - 13.19 | - | 9.56 | 1.0 | 73365 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.87 | 1.0 | 73365 | 21797933 |
| 24.82 - 28.43 | 5 | 27.71 | 15.0 | 1100475 | 10346343 |
| 28.43 - 32.04 | 5 | 29.33 | 12.0 | 880380 | 7776134 |
| 32.04 - 40.05 | 3 | 35.83 | 2.0 | 146730 | 3574570 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.264 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 187 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1924-1991

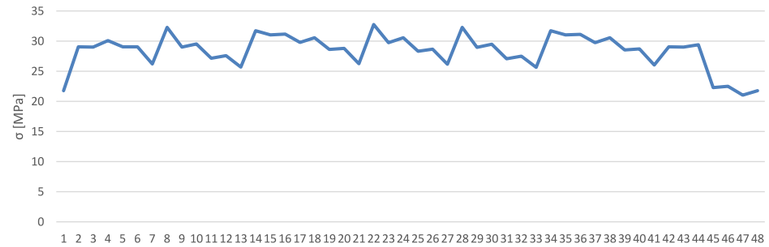
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

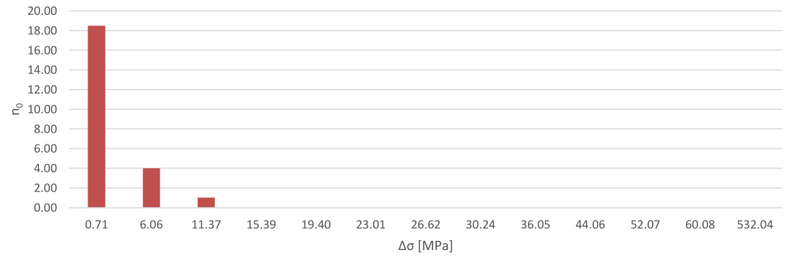
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.71 | 18.50 | 30764390 | - |
| 4.4 - 8.8 | - | 6.06 | 4.00 | 6651760 | - |
| 8.8 - 13.19 | - | 11.37 | 1.00 | 1662940 | - |
| 13.19 - 17.59 | - | 15.39 | 0.00 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1924-1991

PEDELTA

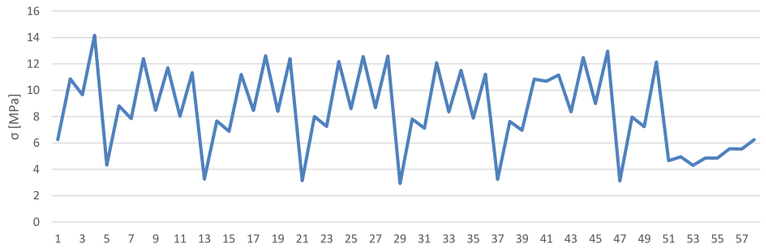
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

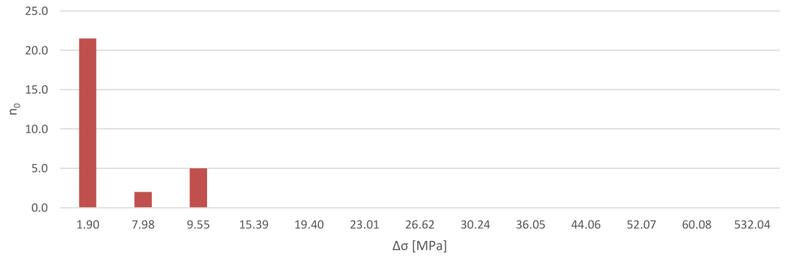
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 1.90 | 21.5 | 35753210 | - |
| 4.4 - 8.8 | - | 7.98 | 2.0 | 3325880 | - |
| 8.8 - 13.19 | - | 9.55 | 5.0 | 8314700 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1924-1991

PEDELTA

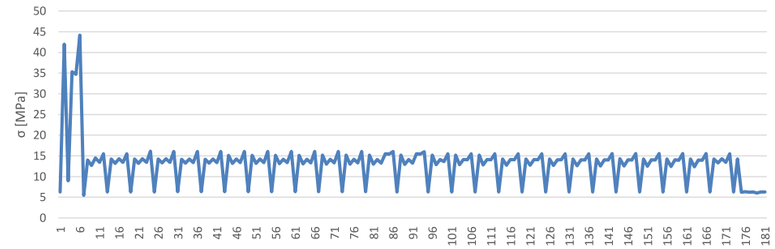
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

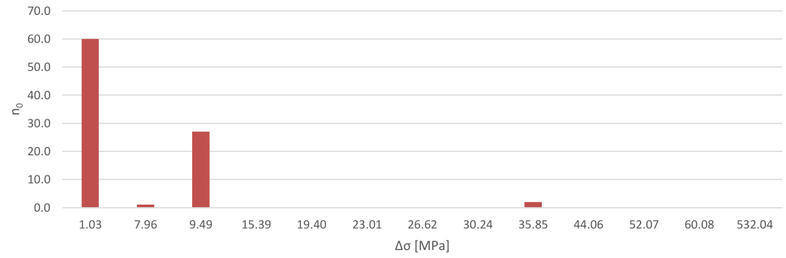
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 1.03 | 60.0 | 4401900 | - |
| 4.4 - 8.8 | - | 7.96 | 1.0 | 73365 | - |
| 8.8 - 13.19 | - | 9.49 | 27.0 | 1980855 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 35.85 | 2.0 | 146730 | 3568271 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.041 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1562 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 VACIO
**PERIODO** 1924-1991

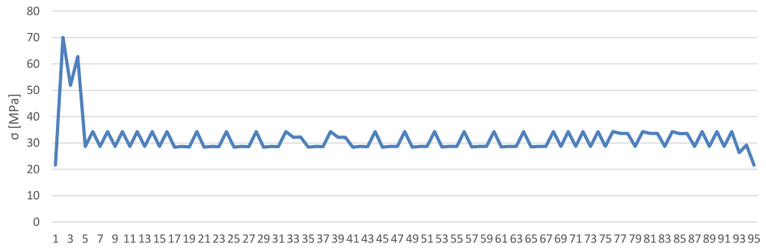
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.22 | 18.00 | 1320570 | - |
| 4.93 - 9.85 | - | 5.73 | 27.00 | 1980855 | - |
| 9.85 - 14.78 | - | 10.93 | 1.00 | 73365 | - |
| 14.78 - 19.7 | - | 17.24 | 0.00 | 0 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 48.41 | 1.00 | 73365 | 2035580 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.036 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1792 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1924-1991

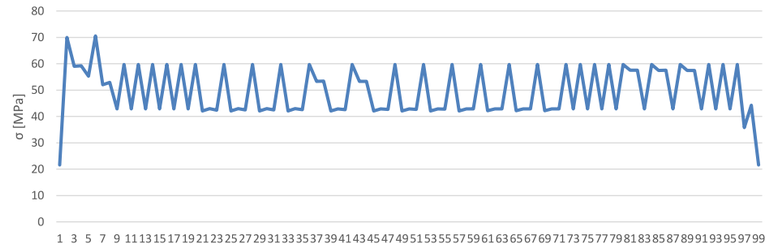
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

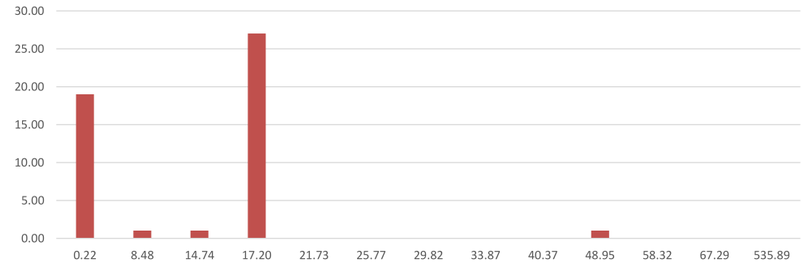
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.22 | 19.00 | 1393935 | - |
| 4.93 - 9.85 | - | 8.48 | 1.00 | 73365 | - |
| 9.85 - 14.78 | - | 14.74 | 1.00 | 73365 | - |
| 14.78 - 19.7 | - | 17.20 | 27.00 | 1980855 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 48.95 | 1.00 | 73365 | 1968839 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.037 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1731 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1924-1991

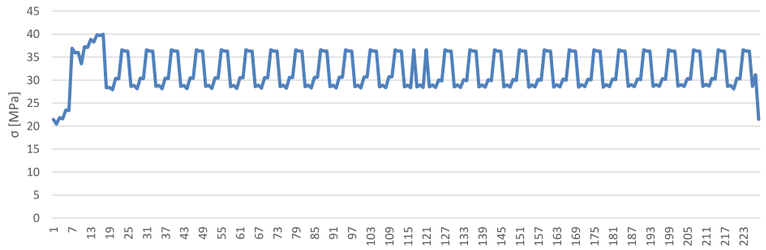
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

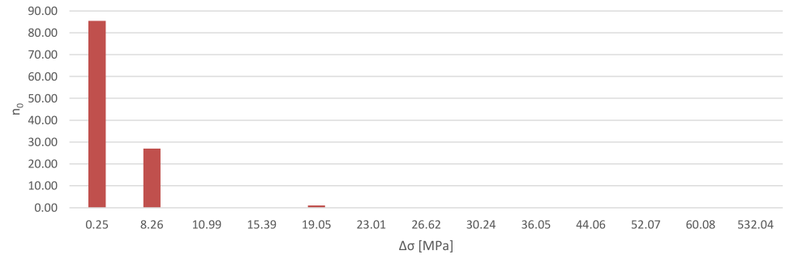
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.25 | 85.50 | 6272708 | - |
| 4.4 - 8.8 | - | 8.26 | 27.00 | 1980855 | - |
| 8.8 - 13.19 | - | 10.99 | 0.00 | 0 | - |
| 13.19 - 17.59 | - | 15.39 | 0.00 | 0 | - |
| 17.59 - 21.2 | 5 | 19.05 | 1.00 | 73365 | 67308632 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.001 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 61402 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1924-1991

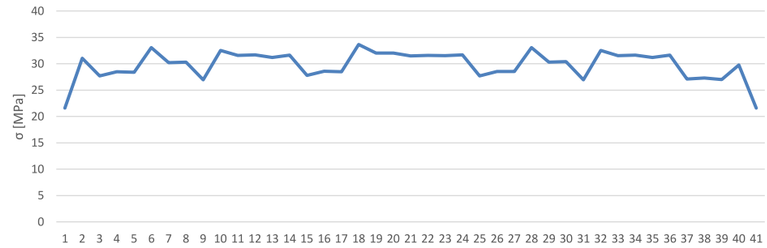
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

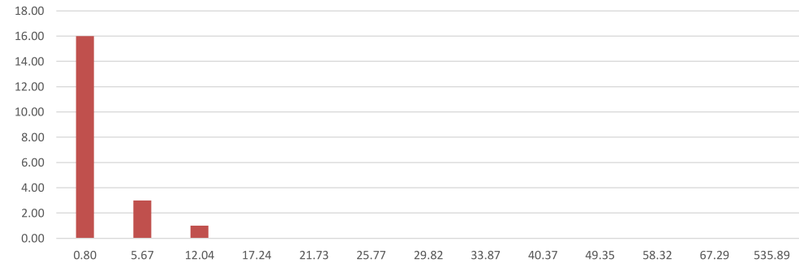
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.80 | 16.00 | 26607040 | - |
| 4.93 - 9.85 | - | 5.67 | 3.00 | 4988820 | - |
| 9.85 - 14.78 | - | 12.04 | 1.00 | 1662940 | - |
| 14.78 - 19.7 | - | 17.24 | 0.00 | 0 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1924-1991

PEDELTA

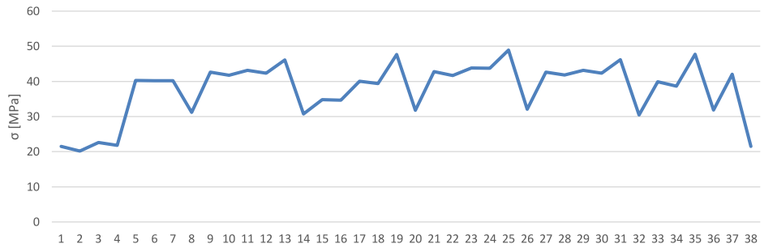
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

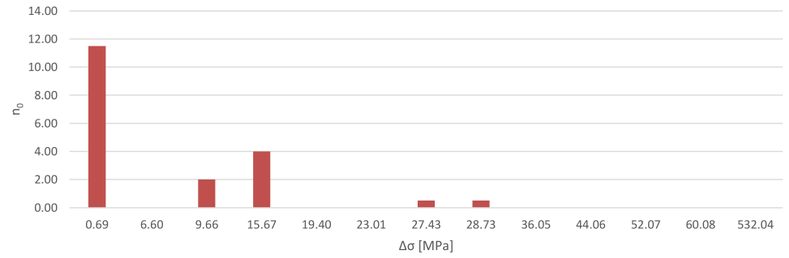
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.69 | 11.50 | 19123810 | - |
| 4.4 - 8.8 | - | 6.60 | 0.00 | 0 | - |
| 8.8 - 13.19 | - | 9.66 | 2.00 | 3325880 | - |
| 13.19 - 17.59 | - | 15.67 | 4.00 | 6651760 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 27.43 | 0.50 | 831470 | 10870981 |
| 28.43 - 32.04 | 5 | 28.73 | 0.50 | 831470 | 8631307 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.173 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 321 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1924-1991

PEDELTA

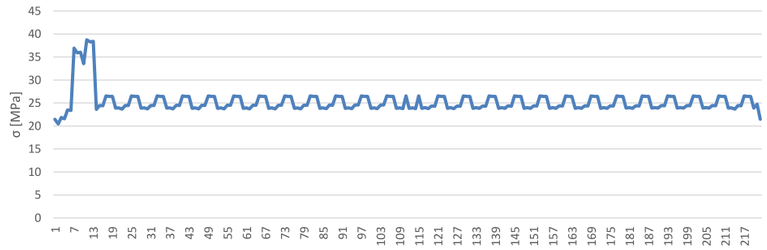
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

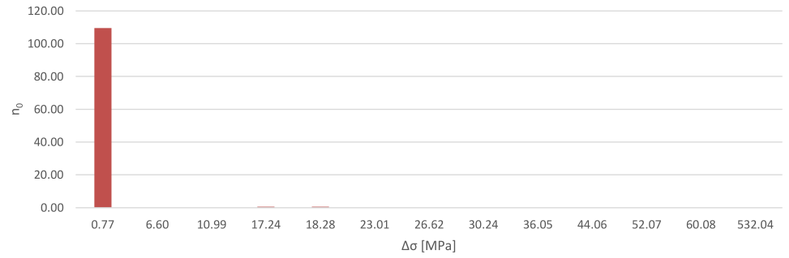
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.77 | 109.50 | 8033468 | - |
| 4.4 - 8.8 | - | 6.60 | 0.00 | 0 | - |
| 8.8 - 13.19 | - | 10.99 | 0.00 | 0 | - |
| 13.19 - 17.59 | - | 17.24 | 0.50 | 36683 | - |
| 17.59 - 21.2 | 5 | 18.28 | 0.50 | 36683 | 82760425 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 151094 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1924-1991

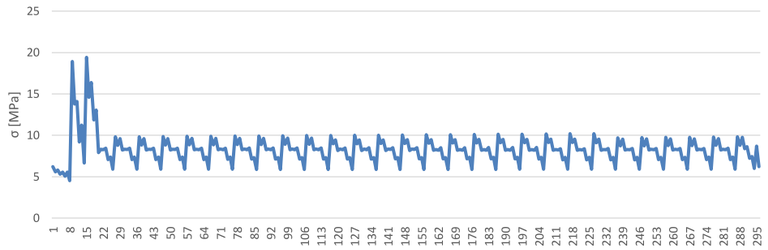
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

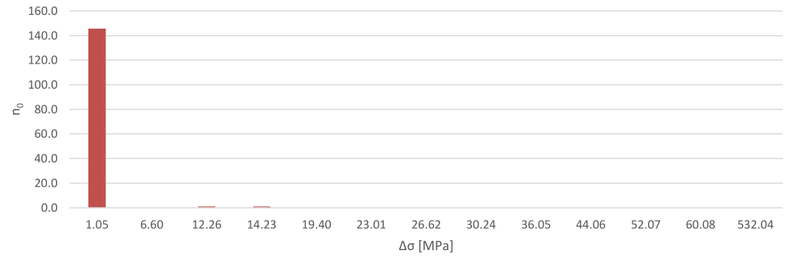
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 1.05 | 145.5 | 10674608 | - |
| 4.4 - 8.8 | - | 6.60 | 0.0 | 0 | - |
| 8.8 - 13.19 | - | 12.26 | 1.0 | 73365 | - |
| 13.19 - 17.59 | - | 14.23 | 1.0 | 73365 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1924-1991

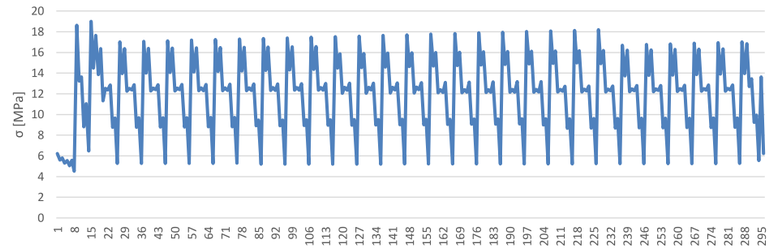
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

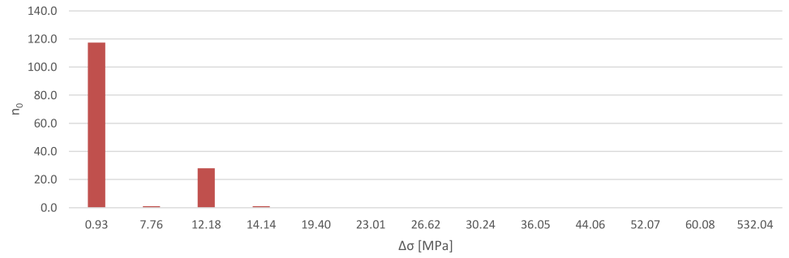
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.93 | 117.5 | 8620388 | - |
| 4.4 - 8.8 | - | 7.76 | 1.0 | 73365 | - |
| 8.8 - 13.19 | - | 12.18 | 28.0 | 2054220 | - |
| 13.19 - 17.59 | - | 14.14 | 1.0 | 73365 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1924-1991

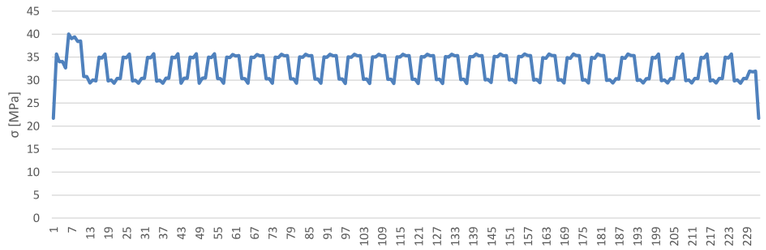
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

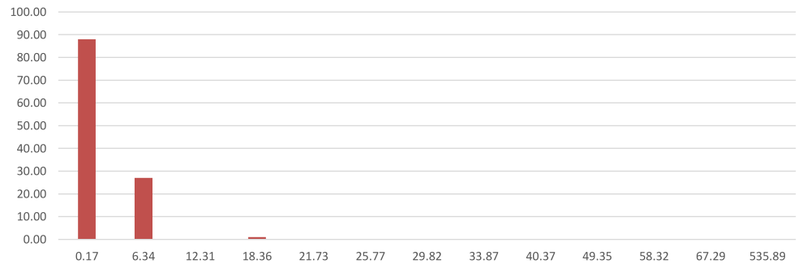
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.17 | 88.00 | 6456120 | - |
| 4.93 - 9.85 | - | 6.34 | 27.00 | 1980855 | - |
| 9.85 - 14.78 | - | 12.31 | 0.00 | 0 | - |
| 14.78 - 19.7 | - | 18.36 | 1.00 | 73365 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1924-1991

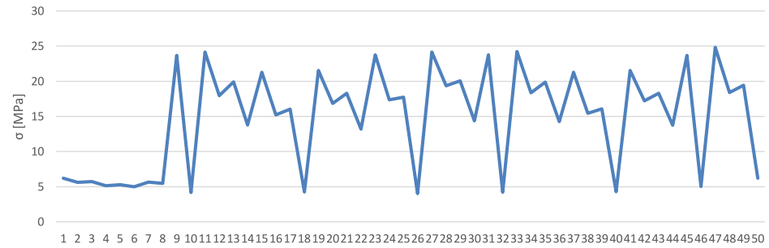
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

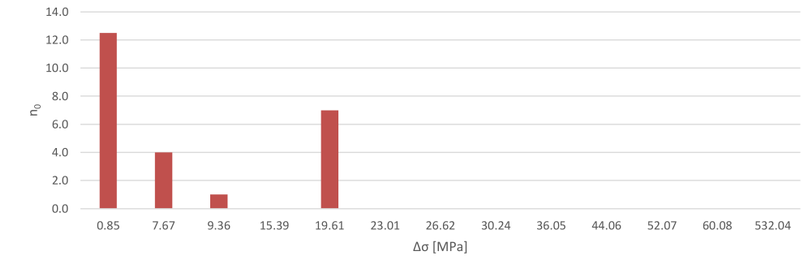
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.85 | 12.5 | 20786750 | - |
| 4.4 - 8.8 | - | 7.67 | 4.0 | 6651760 | - |
| 8.8 - 13.19 | - | 9.36 | 1.0 | 1662940 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.61 | 7.0 | 11640580 | 58195380 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.200 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 268 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1924-1991

PEDELTA

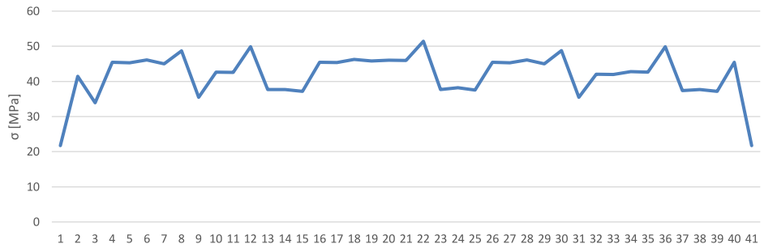
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

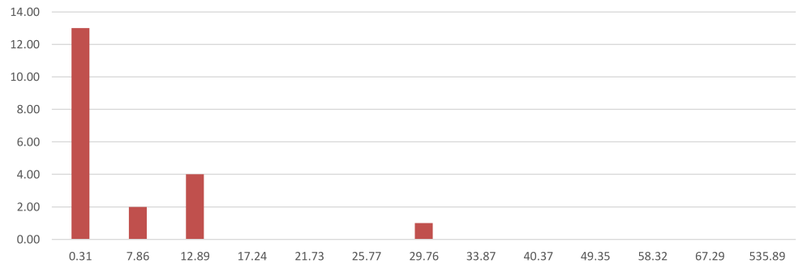
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.31 | 13.00 | 21618220 | - |
| 4.93 - 9.85 | - | 7.86 | 2.00 | 3325880 | - |
| 9.85 - 14.78 | - | 12.89 | 4.00 | 6651760 | - |
| 14.78 - 19.7 | - | 17.24 | 0.00 | 0 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.76 | 1.00 | 1662940 | 12742801 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.131 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 446 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1924-1991

PEDELTA

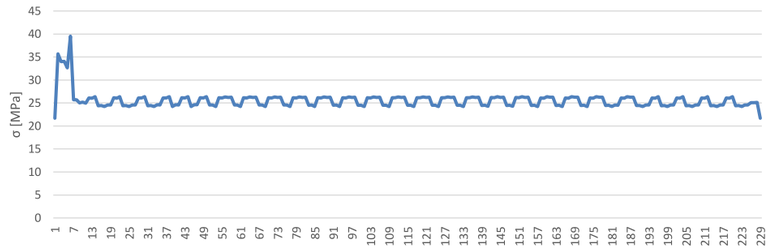
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 67 | Años | *Años* |

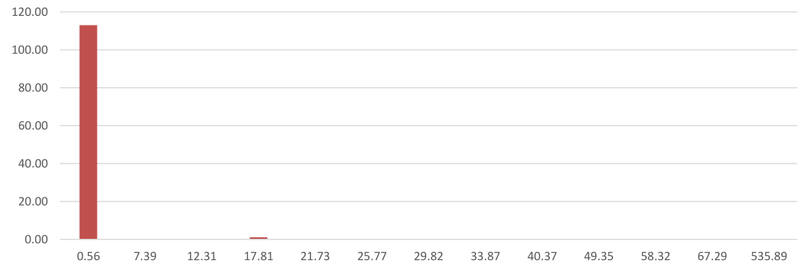
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.56 | 113.00 | 8290245 | - |
| 4.93 - 9.85 | - | 7.39 | 0.00 | 0 | - |
| 9.85 - 14.78 | - | 12.31 | 0.00 | 0 | - |
| 14.78 - 19.7 | - | 17.81 | 1.00 | 73365 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1991-2024

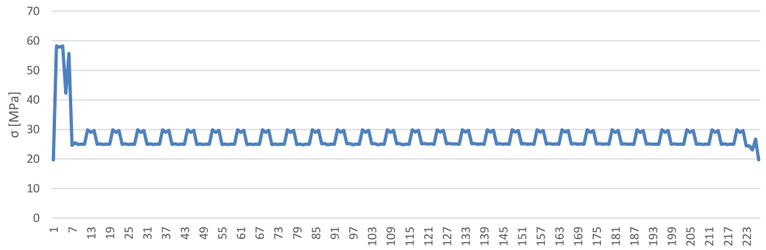
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

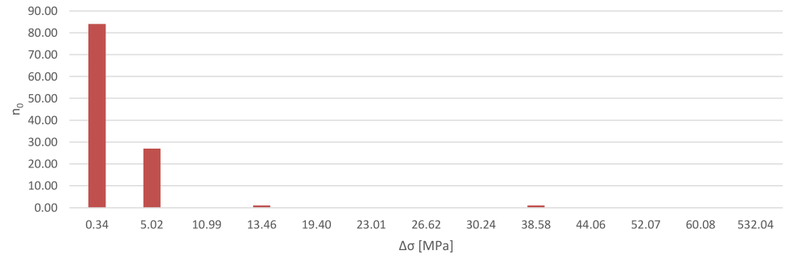
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.34 | 84.00 | 3035340 | - |
| 4.4 - 8.8 | - | 5.02 | 27.00 | 975645 | - |
| 8.8 - 13.19 | - | 10.99 | 0.00 | 0 | - |
| 13.19 - 17.59 | - | 13.46 | 1.00 | 36135 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 38.58 | 1.00 | 36135 | 2863023 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.013 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 2582 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1991-2024

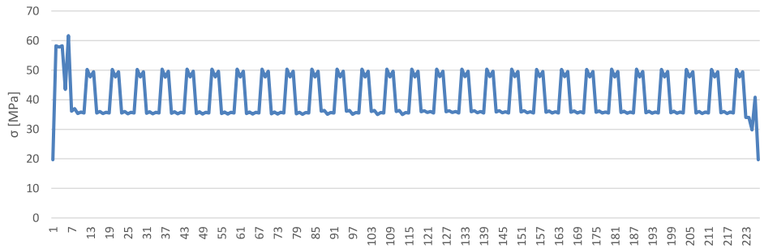
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

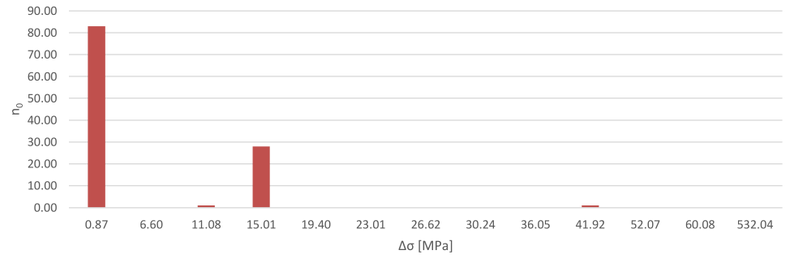
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.87 | 83.00 | 2999205 | - |
| 4.4 - 8.8 | - | 6.60 | 0.00 | 0 | - |
| 8.8 - 13.19 | - | 11.08 | 1.00 | 36135 | - |
| 13.19 - 17.59 | - | 15.01 | 28.00 | 1011780 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 41.92 | 1.00 | 36135 | 2230830 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.016 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 2004 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1991-2024

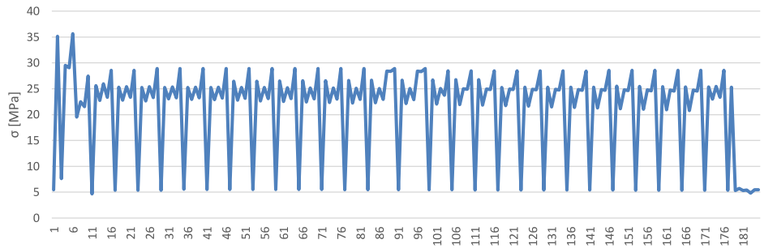
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

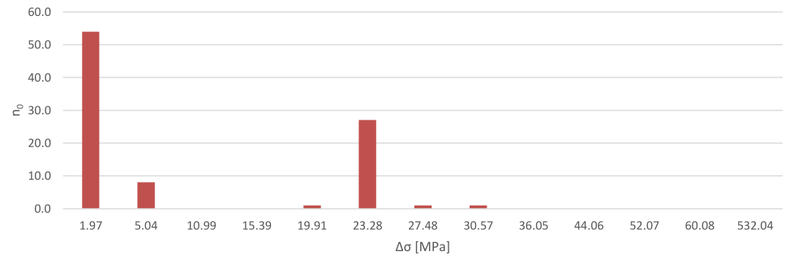
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 1.97 | 54.0 | 1951290 | - |
| 4.4 - 8.8 | - | 5.04 | 8.0 | 289080 | - |
| 8.8 - 13.19 | - | 10.99 | 0.0 | 0 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.91 | 1.0 | 36135 | 53937499 |
| 21.2 - 24.82 | 5 | 23.28 | 27.0 | 975645 | 24724815 |
| 24.82 - 28.43 | 5 | 27.48 | 1.0 | 36135 | 10785439 |
| 28.43 - 32.04 | 5 | 30.57 | 1.0 | 36135 | 6326351 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.049 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 638 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1991-2024

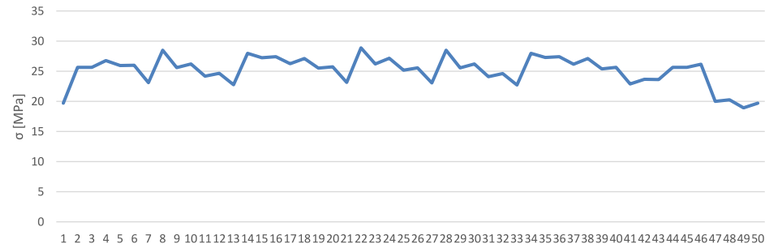
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

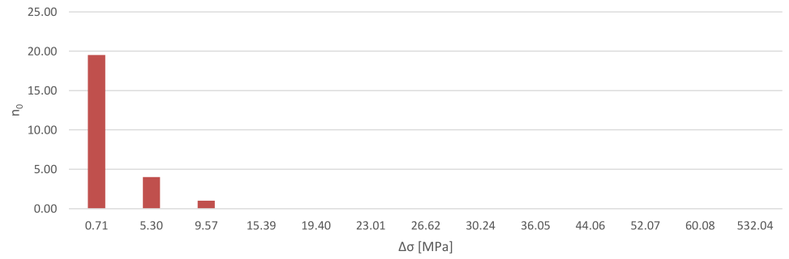
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.71 | 19.50 | 15971670 | - |
| 4.4 - 8.8 | - | 5.30 | 4.00 | 3276240 | - |
| 8.8 - 13.19 | - | 9.57 | 1.00 | 819060 | - |
| 13.19 - 17.59 | - | 15.39 | 0.00 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1991-2024

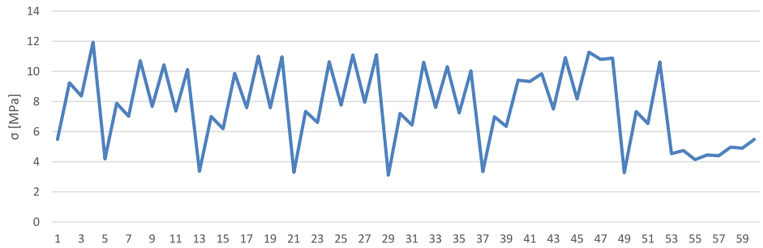
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

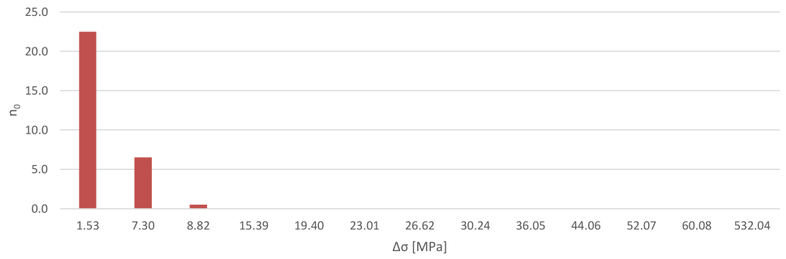
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 1.53 | 22.5 | 18428850 | - |
| 4.4 - 8.8 | - | 7.30 | 6.5 | 5323890 | - |
| 8.8 - 13.19 | - | 8.82 | 0.5 | 409530 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1991-2024

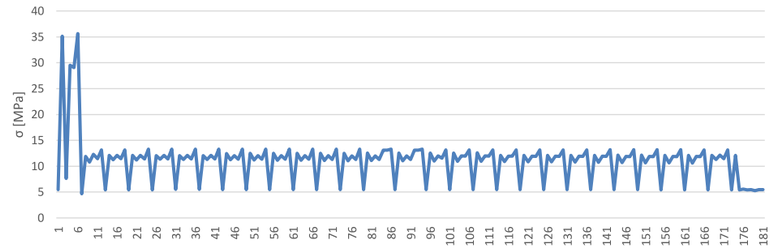
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

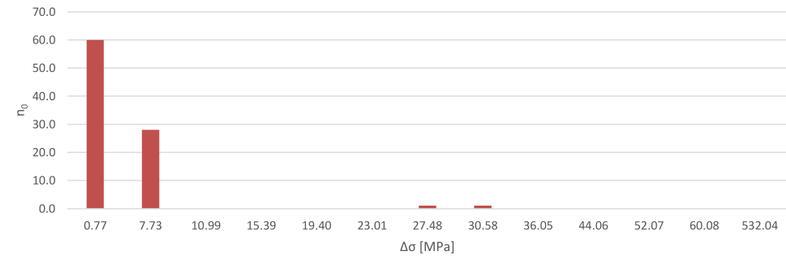
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.77 | 60.0 | 2168100 | - |
| 4.4 - 8.8 | - | 7.73 | 28.0 | 1011780 | - |
| 8.8 - 13.19 | - | 10.99 | 0.0 | 0 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 27.48 | 1.0 | 36135 | 10785439 |
| 28.43 - 32.04 | 5 | 30.58 | 1.0 | 36135 | 6320441 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.009 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 3606 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1991-2024

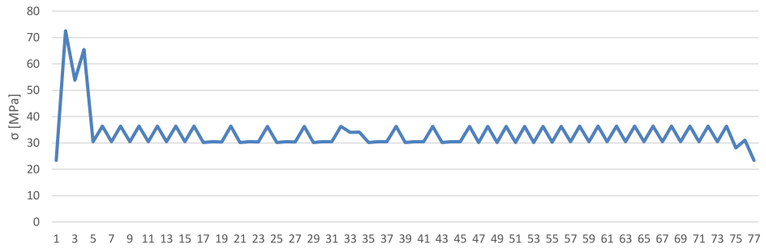
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.37 | 9.00 | 325215 | - |
| 4.93 - 9.85 | - | 5.99 | 27.00 | 975645 | - |
| 9.85 - 14.78 | - | 11.61 | 1.00 | 36135 | - |
| 14.78 - 19.7 | - | 17.24 | 0.00 | 0 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.18 | 1.00 | 36135 | 1941103 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.019 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1740 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1991-2024

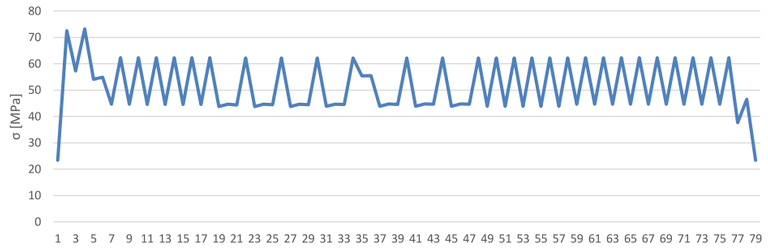
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.22 | 9.00 | 325215 | - |
| 4.93 - 9.85 | - | 8.82 | 1.00 | 36135 | - |
| 9.85 - 14.78 | - | 12.31 | 0.00 | 0 | - |
| 14.78 - 19.7 | - | 17.87 | 28.00 | 1011780 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.84 | 1.00 | 36135 | 1865781 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.019 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1671 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1991-2024

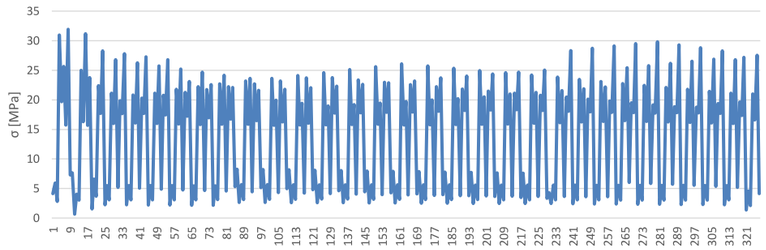
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

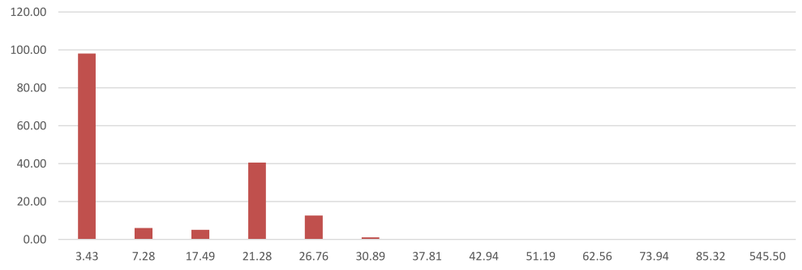
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 3.43 | 98.00 | 3541230 | - |
| 6.25 - 12.49 | - | 7.28 | 6.00 | 216810 | - |
| 12.49 - 18.74 | - | 17.49 | 5.00 | 180675 | - |
| 18.74 - 24.98 | - | 21.28 | 40.50 | 1463468 | - |
| 24.98 - 30.11 | 5 | 26.76 | 12.50 | 451688 | 71079011 |
| 30.11 - 35.24 | 5 | 30.89 | 1.00 | 36135 | 34669101 |
| 35.24 - 40.37 | 5 | 37.81 | 0.00 | 0 | 12626749 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.007 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 4428 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1991-2024

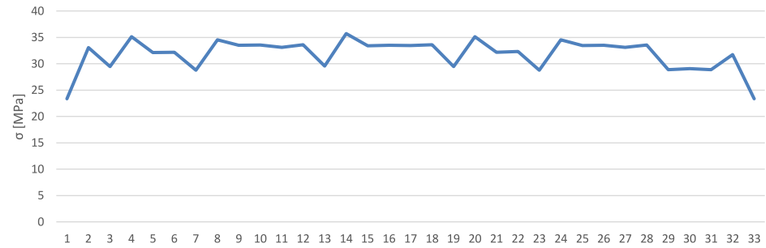
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

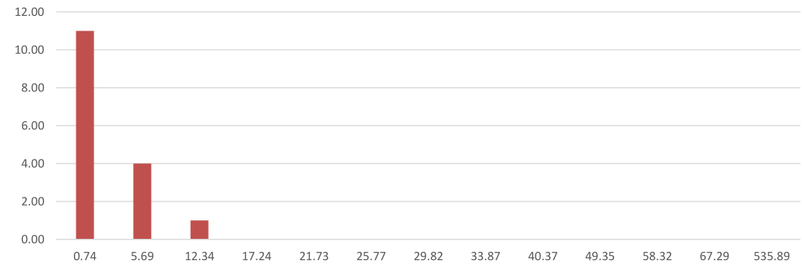
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.74 | 11.00 | 9009660 | - |
| 4.93 - 9.85 | - | 5.69 | 4.00 | 3276240 | - |
| 9.85 - 14.78 | - | 12.34 | 1.00 | 819060 | - |
| 14.78 - 19.7 | - | 17.24 | 0.00 | 0 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1991-2024

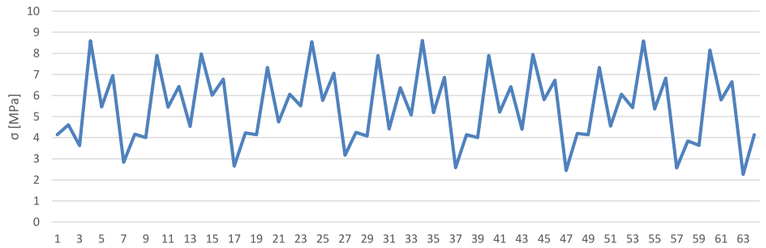
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

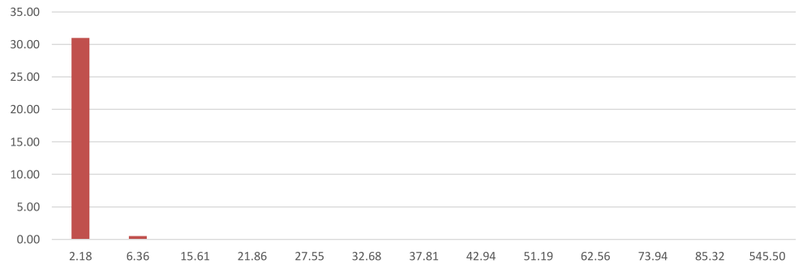
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 2.18 | 31.00 | 25390860 | - |
| 6.25 - 12.49 | - | 6.36 | 0.50 | 409530 | - |
| 12.49 - 18.74 | - | 15.61 | 0.00 | 0 | - |
| 18.74 - 24.98 | - | 21.86 | 0.00 | 0 | - |
| 24.98 - 30.11 | 5 | 27.55 | 0.00 | 0 | 61496103 |
| 30.11 - 35.24 | 5 | 32.68 | 0.00 | 0 | 26180008 |
| 35.24 - 40.37 | 5 | 37.81 | 0.00 | 0 | 12626749 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1991-2024

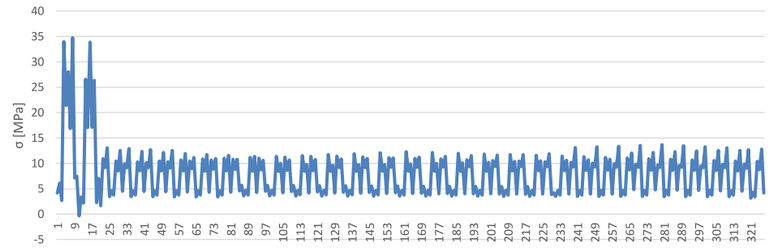
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

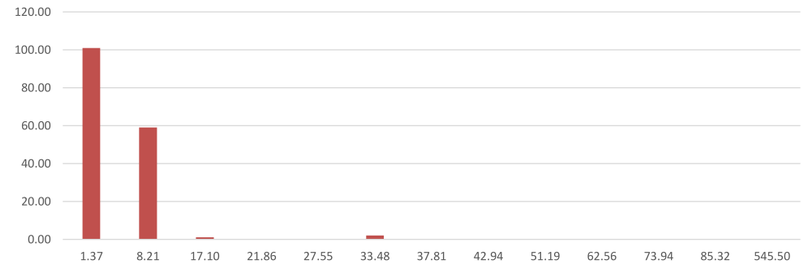
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 1.37 | 101.00 | 3649635 | - |
| 6.25 - 12.49 | - | 8.21 | 59.00 | 2131965 | - |
| 12.49 - 18.74 | - | 17.10 | 1.00 | 36135 | - |
| 18.74 - 24.98 | - | 21.86 | 0.00 | 0 | - |
| 24.98 - 30.11 | 5 | 27.55 | 0.00 | 0 | 61496103 |
| 30.11 - 35.24 | 5 | 33.48 | 2.00 | 72270 | 23179472 |
| 35.24 - 40.37 | 5 | 37.81 | 0.00 | 0 | 12626749 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.003 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 10551 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1991-2024

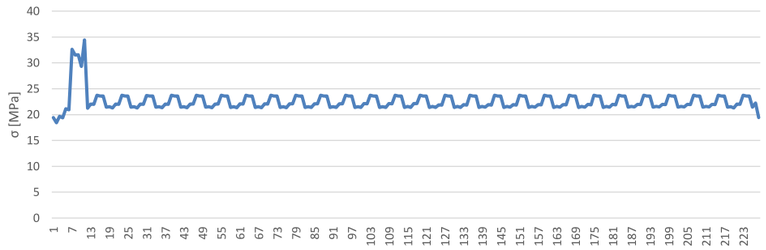
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

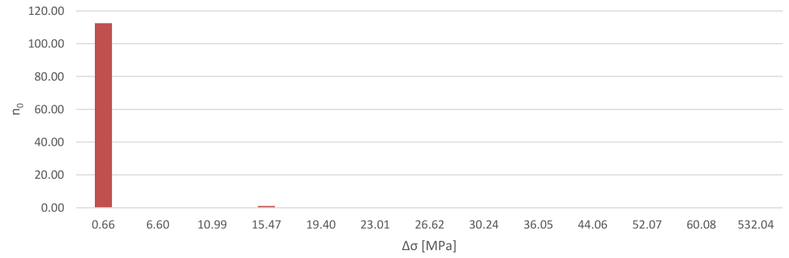
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.66 | 112.50 | 4065188 | - |
| 4.4 - 8.8 | - | 6.60 | 0.00 | 0 | - |
| 8.8 - 13.19 | - | 10.99 | 0.00 | 0 | - |
| 13.19 - 17.59 | - | 15.47 | 1.00 | 36135 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1991-2024

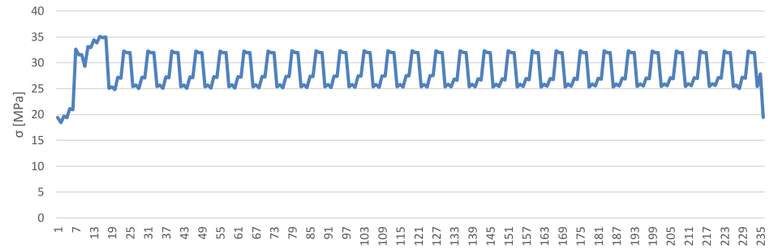
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

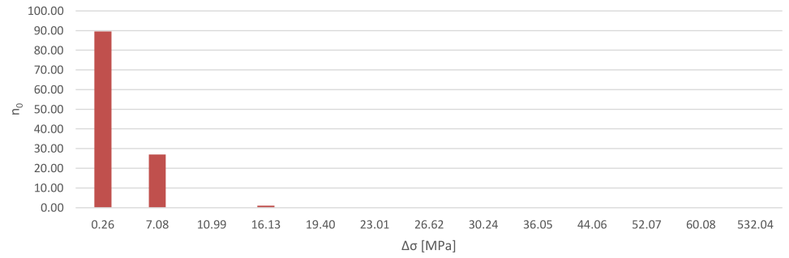
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.26 | 89.50 | 3234083 | - |
| 4.4 - 8.8 | - | 7.08 | 27.00 | 975645 | - |
| 8.8 - 13.19 | - | 10.99 | 0.00 | 0 | - |
| 13.19 - 17.59 | - | 16.13 | 1.00 | 36135 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1991-2024

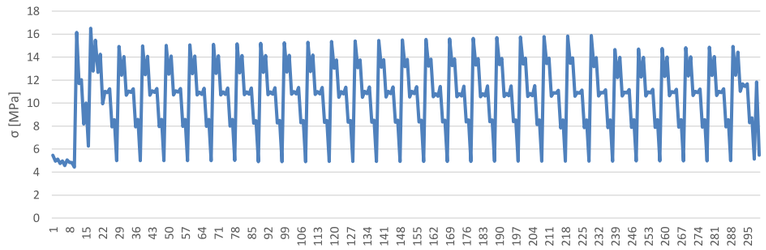
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

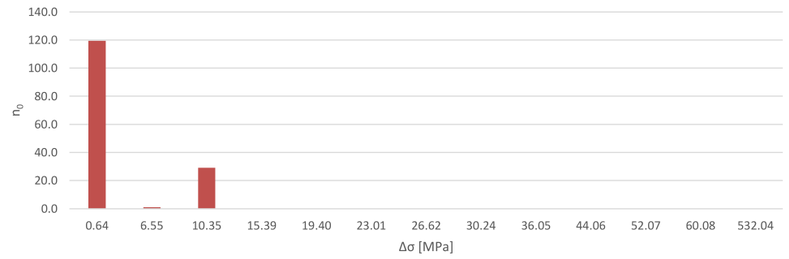
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.64 | 119.5 | 4318133 | - |
| 4.4 - 8.8 | - | 6.55 | 1.0 | 36135 | - |
| 8.8 - 13.19 | - | 10.35 | 29.0 | 1047915 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1991-2024

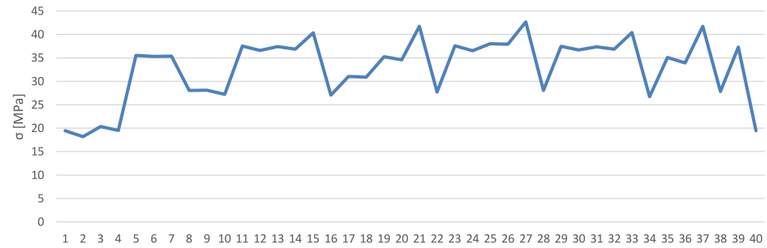
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

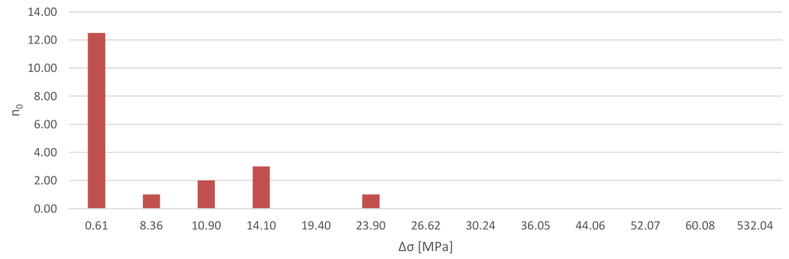
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.61 | 12.50 | 10238250 | - |
| 4.4 - 8.8 | - | 8.36 | 1.00 | 819060 | - |
| 8.8 - 13.19 | - | 10.90 | 2.00 | 1638120 | - |
| 13.19 - 17.59 | - | 14.10 | 3.00 | 2457180 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.90 | 1.00 | 819060 | 21647478 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.038 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 839 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1991-2024

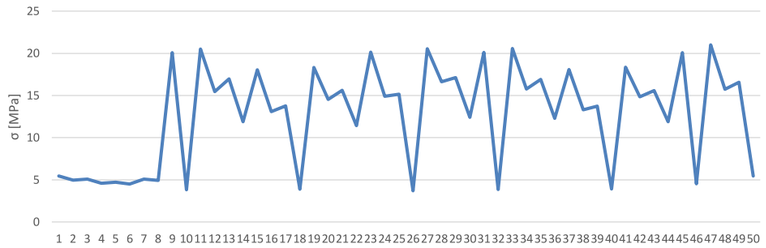
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

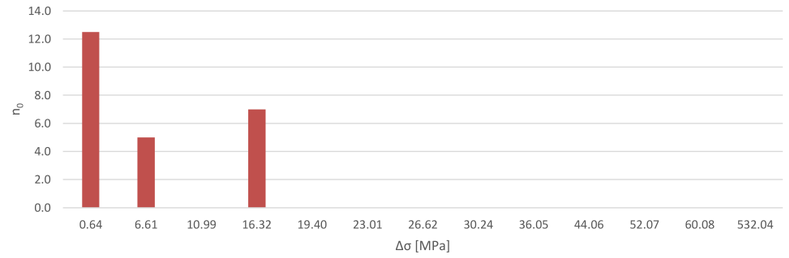
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.64 | 12.5 | 10238250 | - |
| 4.4 - 8.8 | - | 6.61 | 5.0 | 4095300 | - |
| 8.8 - 13.19 | - | 10.99 | 0.0 | 0 | - |
| 13.19 - 17.59 | - | 16.32 | 7.0 | 5733420 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1991-2024

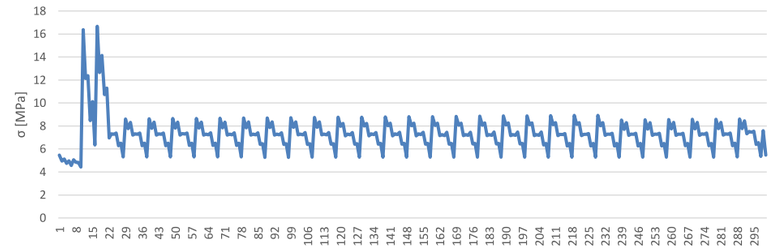
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

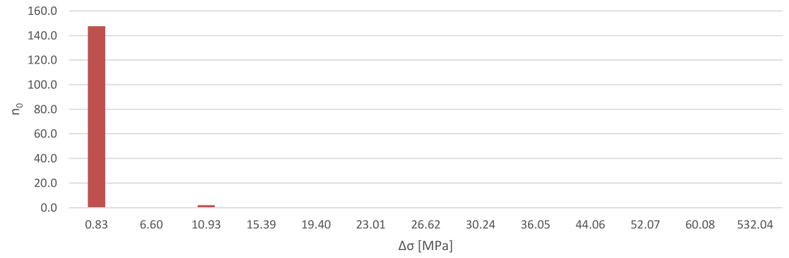
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.83 | 147.5 | 5329913 | - |
| 4.4 - 8.8 | - | 6.60 | 0.0 | 0 | - |
| 8.8 - 13.19 | - | 10.93 | 2.0 | 72270 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1991-2024

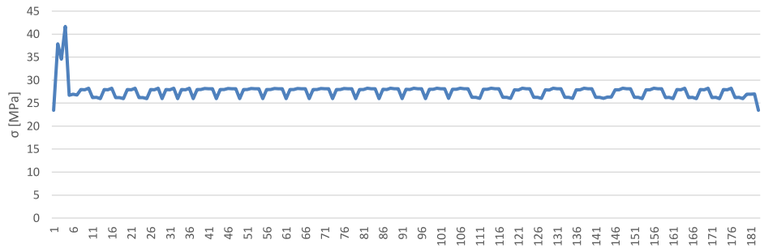
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

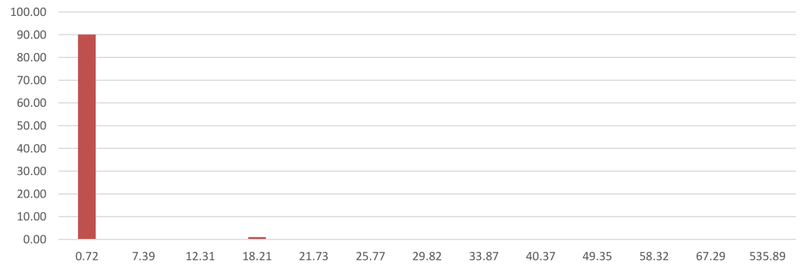
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.72 | 90.00 | 3252150 | - |
| 4.93 - 9.85 | - | 7.39 | 0.00 | 0 | - |
| 9.85 - 14.78 | - | 12.31 | 0.00 | 0 | - |
| 14.78 - 19.7 | - | 18.21 | 1.00 | 36135 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1991-2024

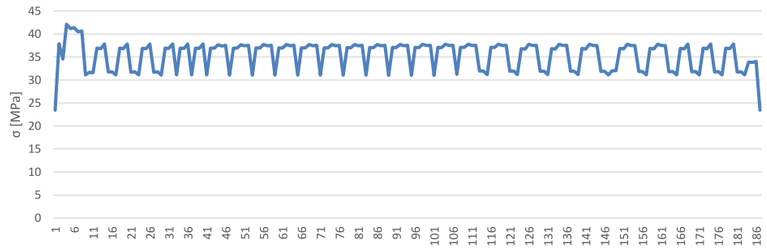
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

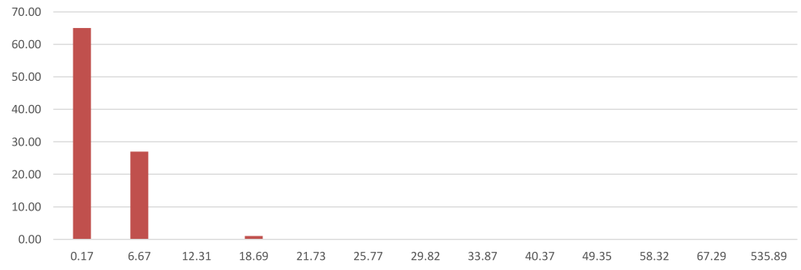
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.17 | 65.00 | 2348775 | - |
| 4.93 - 9.85 | - | 6.67 | 27.00 | 975645 | - |
| 9.85 - 14.78 | - | 12.31 | 0.00 | 0 | - |
| 14.78 - 19.7 | - | 18.69 | 1.00 | 36135 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 LLENO
**PERIODO** 1991-2024

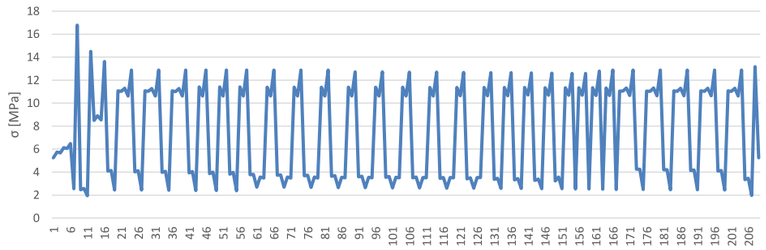
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

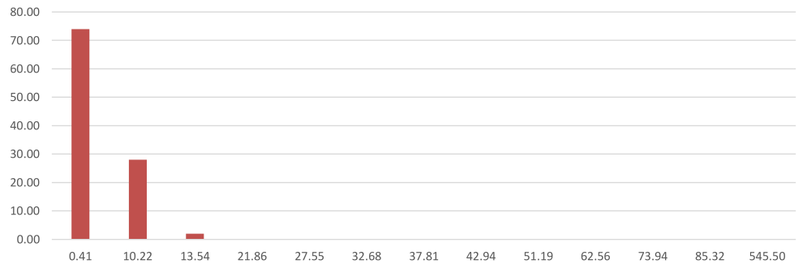
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 0.41 | 74.00 | 2673990 | - |
| 6.25 - 12.49 | - | 10.22 | 28.00 | 1011780 | - |
| 12.49 - 18.74 | - | 13.54 | 2.00 | 72270 | - |
| 18.74 - 24.98 | - | 21.86 | 0.00 | 0 | - |
| 24.98 - 30.11 | 5 | 27.55 | 0.00 | 0 | 61496103 |
| 30.11 - 35.24 | 5 | 32.68 | 0.00 | 0 | 26180008 |
| 35.24 - 40.37 | 5 | 37.81 | 0.00 | 0 | 12626749 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |



### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1991-2024

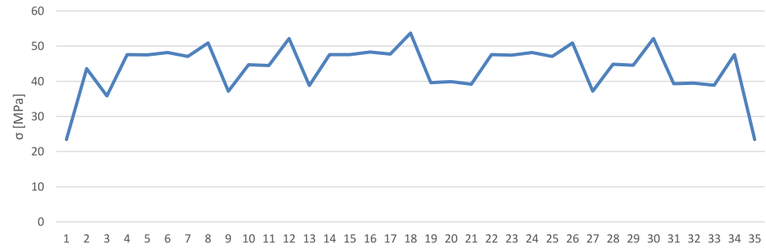
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

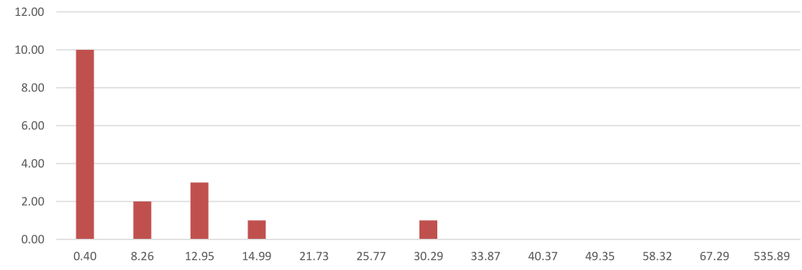
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.40 | 10.00 | 8190600 | - |
| 4.93 - 9.85 | - | 8.26 | 2.00 | 1638120 | - |
| 9.85 - 14.78 | - | 12.95 | 3.00 | 2457180 | - |
| 14.78 - 19.7 | - | 14.99 | 1.00 | 819060 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 30.29 | 1.00 | 819060 | 11676310 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |



### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.070 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 437 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 1991-2024

PEDELTA

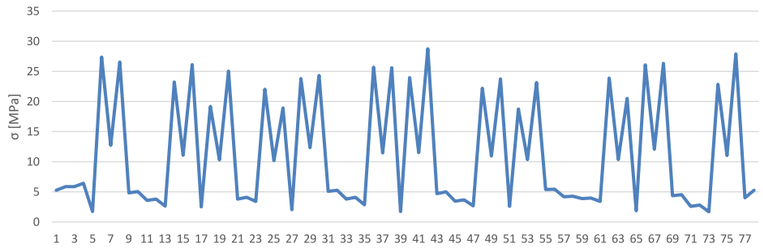
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

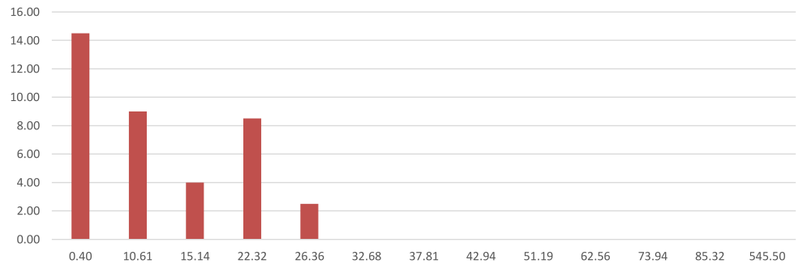
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 0.40 | 14.50 | 11876370 | - |
| 6.25 - 12.49 | - | 10.61 | 9.00 | 7371540 | - |
| 12.49 - 18.74 | - | 15.14 | 4.00 | 3276240 | - |
| 18.74 - 24.98 | - | 22.32 | 8.50 | 6962010 | - |
| 24.98 - 30.11 | 5 | 26.36 | 2.50 | 2047650 | 76664603 |
| 30.11 - 35.24 | 5 | 32.68 | 0.00 | 0 | 26180008 |
| 35.24 - 40.37 | 5 | 37.81 | 0.00 | 0 | 12626749 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.027 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1203 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA PASAJEROS
**VEHÍCULO:** SERIE 254 VACÍO
**PERIODO** 1991-2024

PEDELTA

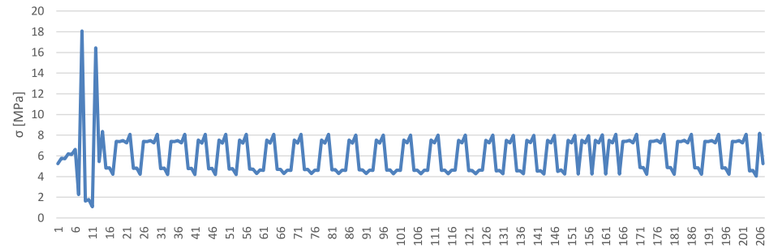
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 33 | Años | *Años* |

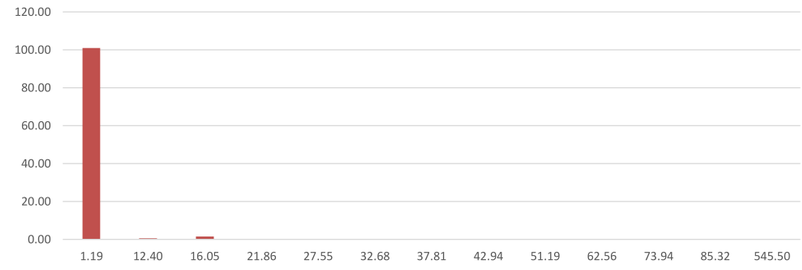
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 1.19 | 101.00 | 3649635 | - |
| 6.25 - 12.49 | - | 12.40 | 0.50 | 18068 | - |
| 12.49 - 18.74 | - | 16.05 | 1.50 | 54203 | - |
| 18.74 - 24.98 | - | 21.86 | 0.00 | 0 | - |
| 24.98 - 30.11 | 5 | 27.55 | 0.00 | 0 | 61496103 |
| 30.11 - 35.24 | 5 | 32.68 | 0.00 | 0 | 26180008 |
| 35.24 - 40.37 | 5 | 37.81 | 0.00 | 0 | 12626749 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 257 VACÍO
**PERIODO** 2024-2124

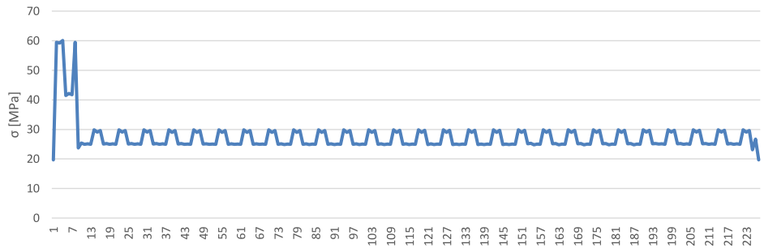
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

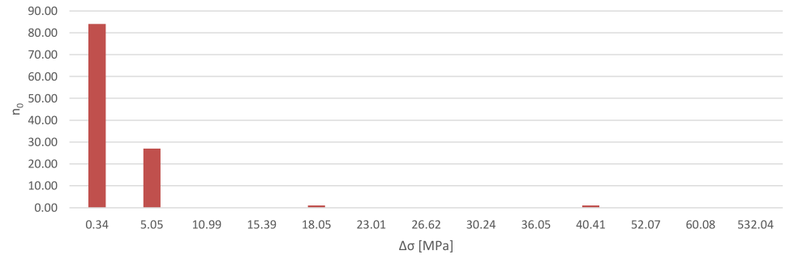
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.34 | 84.00 | 9198000 | - |
| 4.4 - 8.8 | - | 5.05 | 27.00 | 2956500 | - |
| 8.8 - 13.19 | - | 10.99 | 0.00 | 0 | - |
| 13.19 - 17.59 | - | 15.39 | 0.00 | 0 | - |
| 17.59 - 21.2 | 5 | 18.05 | 1.00 | 109500 | 88096068 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 40.41 | 1.00 | 109500 | 2490476 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.045 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 2112 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 257 LLENO
**PERIODO** 2024-2124

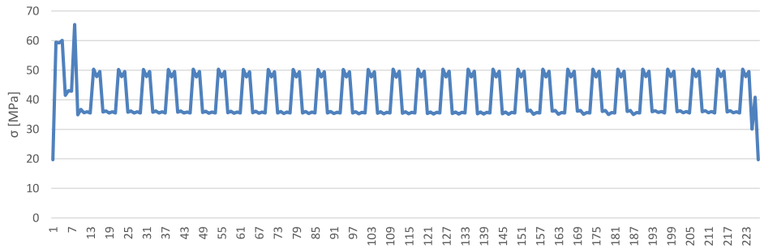
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

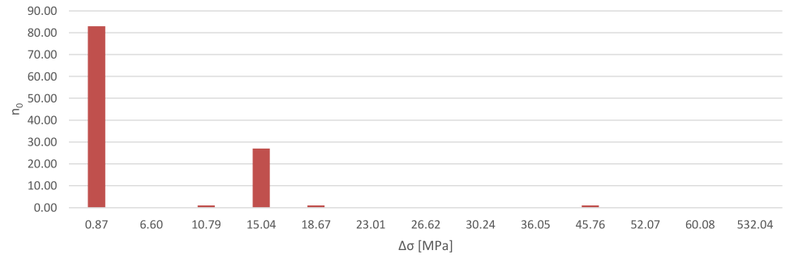
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.87 | 83.00 | 9088500 | - |
| 4.4 - 8.8 | - | 6.60 | 0.00 | 0 | - |
| 8.8 - 13.19 | - | 10.79 | 1.00 | 109500 | - |
| 13.19 - 17.59 | - | 15.04 | 27.00 | 2956500 | - |
| 17.59 - 21.2 | 5 | 18.67 | 1.00 | 109500 | 74407940 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 45.76 | 1.00 | 109500 | 1715472 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.065 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1431 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 257 LLENO
**PERIODO** 2024-2124

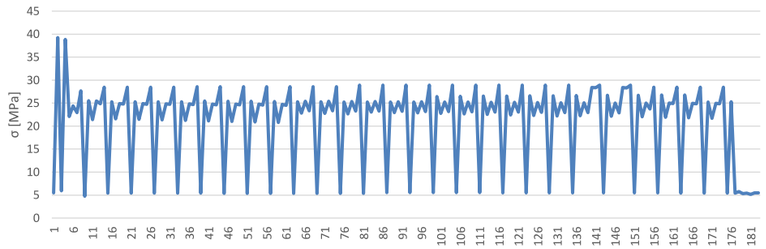
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

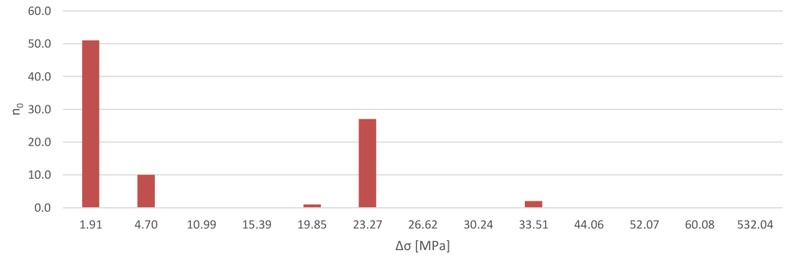
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 1.91 | 51.0 | 5584500 | - |
| 4.4 - 8.8 | - | 4.70 | 10.0 | 1095000 | - |
| 8.8 - 13.19 | - | 10.99 | 0.0 | 0 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.85 | 1.0 | 109500 | 54783806 |
| 21.2 - 24.82 | 5 | 23.27 | 27.0 | 2956500 | 24779511 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 33.51 | 2.0 | 219000 | 4366793 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.171 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 483 | Años | |



**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 2024-2124

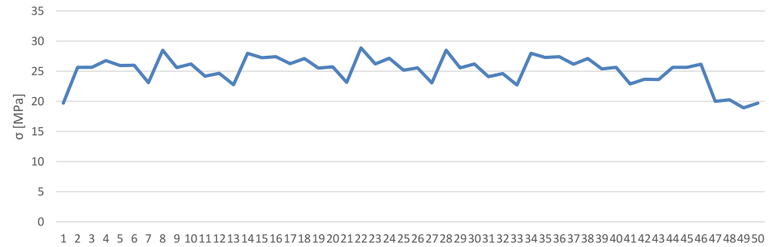
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

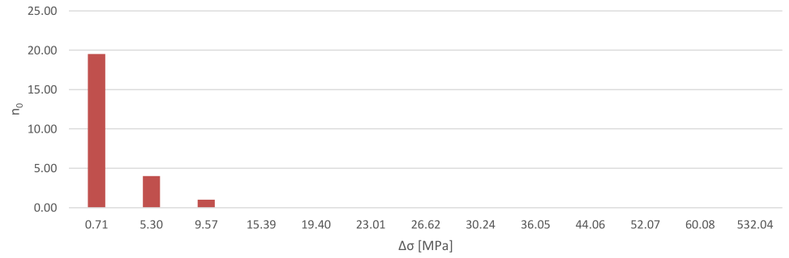
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.71 | 19.50 | 48399000 | - |
| 4.4 - 8.8 | - | 5.30 | 4.00 | 9928000 | - |
| 8.8 - 13.19 | - | 9.57 | 1.00 | 2482000 | - |
| 13.19 - 17.59 | - | 15.39 | 0.00 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 2024-2124

PEDELTA

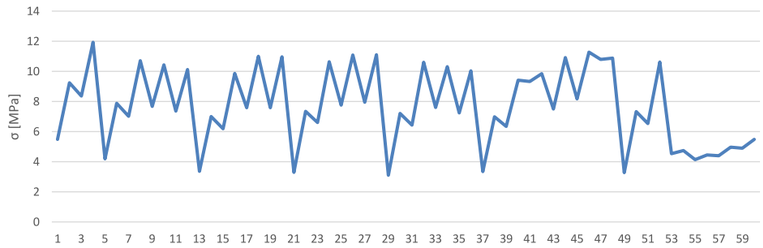
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

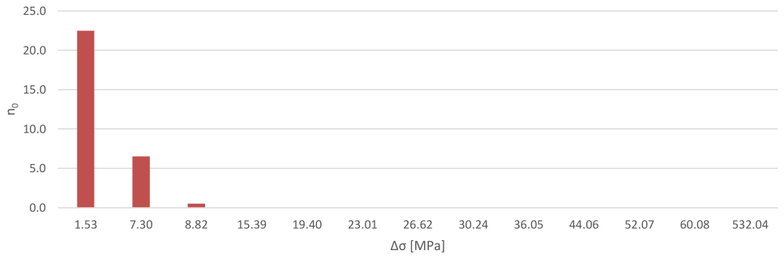
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 1.53 | 22.5 | 55845000 | - |
| 4.4 - 8.8 | - | 7.30 | 6.5 | 16133000 | - |
| 8.8 - 13.19 | - | 8.82 | 0.5 | 1241000 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |



**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 257 VACÍO
**PERIODO** 2024-2124

PEDELTA

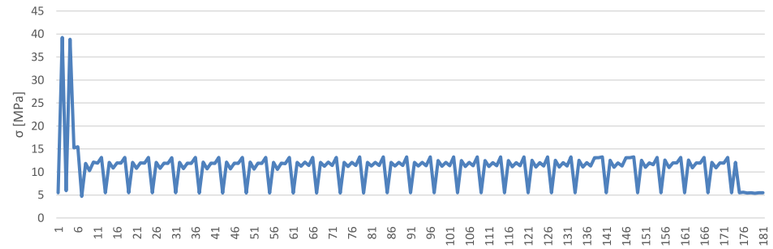
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

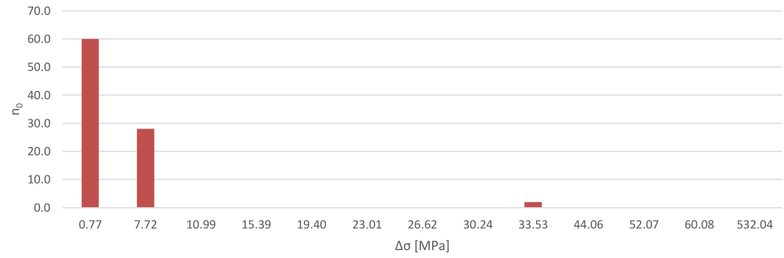
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.77 | 60.0 | 6570000 | - |
| 4.4 - 8.8 | - | 7.72 | 28.0 | 3066000 | - |
| 8.8 - 13.19 | - | 10.99 | 0.0 | 0 | - |
| 13.19 - 17.59 | - | 15.39 | 0.0 | 0 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 33.53 | 2.0 | 219000 | 4362176 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.050 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1892 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 257 VACÍO
**PERIODO** 2024-2124

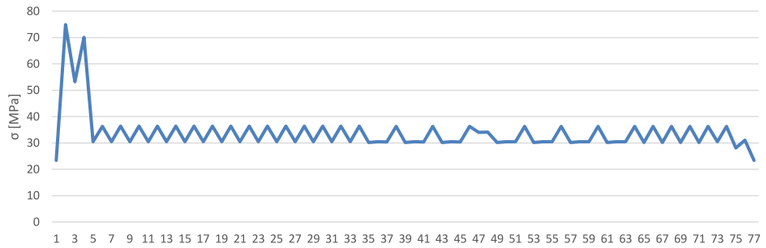
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

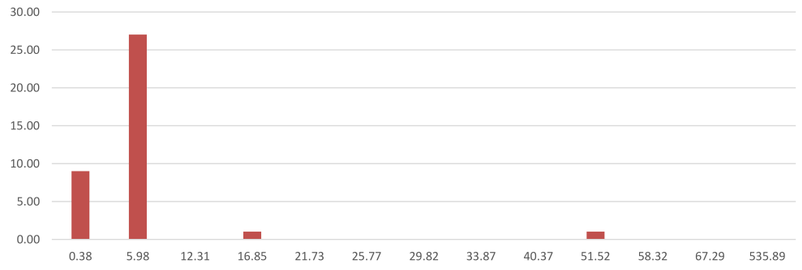
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.38 | 9.00 | 985500 | - |
| 4.93 - 9.85 | - | 5.98 | 27.00 | 2956500 | - |
| 9.85 - 14.78 | - | 12.31 | 0.00 | 0 | - |
| 14.78 - 19.7 | - | 16.85 | 1.00 | 109500 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 51.52 | 1.00 | 109500 | 1688909 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.065 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1442 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 257 LLENO
**PERIODO** 2024-2124

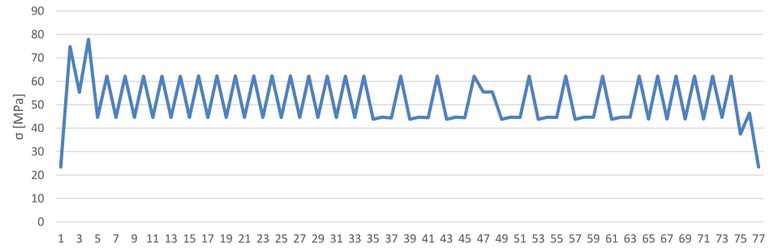
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

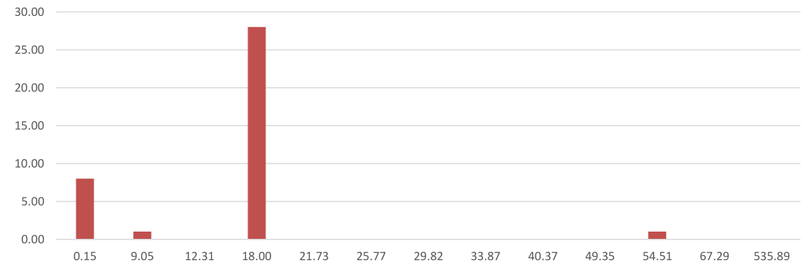
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.15 | 8.00 | 876000 | - |
| 4.93 - 9.85 | - | 9.05 | 1.00 | 109500 | - |
| 9.85 - 14.78 | - | 12.31 | 0.00 | 0 | - |
| 14.78 - 19.7 | - | 18.00 | 28.00 | 3066000 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 54.51 | 1.00 | 109500 | 1425538 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.077 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1202 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 257 LLENO
**PERIODO** 2024-2124

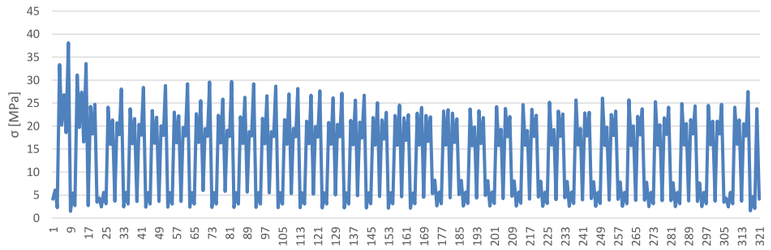
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

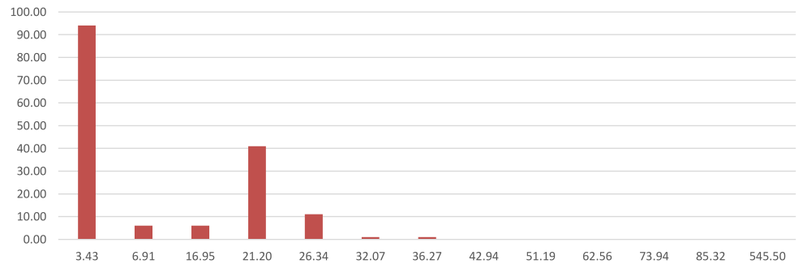
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 3.43 | 94.00 | 10293000 | - |
| 6.25 - 12.49 | - | 6.91 | 6.00 | 657000 | - |
| 12.49 - 18.74 | - | 16.95 | 6.00 | 657000 | - |
| 18.74 - 24.98 | - | 21.20 | 41.00 | 4489500 | - |
| 24.98 - 30.11 | 5 | 26.34 | 11.00 | 1204500 | 76883879 |
| 30.11 - 35.24 | 5 | 32.07 | 1.00 | 109500 | 28734329 |
| 35.24 - 40.37 | 5 | 36.27 | 1.00 | 109500 | 15546760 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.027 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 3671 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 2024-2124

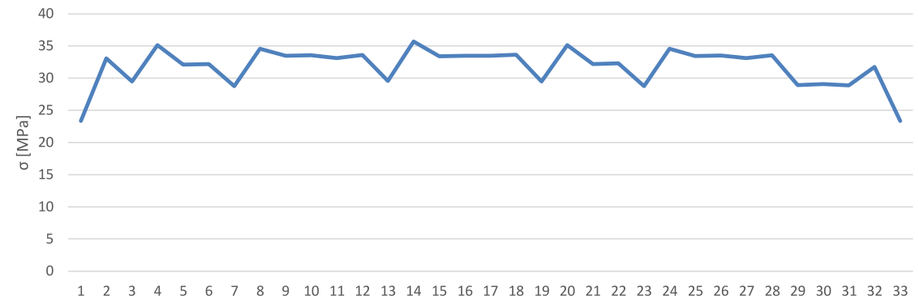
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.74 | 11.00 | 27302000 | - |
| 4.93 - 9.85 | - | 5.69 | 4.00 | 9928000 | - |
| 9.85 - 14.78 | - | 12.34 | 1.00 | 2482000 | - |
| 14.78 - 19.7 | - | 17.24 | 0.00 | 0 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA MERCANCÍAS
**VEHÍCULO:** PASAJEROS
**PERIODO** 2024-2124

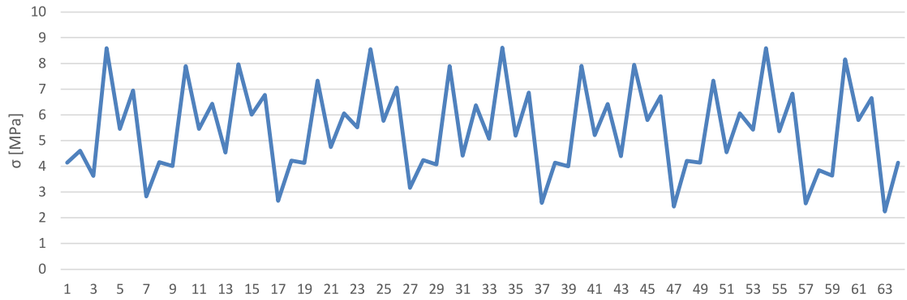
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 2.18 | 31.00 | 76942000 | - |
| 6.25 - 12.49 | - | 6.36 | 0.50 | 1241000 | - |
| 12.49 - 18.74 | - | 15.61 | 0.00 | 0 | - |
| 18.74 - 24.98 | - | 21.86 | 0.00 | 0 | - |
| 24.98 - 30.11 | 5 | 27.55 | 0.00 | 0 | 61496103 |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA MERCANCÍAS
**VEHÍCULO:** SERIE 257 VACÍO
**PERIODO** 2024-2124

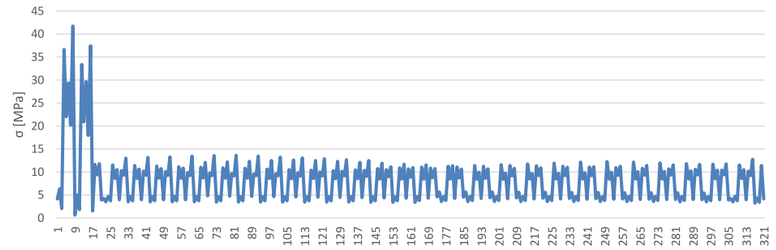
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

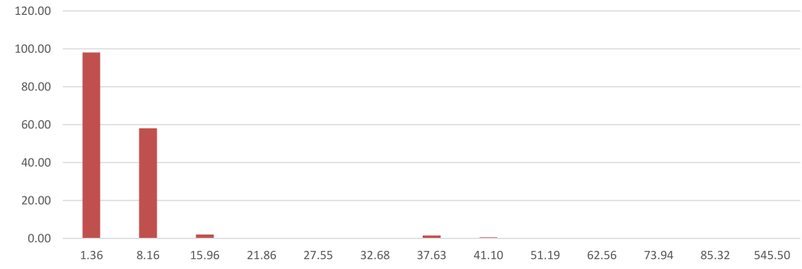
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 1.36 | 98.00 | 10731000 | - |
| 6.25 - 12.49 | - | 8.16 | 58.00 | 6351000 | - |
| 12.49 - 18.74 | - | 15.96 | 2.00 | 219000 | - |
| 18.74 - 24.98 | - | 21.86 | 0.00 | 0 | - |
| 24.98 - 30.11 | 5 | 27.55 | 0.00 | 0 | 61496103 |
| 30.11 - 35.24 | 5 | 32.68 | 0.00 | 0 | 26180008 |
| 35.24 - 40.37 | 5 | 37.63 | 1.50 | 164250 | 12921260 |
| 40.37 - 45.5 | 5 | 41.10 | 0.50 | 54750 | 8311412 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.019 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 5082 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 257 VACÍO
**PERIODO** 2024-2124

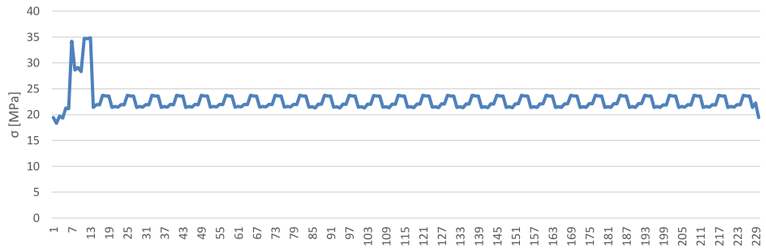
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

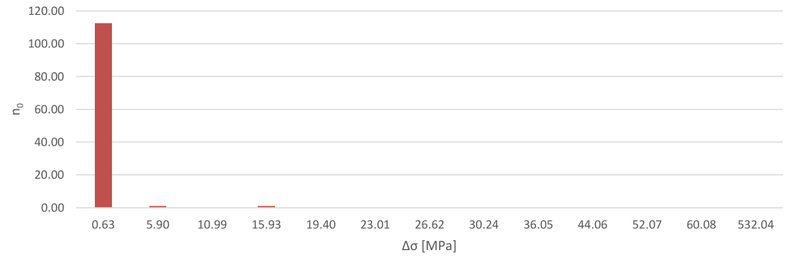
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.63 | 112.50 | 12318750 | - |
| 4.4 - 8.8 | - | 5.90 | 1.00 | 109500 | - |
| 8.8 - 13.19 | - | 10.99 | 0.00 | 0 | - |
| 13.19 - 17.59 | - | 15.93 | 1.00 | 109500 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 257 LLENO
**PERIODO** 2024-2124

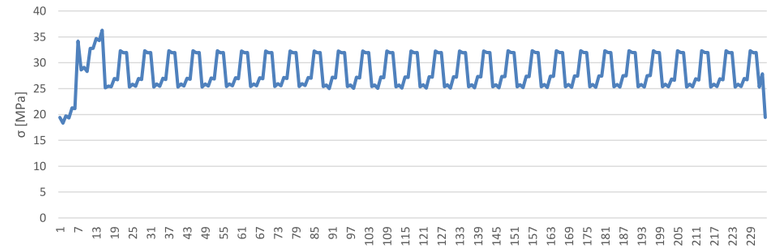
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

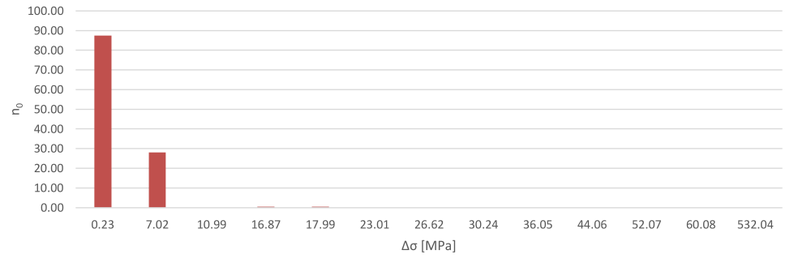
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.23 | 87.50 | 9581250 | - |
| 4.4 - 8.8 | - | 7.02 | 28.00 | 3066000 | - |
| 8.8 - 13.19 | - | 10.99 | 0.00 | 0 | - |
| 13.19 - 17.59 | - | 16.87 | 0.50 | 54750 | - |
| 17.59 - 21.2 | 5 | 17.99 | 0.50 | 54750 | 89758418 |
| 21.2 - 24.82 | 5 | 23.01 | 0.00 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.001 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 163842 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 257 LLENO
**PERIODO** 2024-2124

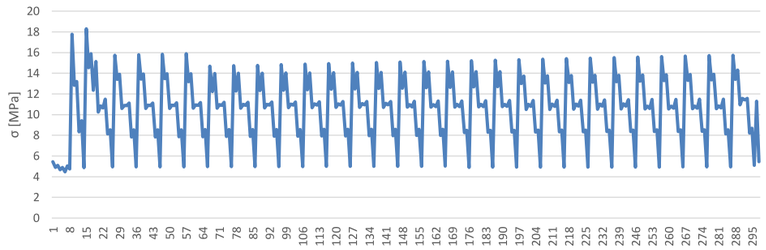
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

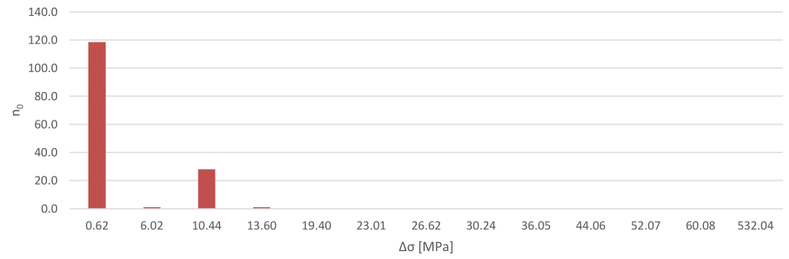
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.62 | 118.5 | 12975750 | - |
| 4.4 - 8.8 | - | 6.02 | 1.0 | 109500 | - |
| 8.8 - 13.19 | - | 10.44 | 28.0 | 3066000 | - |
| 13.19 - 17.59 | - | 13.60 | 1.0 | 109500 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA PRINCIPAL - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 2024-2124

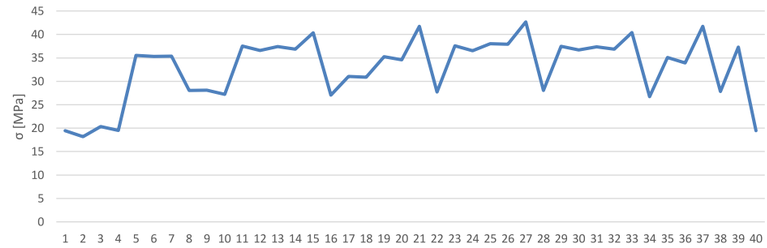
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.17 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

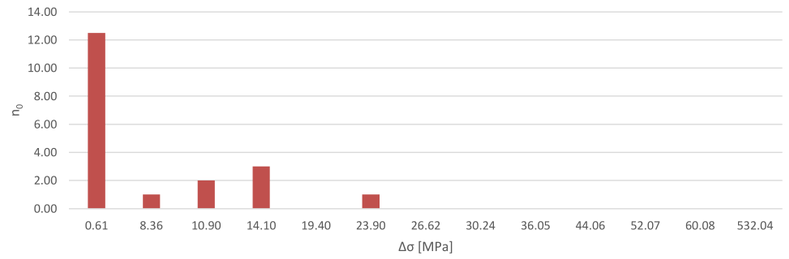
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.61 | 12.50 | 31025000 | - |
| 4.4 - 8.8 | - | 8.36 | 1.00 | 2482000 | - |
| 8.8 - 13.19 | - | 10.90 | 2.00 | 4964000 | - |
| 13.19 - 17.59 | - | 14.10 | 3.00 | 7446000 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.00 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.90 | 1.00 | 2482000 | 21647478 |
| 24.82 - 28.43 | 5 | 26.62 | 0.00 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.00 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.00 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.00 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.00 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.00 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.00 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.115 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 772 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 2024-2124

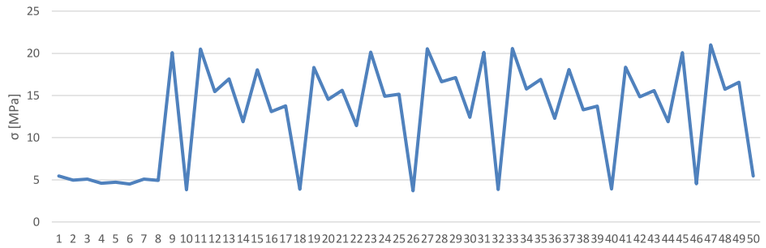
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

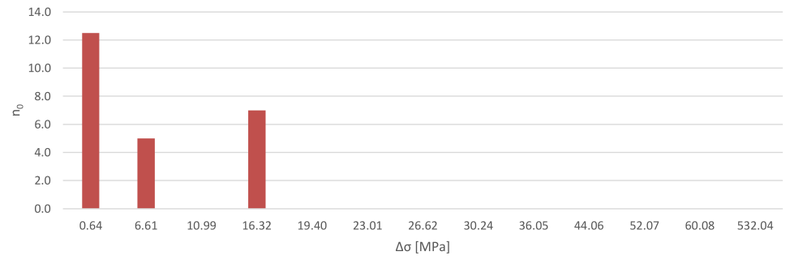
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.64 | 12.5 | 31025000 | - |
| 4.4 - 8.8 | - | 6.61 | 5.0 | 12410000 | - |
| 8.8 - 13.19 | - | 10.99 | 0.0 | 0 | - |
| 13.19 - 17.59 | - | 16.32 | 7.0 | 17374000 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** ALA INFERIOR VIGA TRANSVERSAL - VIA PASAJEROS
**VEHÍCULO:** SERIE 257 VACÍO
**PERIODO** 2024-2124

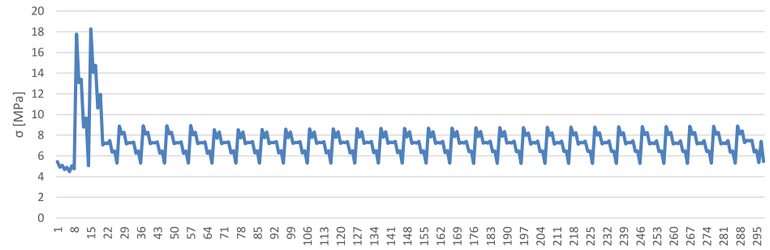
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 50 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

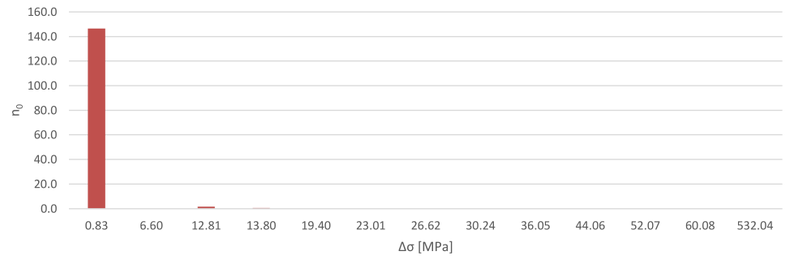
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 43.48 | 32.04 | 17.59 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.4 | - | 0.83 | 146.5 | 16041750 | - |
| 4.4 - 8.8 | - | 6.60 | 0.0 | 0 | - |
| 8.8 - 13.19 | - | 12.81 | 1.5 | 164250 | - |
| 13.19 - 17.59 | - | 13.80 | 0.5 | 54750 | - |
| 17.59 - 21.2 | 5 | 19.40 | 0.0 | 0 | 61496103 |
| 21.2 - 24.82 | 5 | 23.01 | 0.0 | 0 | 26180008 |
| 24.82 - 28.43 | 5 | 26.62 | 0.0 | 0 | 12626749 |
| 28.43 - 32.04 | 5 | 30.24 | 0.0 | 0 | 6683021 |
| 32.04 - 40.05 | 3 | 36.05 | 0.0 | 0 | 3508892 |
| 40.05 - 48.07 | 3 | 44.06 | 0.0 | 0 | 1921850 |
| 48.07 - 56.08 | 3 | 52.07 | 0.0 | 0 | 1164307 |
| 56.08 - 64.09 | 3 | 60.08 | 0.0 | 0 | 757921 |
| 64.09 > | 3 | 532.04 | 0.0 | 0 | 1091 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA PASAJEROS
**VEHÍCULO:** SERIE 257 VACÍO
**PERIODO** 2024-2124

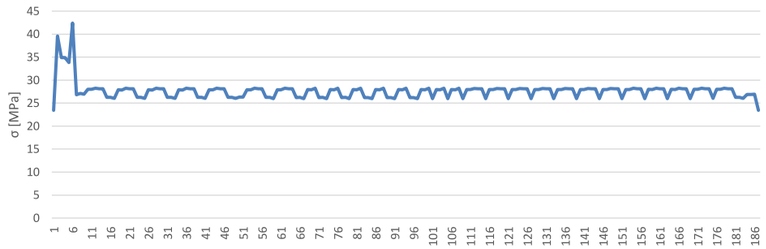
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

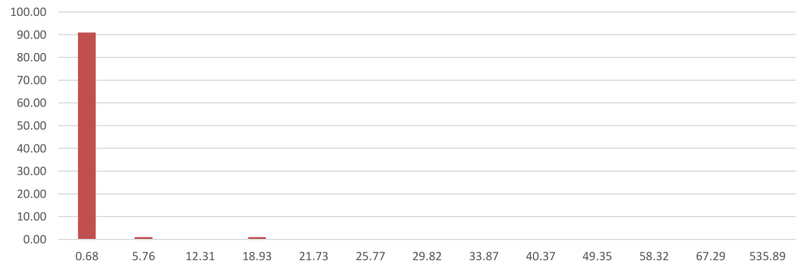
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.68 | 91.00 | 9964500 | - |
| 4.93 - 9.85 | - | 5.76 | 1.00 | 109500 | - |
| 9.85 - 14.78 | - | 12.31 | 0.00 | 0 | - |
| 14.78 - 19.7 | - | 18.93 | 1.00 | 109500 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA PASAJEROS
**VEHÍCULO:** SERIE 257 LLENO
**PERIODO** 2024-2124

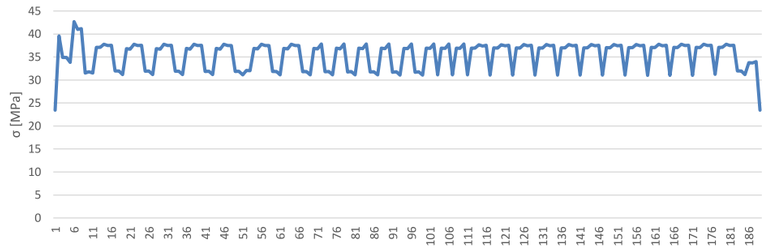
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

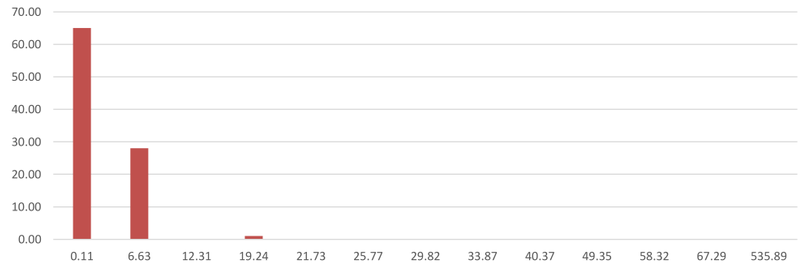
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.11 | 65.00 | 7117500 | - |
| 4.93 - 9.85 | - | 6.63 | 28.00 | 3066000 | - |
| 9.85 - 14.78 | - | 12.31 | 0.00 | 0 | - |
| 14.78 - 19.7 | - | 19.24 | 1.00 | 109500 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 29.82 | 0.00 | 0 | 12626749 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA PASAJEROS
**VEHÍCULO:** SERIE 257 LLENO
**PERIODO** 2024-2124

PEDELTA

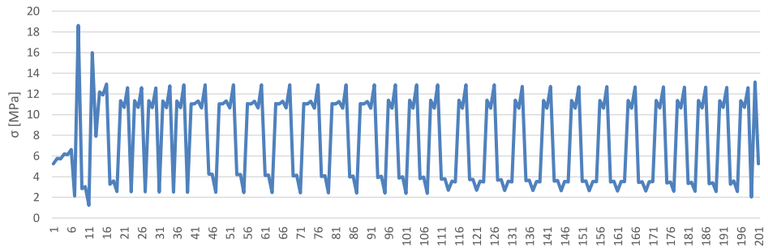
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

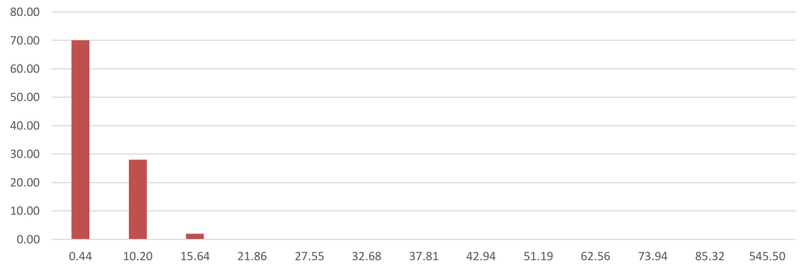
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 0.44 | 70.00 | 7665000 | - |
| 6.25 - 12.49 | - | 10.20 | 28.00 | 3066000 | - |
| 12.49 - 18.74 | - | 15.64 | 2.00 | 219000 | - |
| 18.74 - 24.98 | - | 21.86 | 0.00 | 0 | - |
| 24.98 - 30.11 | 5 | 27.55 | 0.00 | 0 | 61496103 |
| 30.11 - 35.24 | 5 | 32.68 | 0.00 | 0 | 26180008 |
| 35.24 - 40.37 | 5 | 37.81 | 0.00 | 0 | 12626749 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |



### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** MONTANTE - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 2024-2124

PEDELTA

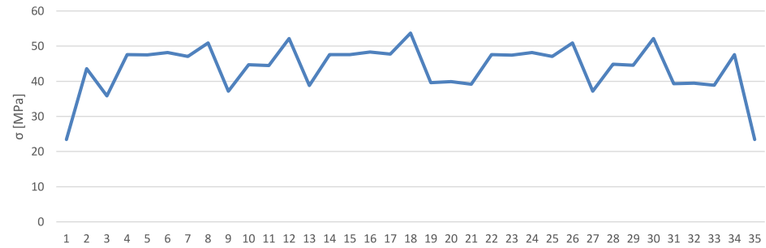
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 56 | MPa | *Categoría de detalle* |
| IM | 1.30 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

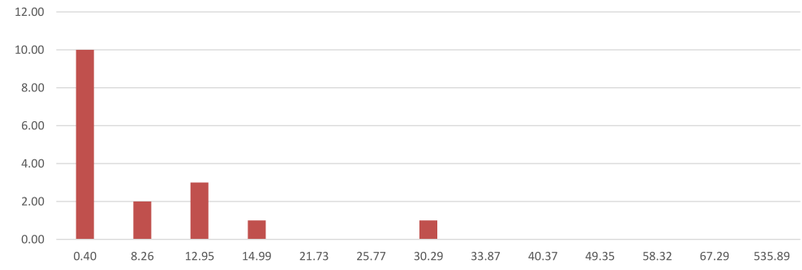
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 48.70 | 35.89 | 19.70 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 4.93 | - | 0.40 | 10.00 | 24820000 | - |
| 4.93 - 9.85 | - | 8.26 | 2.00 | 4964000 | - |
| 9.85 - 14.78 | - | 12.95 | 3.00 | 7446000 | - |
| 14.78 - 19.7 | - | 14.99 | 1.00 | 2482000 | - |
| 19.7 - 23.75 | 5 | 21.73 | 0.00 | 0 | 61496103 |
| 23.75 - 27.8 | 5 | 25.77 | 0.00 | 0 | 26180008 |
| 27.8 - 31.84 | 5 | 30.29 | 1.00 | 2482000 | 11676310 |
| 31.84 - 35.89 | 5 | 33.87 | 0.00 | 0 | 6683021 |
| 35.89 - 44.86 | 3 | 40.37 | 0.00 | 0 | 3508892 |
| 44.86 - 53.83 | 3 | 49.35 | 0.00 | 0 | 1921850 |
| 53.83 - 62.81 | 3 | 58.32 | 0.00 | 0 | 1164307 |
| 62.81 - 71.78 | 3 | 67.29 | 0.00 | 0 | 757921 |
| 71.78 > | 3 | 535.89 | 0.00 | 0 | 1501 |



### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.213 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 370 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA PASAJEROS
**VEHÍCULO:** PASAJEROS
**PERIODO** 2024-2124

PEDELTA

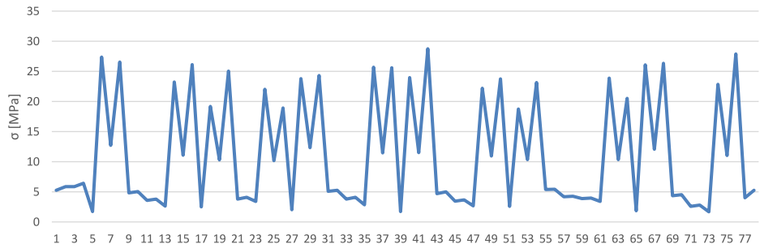
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 68 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

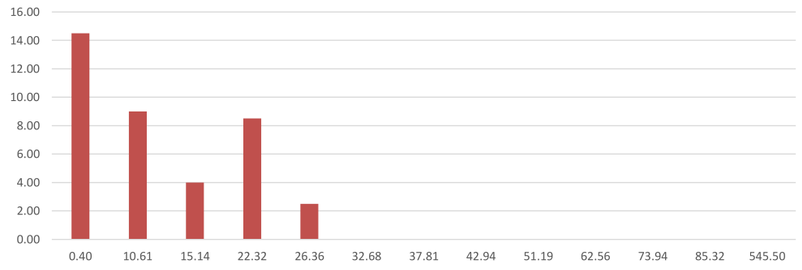
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 0.40 | 14.50 | 35989000 | - |
| 6.25 - 12.49 | - | 10.61 | 9.00 | 22338000 | - |
| 12.49 - 18.74 | - | 15.14 | 4.00 | 9928000 | - |
| 18.74 - 24.98 | - | 22.32 | 8.50 | 21097000 | - |
| 24.98 - 30.11 | 5 | 26.36 | 2.50 | 6205000 | 76664603 |
| 30.11 - 35.24 | 5 | 32.68 | 0.00 | 0 | 26180008 |
| 35.24 - 40.37 | 5 | 37.81 | 0.00 | 0 | 12626749 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.081 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | 1136 | Años | |

**PROYECTO:** PONT MANRESA
**ELEMENTO:** LARGUERO - VIA PASAJEROS
**VEHÍCULO:** SERIE 257 VACÍO
**PERIODO** 2024-2124

PEDELTA

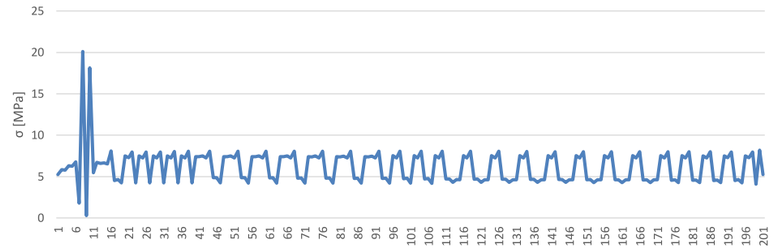
**Preparado por:** IC
**Verificado por:**
**Aprobado por:**

## CÁLCULO DE FATIGA POR EL MÉTODO DEL DAÑO ACUMULADO EN 1993-1-9

### PARÁMETROS DE CÁLCULO

| | | | |
|---|---|---|---|
| $\gamma_{Mf}$ | 1.15 | | *Factor de seguridad* |
| $\Delta\sigma_c$ | 71 | MPa | *Categoría de detalle* |
| IM | 1.25 | | *Factor de impacto* |
| V | 3 | Vh/día | *Vehículos por día* |
| A | 100 | Años | *Años* |

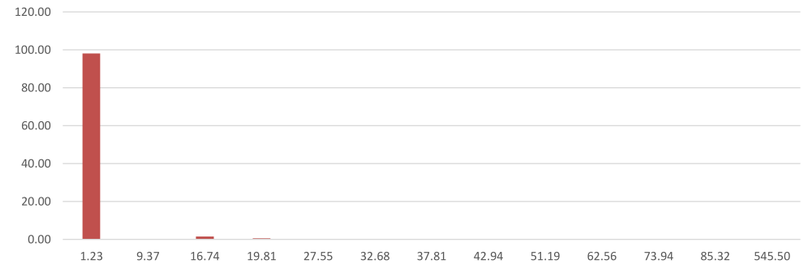
### HISTORIAL DE TENSIONES




### ESPECTRO DE TENSIONES

| | $\Delta\sigma_C/\gamma_{Mf}$ | $\Delta\sigma_D/\gamma_{Mf}$ | $\Delta\sigma_L/\gamma_{Mf}$ | |
|---|---|---|---|---|
| *Tensiones límite* | 61.74 | 45.50 | 24.98 | *EN 1993-1-9 7.1* |

| Intervalo [MPa] | m | $\Delta\sigma_i$ [Mpa] | $n_{i0}$ | $n_i$ | $N_i$ |
|---|---|---|---|---|---|
| 0 - 6.25 | - | 1.23 | 98.00 | 10731000 | - |
| 6.25 - 12.49 | - | 9.37 | 0.00 | 0 | - |
| 12.49 - 18.74 | - | 16.74 | 1.50 | 164250 | - |
| 18.74 - 24.98 | - | 19.81 | 0.50 | 54750 | - |
| 24.98 - 30.11 | 5 | 27.55 | 0.00 | 0 | 61496103 |
| 30.11 - 35.24 | 5 | 32.68 | 0.00 | 0 | 26180008 |
| 35.24 - 40.37 | 5 | 37.81 | 0.00 | 0 | 12626749 |
| 40.37 - 45.5 | 5 | 42.94 | 0.00 | 0 | 6683021 |
| 45.5 - 56.88 | 3 | 51.19 | 0.00 | 0 | 3508892 |
| 56.88 - 68.25 | 3 | 62.56 | 0.00 | 0 | 1921850 |
| 68.25 - 79.63 | 3 | 73.94 | 0.00 | 0 | 1164307 |
| 79.63 - 91 | 3 | 85.32 | 0.00 | 0 | 757921 |
| 91 > | 3 | 545.50 | 0.00 | 0 | 2899 |




### MÉTODO DEL DAÑO ACUMULADO

| | | | |
|---|---|---|---|
| D | 0.000 | <1 | *Daño acumulado* |
| ¿Cumple? | SI | | |
| Vida remanente | #¡DIV/0! | Años | |

# ANNEX NÚM. 8: MONITORATGE

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 01/02/2024 | JJO | JPO | JJO |
| | | | | |
| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| Totes | Creació del document |
| | |
| | |
| | |

NOM FITXER : 240201 PMAN-FGC-PED-MONITORATGE-00

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# 1 OBJECTE

Al present annex es relaciona tota la informació i documentació referent al monitoratge i dades del projecte, resumint de forma general varis aspectes del mateix "Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya".

# 2 PROPIETARI

- Promotor: Ferrocarrils de la Generalitat de Catalunya

# 3 AUTOR/S DEL ESTUDI D'AUSCULTACIÓ

El projecte o proposta d'auscultació ha estat elaborada per l'autor del projecte amb la col·laboració de la resta de l'equip de Pedelta assignat a aquest Projecte i d'empreses de monitoratge externes consultades de forma particular per a les necessitats particulars per a aquest pont.

# 4 DADES DEL PROJECTE

## 4.1 AUTOR/S DEL PROJECTE

- Autor del projecte: F. Javier Jordán García
- Titulació/ns: Enginyer de Camins, Canals i Ports
- Col·legiat Núm.: 14066
- Despatx professional: PEDELTA SL
- Població: Barcelona

## 4.2 COORDINADOR DE SEGURETAT DURANT L'ELABORACIÓ DEL PROJECTE

- Coordinador se S&S: Jordi Pons
- Titulació/ns: Enginyer de Camins, Canals i Ports
- Col·legiat Núm.: 25114
- Despatx professional: PEDELTA SL
- Població: Barcelona

## 4.3 TIPOLOGIA DE L'OBRA

És un pont de estructura metàl·lica, el pont té un únic vanol (isostàtic) amb longitud de 17,9m i 8,8m d'amplada.

El pont es constituït per les bigues principals són gelosies a Cruz de Sant Andreu, amb sustentació isostàtica i longitud entre suports de 17,3 m. Consten de 9 mòduls de 1,82 m, amb diagonals creuades a tots ells. El seu cantell màxim és de 2,002 m i la separació entre els seus eixos de 8,8 m. Els cordons estan constituïts per seccions a "T", invertida la inferior, i són variables en anar entrant xapes de reforç. Tant el superior com l'inferior estan reforçats amb perfils angulars simples. Els muntants estan constituïts per xapes i angulars. Les diagonals estan formades per parells d'angulars de diferents mides units entre si per xapes d'ànima. Les unions entre els diferents elements són reblonades. Hi ha cartells als nusos superiors extrems i a les unions amb les biguetes i elements d'arriostraments.

La posició del tauler és inferior en relació amb les bigues principals. Les biguetes tenen una longitud teòrica de 8,8 m i estan modulades cada 1,82 m, coincidint amb els muntants de les bigues principals. Són bigues armades d'ànima plena, constituïdes per xapes i quatre angulars, amb angulars de reforç a les ales inferiors que no és existent al costat exterior de les biguetes extremes. Tenen secció variable amb un cantell màxim de 0,74 m, al centre de va, i cantell mínim de 0,72 m en els suports. Les unions amb les bigues principals són roblonades i es realitzen a través de les cartel·les de rigidesa dels muntants.

Els bigues longitudinals han estat substituïts per bigues al calaix. La separació transversal entre eixos és de 1,060 m, sent 1,880 m la distància entre la biga longitudinal exterior i la biga principal, per a ambdues vies, finalment, la separació entre els bigues longitudinals interiors és de 2,92m. Tenen una llum de 1,82m i 0,303m de cantell. S'uneixen a les biguetes mitjançant cargols d'alta resistència a través de casquets d'angular. La unió entre els diferents elements es realitza mitjançant reblons.

El pont disposa d'un arriostrament horitzontal contravent entre les dues bigues, amb modulació cada tres mòduls de biga, a nivell del seu cordó inferior, constituït per una gelosia a la Creu de Sant Andreu.

A més, recentment, s'ha disposat un arriostrament contravent nou entre els bigues longitudinals interiors de cada via, resolt també mitjançant una gelosia a Cruz de San Andreu, modulada igual queles biguetes del tauler.

Finalment, hi ha pòrtics de frenada disposats en els mòduls 2 i 8, resolts mitjançant mòduls a "K" entre el travesser exterior i el cordó inferior de la biga principal adjacent, i per mòduls a Cruz de San Andreu entre els bigues longitudinals dels mòduls afectats.

Totes les unions són reblonades, excepte a les diagonals de l'arriostrament inferior reforçades. Les unions es fan a través de cartel·les, presentant excentricitat totes les diagonals.

El pont també disposa de dues passejades de servei interiors a les bigues principals que han estat producte de les feines de renovació. A més, s'han disposat pòrtics de suport de canonades a la zona d'entrevies, cobertes per una xapa estriada que dóna lloc a un tercer passeig.

La xapa de pis és metàl·lica estriada, i està reblonada als perfils que les sustenten. Existeix unes baranes als passeigs laterals.

Els estreps del pont presenten paraments frontals plans de maçoneria carejada amb carreus en cantonades i imposta de coronació. Els paraments laterals són murs envoltats de la mateixa tipologia que els frontals. Amb l'existència de dos passos inferiors, en ambdós estreps. Els murs guardabalast són de carreuat, a l'estrep d'entrada, i de formigó, al de sortida. Les coronacions de suports són de carreuat.

Els aparells de suport fixos es troben a l'estrep de sortida. La biga s'uneix a una peça metàl·lica alleugerida que descansa sobre la coronació dels suports. Els mòbils estan a l'estrep d'entrada i compten amb una peça esfèrica que permet el moviment i una base que recolza sobre la coronació. Les bigues estan unides amb quatre cargols a la peça superior dels aparells.



Foto 1. Situació del pont

# 5 CONDICIONS DE L'ENTORN

## 5.1 SITUACIÓ

És un pont metàl·lic de FGC situat en la sobre la carretera de Vic de la línia Llobregat-Anoia. És un pas ferroviari que salva una carretera de dos carrils per cada sentit i dos passos de vianants, un a cada costat.

## 5.2 CLIMATOLOGIA

Manresa té un clima mediterrani continental de baixa altitud caracteritzat per una notable oscil·lació tèrmica, marcat per un clima humit amb estius calorosos i hiverns freds. A Manresa, els estius són curts, càlids i majorment clars; els hiverns són llargs, freds i parcialment ennuvolats i està sec durant tot l'any. Durant el transcurs de l'any, la temperatura generalment varia d'1 °C a 31 °C i poques vegades baixa a menys de -3 °C o puja a més de 34 °C.

# 6 ACTIVITATS CONSTRUCTIVES

Es proposa les següents actuacions recomanades de reparació:

- Reparació de bigues de diafragma danyades.
- Substitució d'ala inferior de les bigues i arriostrament inferior.
- Reparació de fissura en diagonal
- Reparació de soldadures
- Revisió de bigues del tramex
- Manteniment dels aparells de suport
- Pintat
- Neteja d'estreps
- Neteja de paraments de carreu

- Segellat de fissures en carreus
- Reposició d'arrebossat en voltes mitjançant aplicació de morter hidròfug
- Reparació d'arrebossats en murs laterals
- Reparació de rejuntats entre carreus degradats o fissurats
- Substitució de carreus trencats.

## 7 DESCRIPCIÓ DELS TREBALLS D'INSTRUMENTACIÓ.

Els principals objectius que persegueix assolir la instrumentació del pont a rehabilitar són:

- Controlar els processos patològics mitjançant la instrumentació i seguiment dels paràmetres que defineixen l'evolució de les patologies.
- Verificar les implicacions i efectes de la intervenció estructural de reforç ha tingut en el comportament estructural de forma efectiva i segons el previst al projecte de rehabilitació comparant paràmetres de control abans, durant i després de l'actuació.

En el cas del pont sobre la carretera de Vic a Manresa, els paràmetre crític a mesurar és el rang de tensions a certs elements metàl·lics del tauler al pas de trens reals.

Els elements crítics són els traccionats i sotmesos a més variació de tensions, concretament les bigues transversals i el cordó inferior de les gelosies metàl·liques laterals.

La mesura del rang de tensions es fa de forma indirecta mitjançant la mesura de les deformacions a l'acer mitjançant galgues extensomètriques.

Convé tenir un registre prou representatiu per tal de caracteritzar aquest rang de variació de tensions i correlacionar-lo amb el pes considerat per les locomotores i tremuges.

En aquest sentit és convenient tenir les dades addicionals de número de viatgers aproximats a cada composició a la via que suporta el trànsit de viatgers, i del pes dels eixos de les composicions circulants.

## 8 ORGANITZACIÓ DE LA UNITAT D'AUSCULTACIÓ.

L'auscultació es dividiria en:

- -Instal·lació de galgues extensomètriques a bigues transversals i longitudinals. Estimem que 10 galgues serien suficients.
- Datalogger per transmetre lectures i adquisició dinàmica per a 10 canals amb 80 adquisicions per segon.
- Software d'anàlisi, visualització i gestió de dades.

## 9 PLA D'AUSCULTACIÓ

Estimem uns 18 mesos considerant temps abans de l'actuació durant l'actuació i posteriorment, per tal de cobrir posteriorment a l'actuació un any com a període de temps representatiu.

## 10 GESTIÓ DE DADES DE L'AUSCULTACIÓ

Les dades de l'auscultació es guardarien al núvol a un entorn comú de dades compartit amb FGC i altres parts que consideri convenient FGC i s'analitzarien valors anòmals o superant llindars admissibles d'avís en temps real. Aquestes dades es tractarien de forma confidencial amb FGC i podrien ser destruïdes qualsevol tipus de còpies en finalitzar els treballs un cop acabada la campanya.

## 11 ANÀLISI DE LES LECTURES D'INSTRUMENTACIÓ

Les lectures d'instrumentació s'analitzaran en dues fases. En fase d'adquisició, detectant i filtrant possibles valors anòmals o valors d'alerta per sobre de toleràncies admeses i definides al projecte. En fase d'anàlisi de dades per tal de reconsiderar la vida útil a fatiga, es pot calibrar el model d'anàlisi amb el dany de fatiga realment acumulat i redefinir les càrregues a fatiga considerades per tal d'actualitzar aquesta anàlisi per a aquesta verificació.

## 12 CONCLUSIONS.

El Sistema de monitoratge proposat permetria caracteritzar les accions reals dels tren que circulen per les vies sense necessitat de proves de càrrega estàtiques ni dinàmiques i donant una major aproximació al nivell de seguretat del pont que amb aquestes proves, especialment pel que fa a les verificacions a fatiga. També permetria confirmar la idoneïtat del reforç plantejar i controlar durant l'execució dels reforços, en fase en que es retiren ales de perfils existents, que el comportament del pont és l'adequat.

## 13 TERMINI D'EXECUCIÓ I PRESSUPOST.

La instrumentació s'hauria de col·locar uns mesos abans d'iniciar-se la reparació i no retirar-se fins una mesos després. Considerant un període total d'un any i mig, el cost seria:

**PONT DE FGC A MANRESA SOBRE LA CARRETERA DE VIC. ESTIMACIÓ DEL PRESSUPOST DEL MONITORATGE**

| Partida | Unitats | Preu unitari | Total |
|---|---|---|---|
| Subministrament i instal·lació de galga extensomètrica | 10 | 600,00 € | 6.000,00 € |
| Subministrament de datalogger per l'adquisició dinàmica de 19 canals | 1 | 6.000,00 € | 6.000,00 € |
| Prestació mensual de software d'anàlisi, gestió de dades i visualització | 18 | 1.000,00 € | 18.000,00 € |
| Anàlisi de les dades, reevaluació de les consideracions a fatiga al pont i informe associat | 1 | 6.500,00 € | 6.500,00 € |
| **TOTAL** | | | **36.500,00 €** |

Addicionalment s'hauria de considerar una connexió a punt de subministrament elèctric.

# ANNEX NÚM. 9: SERVEIS AFECTATS

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 17/01/2024 | DJS | | |
| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| | |
| | |
| | |
| | |

NOM FITXER : 240117 PMAN-FGC-PED-SERVEIS AFECTATS-V00

**ÍNDEX**

1 OBJECTE....3

2 DESCRIPCIÓ DELS SERVEIS EXISTENTS....3

## 1 OBJECTE

Al present annex presenta tota la informació i documentació relacionada amb els serveis afectats en l'àmbit del present Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya.

L'objectiu final és estudiar quines instal·lacions i serveis, siguin públics o privats, puguin ser afectats per les obres del projecte i definir i valorar la seva modificació o restitució.

## 2 DESCRIPCIÓ DELS SERVEIS EXISTENTS

Durant la inspecció visual realitzat amb data de 01 de desembre 2023 s'ha observat que no es preveu necessari consultar les companyies i organismes de la zona ja que no s'estima cap incidència ni afectació en relació als serveis, atès que les actuacions de la reparació es determinen majoritàriament dins de l'àmbit de l'estructura metàl·lica del pont.

S'ha inclòs dins del pressupost del projecte una partida alçada a justificar segons actuacions imprevistes de retirada/desviaments i reposició de Serveis Afectats.

# ANNEX NÚM. 10: EXPROPIACIONS

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 10/01/2024 | DJS | | |
| | | | | |
| | | | | |
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ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| | |
| | |
| | |
| | |

NOM FITXER : 240110 PMAN-FGC-PED-EXPROPIACIONS-V00

**ÍNDEX**

1 OBJECTE ..... 1

2 LEGISLACIÓ APLICABLE ..... 1

3 SUPERFÍCIES ..... 1

4 VALORACIÓ DE BÉNS I DRETS AFECTATS ..... 2

5 PLÀNOL D'OCUPACIONS TEMPORALS. IMPLANTACIÓ D'OBRA ..... 2

## 1 OBJECTE

L'objecte del present annex és descriure i valorar de forma justificada el cost estimatiu de les expropiacions necessaris que comporta la execució de l'obra del present projecte. L'expedient d'expropiació forçosa que s'ha de tramitar per a l'ocupació dels terrenys que es veuran afectats per les obres obliga a iniciar la recollida de dades, relació i inventari de béns i drets afectats, a fi d'obtenir un plànol parcel·lari el més complet possible, que serveixi com a base per tramitar el citat expedient expropiador.

Es tracta de definir i valorar els béns afectats pel Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya.

La informació cadastral ha estat obtinguda de la Seu Electrònica del Cadastre.

## 2 LEGISLACIÓ APLICABLE

La normativa que cal aplicar és:

a) Llei de 16 de desembre de 1954, sobre expropiació forçosa.
b) Decret de 26 d'Abril de 1957, pel qual s'aprova el Reglament de la Llei d'expropiació Forçosa.
c) Decret legislatiu 2/2009, de 25 d'agost, pel qual s'aprova el text refós de la Llei de carreteres (DL 2/2009).
d) Decret 293/2003, de 18 de novembre, pel qual s'aprova el Reglament General de Carreteres.
e) Reial decret legislatiu 7/2015, de 30 d'octubre, pel qual s'aprova el text refós de la Llei del sòl i rehabilitació urbana.
f) Reial decret 1492/2011, de 24 d'octubre, pel qual s'aprova el Reglament de valoracions de la Llei del sòl.

L'article 35.1 del Decret 293/2003 estableix que els projectes de carreteres i les modificacions corresponents han de comprendre la definició del traçat i la determinació dels terrenys, les construccions i els altres béns i drets i drets que s'estimi necessari adquirir o ocupar per la construcció, la defensa o el servei de la via i la seguretat de la circulació, així com la relació de les persones titulars.

## 3 SUPERFÍCIES

Les expropiacions requerides per a les obres del present projecte consistiran únicament en ocupacions temporals. D'una banda, les zones ocupades pels treballs seran tota la superfície superior del pont; a més de tota la zona inferior del pont, si bé aquesta darrera s'ocuparà només durant fases puntuals.

D'altra banda, hi haurà diverses superfícies ocupades durant tota l'obra per establir la zona de casetes, recollida de materials i contenidors de residus.

Es proposa que la zona de casetes s'ubiqui al costat est del pont, aquesta superfície tindria una àrea d'aproximadament 100 m2.

Pel que fa a la zona d'apilament de materials es proposa ubicar-la a prop de la zona de casetes ocupant una àrea aproximada de 50 m2.

La zona de contenidors de residus es proposa ubicar-la a prop de la carretera per facilitar l'accés per la recollida de residus, ocupant una àrea aproximada de 50 m2.




Figura 1: Zones d'ocupacions temporals.

En la següent tabla es resumeix el total de superfícies afectats per municipi:

| SUPERFICIES T.M. BARCELONA ($m^2$) | | | | | |
|---|---|---|---|---|---|
| SITUACIÓN BÁSICA DEL SUELO | EXPROPIACIÓN POR VIALES | EXPROPIACIÓN POR SERVICIOS | SERVIDUMBRE DE PASO AÉREA | SERVIDUMBRE DE PASO SUBTERRÁNEA | OCUPACIÓN TEMPORAL |
| Rural secano | | | | | |
| Rural regadío | | | | | |
| Rural forestal | | | | | |
| Otros suelos rurales | | | | | |
| Urbanizado | | | | | 200 |
| Hidrografía natural | | | | | |
| Improductivo | | | | | |

## 4 VALORACIÓ DE BÉNS I DRETS AFECTATS

Amb motiu de les obres s'ocupen temporalment superfícies als termes municipals de Barcelona.

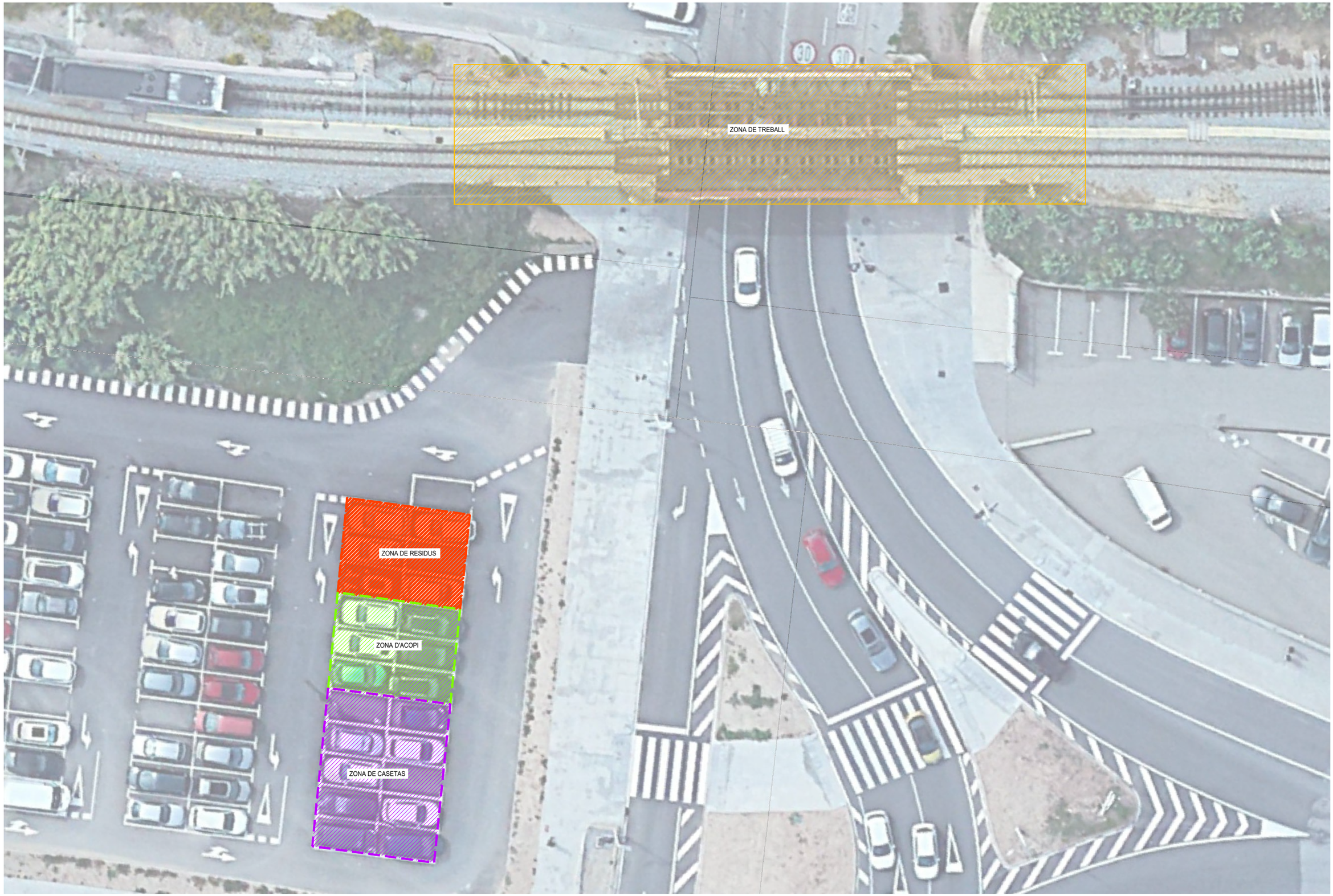
Com que totes les superfícies afectades corresponen a vials públics de naturalesa urbana, no es requereix cap procediment expropiatori, i no cal valorar econòmicament l'ocupació temporal d'aquestes superfícies.

## 5 PLÀNOL D'OCUPACIONS TEMPORALS. IMPLANTACIÓ D'OBRA

A continuació, s’adjunta el plànol d'ocupacions temporals per la implantació d'obra.

# PONT SOBRE CARRETERA DE VIC

ESCALA 1:150




02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AESP23B117PMAN-FGC\07BIM\01PH1\04DRW\07AF01.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
OCUPACIONS TEMPORALS

DATA: GENER 2024

PLÀNOL NÚM.: 07A

NOM FITXER: 07AF01.dwg

FULL 1 DE 1

COL·LEGI D'ENGINYERS DE CAMINS, CANALS I PORTS CATALUNYA

| Expedient | Data |
|---|---|
| 2024/01262/01 | 10/04/2024 |

VISAT

# ANNEX NÚM. 11: ESTUDI DE GESTIÓ DE RESIDUS

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 01/02/2024 | DJS | | |
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| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| Totes | Creació del document |
| | |
| | |
| | |

NOM FITXER : 240201 PMAN-FGC-PED-ESTUDI DE GESTIÓ DE RESIDUS-V00

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1 INTRODUCCIÓ ..... 1

2 TIPOLOGIA DE RESIDUS GENERATS ..... 1

3 IDENTIFICACIÓ I INTEGRACIÓ DELS ANTECEDENTS ADMINISTRATIUS I TÈCNICS. DADES DE PARTIDA ..... 3

3.1 TIPOLOGIA I ESTIMACIÓ DE RESIDUS D'OBRA NOVA ..... 3

4 ACCIONS DE MINIMITZACIÓ I PREVENCIÓ DE RESIDUS A L'OBRA ..... 4

5 OPERACIONS DE GESTIÓ DE RESIDUS ..... 6

6 MESURES PER LA SEPARACIÓ DE RESIDUS A L'OBRA ..... 7

7 PLEC DE PRESCRIPCIONS TÈCNIQUES PARTICULARS ..... 8

8 VALORACIÓ ECONÒMICA ..... 12

APÈNDIX 1 PRESSUPOST DE GESTIÓ DE RESIDUS DE LA CONSTRUCCIÓ ..... 13

# 1 INTRODUCCIÓ

L'aprovació del Reial Decret 105/2008, d'1 de febrer, pel qual es regula la producció i la gestió dels residus de construcció i demolició, estableix un precedent a nivell nacional en la gestió dels residus de construcció i enderrocs. A l'article 4 d'aquest Reial Decret, s'obliga el productor de residus a incloure al projecte d'execució de l'obra un estudi de gestió de residus de la construcció i demolició.

El productor de residus ha de vetllar pel compliment de la normativa específica vigent fomentant la prevenció de residus d'obra, la reutilització, el reciclatge i altres formes de valoració assegurar un tractament adequat per tal d'aconseguir un desenvolupament sostenible d'activitat de la construcció.

Els objectius generals d'un estudi de gestió de residus consisteix principalment en:

- Donar compliment al Reial Decret 105/2008.
- Incidir en la cultura del personal de labor amb l'objectiu de millorar la gestió dels residus.
- Planificar i minimitzar el possible impacte ambiental dels residus de l'obra. En aquest cas, els objectius se centraran en la classificació en origen i la gestió externa correcta dels residus.
- Amés de planificar la gestió dels residus , s'optimitzaran els recursos que s'hi destinin.

La Direcció General de carreteres de Departament de Territori i Sostenibilitat de la Generalitat de Catalunya, com a productor de residus, ha de vetllar pel compliment de la normativa específica vigent, fomentant la prevenció de residus d'obra, la reutilització, el reciclatge i altres formes de valoració, assegurant un tractament adequat per aconseguir un desenvolupament sostenible de l'activitat de la construcció.

# 2 TIPOLOGIA DE RESIDUS GENERATS

A continuació, es presenta un llistat dels residus que es poden produir durant l'obra i la seva classificació, segons el Catàleg Europeu de Residus (CER), que està en vigor des de l'1 de gener de 2002. Amb el nou Catàleg, mitjançant un sistema de llista única s'estableix quins residus han d'ésser considerat com a perillosos (especials).

En el nou Catàleg, els residus adopten una codificació de sis xifres, essent el format de la codificació el mateix que en el Catàleg de Residus de Catalunya (CRC), tot i que aquests no tenen per què coincidir.

El CRC continua essent per a determinar la correcta gestió que ha de tenir cadascun dels residus (valoració, tractament o disposició), sempre que no entri en contradicció amb l'aplicació del nou Catàleg Europeu de Residus (CER), com és el cas de la seva classificació.

En general, els principals residus del procés de construcció o demolició son els següents:

- Terres
- Roca
- Formigó
- Restes vegetals
- Metalls
- Altres: fustes, vidre, plàstic...

A continuació, s'adjunta quins materials es preveu que es generin com a residus:

| Codi CER | Descripció | Si | No |
|---|---|---|---|
| **17** | **Residus de construcció i d'enderrocs (inclosa la terra excavada de zones contaminades)** | | |
| 17 01 | *Formigó, maons, teules i materials ceràmics* | | |
| 17 01 01 | Formigó | X | |
| 17 01 02 | Maons | X | |
| 17 01 03 | Teules i materials ceràmics | X | |
| 17 01 06* | Barreges, o fraccions separades de formigó, maons, teules i materials ceràmics que contenen substàncies perilloses. | | X |
| 17 01 07 | Barreges de formigó, maons, teules i materials ceràmics diferents de les especificades en el codi 17 01 06 | X | |
| 17 02 | *Fusta, vidre i plàstic* | | |
| 17 02 01 | Fusta | X | |
| 17 02 02 | Vidre | | X |
| 17 02 03 | Plàstic | X | |
| 17 02 04* | Vidre, plàstic i fusta que contenen substàncies perilloses o estan contaminats per aquestes | | X |
| 17 03 | *Mescles bituminoses, quitrà d´hulla i altres productes enquitranats* | | |
| 17 03 01* | Mescles bituminoses que contenen quitrà d'hulla | | X |
| 17 03 02 | Barreges bituminoses diferents de les especificades en el codi 17 03 01 | | X |
| 17 03 03* | Quitrà d'hulla i productes enquitranats | | X |

| | | | |
|---|---|---|---|
| 17 04 | *Metalls (inclosos els seus aliatges)* | | |
| 17 04 01 | Coure, bronze, llautó | X | |
| 17 04 02 | Alumini | X | |
| 17 04 03 | Plom | | X |
| 17 04 04 | Zinc | | X |
| 17 04 05 | Ferro i acer | X | |

| Codi CER | Descripció | Si | No |
|---|---|---|---|
| 17 04 06 | Estany | | X |
| 17 04 07 | Metalls mesclats | X | |
| 17 04 08* | Residus metàl·lics contaminats amb substàncies perilloses | | X |
| 17 04 10* | Cables que contenen hidrocarburs, quitrà d'hulla i altres substàncies perilloses | | X |
| 17 04 11 | Cables diferents dels especificats en el codi 17 04 10 | | X |
| 17 05 | *Terra (inclosa l´excavada de zones contaminades), pedres i llots de drenatge* | | |
| 17 05 03* | Terra i pedres que contenen substàncies perilloses | | X |
| 17 05 04 | Terra i pedres diferents de les especificades en el codi 17 05 03 | | X |
| 17 05 05* | Llots de drenatge que contenen substàncies perilloses | | X |
| 17 05 06 | Llots de drenatge diferents dels especificats en el codi 17 05 05 | | X |
| 17 05 07* | Balast de vies fèrries que conté substàncies perilloses | | X |
| 17 05 08* | Balast de vies fèrries diferent de l'especificat en el codi 17 05 07 | | X |
| 17 06 | *Materials d´aïllament i materials de construcció que contenen amiant* | | |
| 17 06 01* | Materials d'aïllament que contenen amiant | | X |
| 17 06 03* | Altres materials d'aïllament que consisteixen en, o contenen, substàncies perilloses | | X |
| 17 06 04 | Materials d'aïllament diferents dels especificats en els codis 17 06 01 i 17 06 03 | | X |
| 7 06 05* | Materials de construcció que contenen amiant | | X |
| 17 08 | *Materials de construcció a base de guix* | | |
| 17 08 01* | Materials de construcció a base de guix contaminats amb substàncies perilloses | | X |
| 17 08 02 | Materials de construcció a base de guix diferents dels especificats en el codi 17 08 01 | X | |

| | | | |
|---|---|---|---|
| 17 09 | *Altres residus de construcció i demolició* | | |
| 17 09 01* | Residus de construcció i demolició que contenen mercuri | | X |

| Codi CER | Descripció | Si | No |
|---|---|---|---|
| 17 09 02* | Residus de construcció i demolició que contenen PCB (per exemple, segellants que contenen PCB, revestiments de sòl a base de resines que contenen PCB, envidraments dobles que contenen PCB, condensadors que contenen PCB) | | X |
| 17 09 03* | Altres residus de construcció i demolició (inclosos els residus mesclats) que contenen substàncies perilloses | | X |
| 17 09 04 | Residus mesclats de construcció i demolició diferents dels especificats en els codis 17 09 01, 17 09 02 i 17 09 03 | X | |

* Els residus senyalats amb * són residus catalogats com a residus especials d'acord amb la Directiva 91/689/CEE sobre residus perillosos a les disposicions del qual estan subjectes a menys que s'apliqui l'apartat 5 de l'article 1 d'aquesta Directiva.

<u>- Altres residus no especials generats durant les obres no inclosos al capítol 17 del CER</u>

- Restes vegetals

El Catàleg Europeu de Residus (CER) no inclou la classificació de restes vegetals en el capítol de Residus de Construcció i Demolició. Igualment, al capítol 02, del CER s'inclou els residus de silvicultura, aquest és equivalent a les restes vegetals.

| Codi CER | Descripció | Si | No |
|---|---|---|---|
| 02 01 07 | Residus de silvicultura | X | |

A més dels residus citats es poden originar altres residus en petites quantitats com són:

- Paper i cartró
- Envasos, draps de neteja i roba de treball

Segons el Catàleg Europeu de Residus, aquests residus s'inclouen en els següents grups:

| Codi CER | Descripció | Si | No |
|---|---|---|---|
| 20 01 01 | Paper i cartró | X | |
| 15 | Residus d'envasos, absorbents, draps de neteja, materials de filtració i roba de protecció no especificats en cap altra categoria | X | |

- Altres residus especials generats durant les obres no inclosos al capítol 17 del CER

Durant les obres es poden generar altres residus especials no inclosos tampoc al capítol 17:

| Codi CER | Descripció | Si | No |
|---|---|---|---|
| 13* | Residus d'olis i combustibles líquids (excepte olis comestibles i els dels capítols 05, 12 i 19) | X | |
| 02 01 08* | Residus agroquímics que contenen substàncies perilloses | | X |
| 15 01 11* | Envasos metàl·lics, inclosos els recipients a pressió buits, que contenen una matriu sòlida i porosa perillosa | X | |

# 3 IDENTIFICACIÓ I INTEGRACIÓ DELS ANTECEDENTS ADMINISTRATIUS I TÈCNICS. DADES DE PARTIDA

Segons l'article 4 del Real Decreto 105/2008, de 1 de febrer, pel qual es regula la producció i gestió dels residus de construcció i demolició, s'ha d'estimar el volum dels residus de construcció i demolició que es generarà a obra en l'estudi de Gestió de Residus.

Per tant, en el present apartat s'elabora una estimació del volum de residus de demolició o enderrocs que es generen a obra.

La classificació dels residus es basa en la codificació dels residus d'enderrocs del Catàleg Europeu de Residus (CER), definida a l'apartat 2 del present annex.

La taula que es presenta a continuació conté els volums i pesos de residus que es preveuen generar classificats per tipologies.

## 3.1 TIPOLOGIA I ESTIMACIÓ DE RESIDUS D'OBRA NOVA

Per a realitzar el càlcul dels residus generats s'ha tingut en compte les indicacions de la Guia per a la redacció de l'Estudi de Gestió de Residus de construcció i enderroc de la Agència de Residus de Catalunya. Concretament, s'han utilitzat els percentatges de la Taula 2 "Fitxa model per a la definició de la tipologia i l'estimació dels residus de la construcció de l'edificació: residus d'obra nova".

*Taula de previsions de generació de sobrats de materials*

**Superfície de actuación** 450 **m2**

**PREVISIONES DE GENERACIÓN DE SOBRANTES DE MATERIALES DE OBRA**

**Tabla 2. Ficha modelo para la definición de la tipología y la estimación de los residuos de la construcción de la edificación Guía para la redacción del Estudio de Gestión de Residuos de construcción y escombros. Agencia de Residuos de Cataluña**

| RESIDUOS DE OBRA NUEVA | | | |
|---|---|---|---|
| **Materiales** | **Tipología[(1)]** | **Previsión volumen aparente (m3 residuo)** | **Previsión peso (Tn residuo)** |
| **Cimentación y estructuras** | | | |
| 17 01 01 Hormigón | Inerte | 1,71 | 2,40 |
| 17 04 07 Metales mezclados | No Especial | 0,57 | 0,20 |
| 17 02 01 Madera | No Especial | 4,27 | 1,07 |
| 17 02 03 Plástico | No Especial | 0,85 | 0,13 |
| 15 01 01 Envases de papel y cartón | No Especial | 0,36 | 0,03 |
| **Acabados** | | | |
| 17 01 01 Hormigón | Inerte | 5,10 | 7,14 |
| 17 02 01 Madera | No Especial | 1,53 | 0,38 |
| 17 02 03 Plástico | No Especial | 2,84 | 0,43 |
| 17 09 04 Residuos mezclados de la construcción y demolición | No Especial | 0,16 | 0,07 |
| 15 01 01 Envases de papel y cartón | No Especial | 3,29 | 0,23 |
| **Total por tipologías** | 17 01 01 Hormigón | 6,81 | 9,54 |
| | 17 04 07 Metales mezclados | 0,57 | 0,20 |
| | 17 02 01 Madera | 5,80 | 1,45 |
| | 17 02 03 Plástico | 3,70 | 0,57 |
| | 17 09 04 Residuos mezclados de la construcción y demolición | 0,16 | 0,07 |
| | 15 01 01 Envases de papel y cartón | 3,65 | 0,26 |

# 4 ACCIONS DE MINIMITZACIÓ I PREVENCIÓ DE RESIDUS A L'OBRA

El procés de fabricació dels materials i productes de la construcció té un fort impacte que afecta negativament el medi ambient, provocant una disminució de recursos naturals i l'augment de la despesa energètica. L'extracció del material natural, la seva transformació en matèria primera, el procés de fabricació del producte i el consum d'energia procedent del petroli originen emissions de tot tipus, molt tòxiques, contaminants i potencialment perilloses per la salut.

El present apartat pretén identificar totes aquelles accions de minimització a tenir en consideració en el projecte per tal de prevenir la generació de residus de la construcció i demolició durant la fase d'obra o de reduir-ne la seva producció.

En línies generals, les accions que hem considerat per reduir la generació de residus són les següents:

1. Realitzar solucions constructives que s'ajustin al màxim amb els càlculs (per reduir el volum de material i, per tant, d'energia).
2. S'han emprat sistemes constructius industrialitzats i prefabricats que es munten a obra sense gairebé generar residus.
3. S'ha considerat la reutilització de tota la terra vegetal provinent del moviment de terres, la mateixa que serà col·locada en els nous talussos i les superfícies de la calçada existent a renaturalitzar.
4. S'han intentat utilitzar els "materials reutilitzables" a la pròpia obra, procurant que aquests continguin unes característiques físico-químiques adequades i regulades en el Plec de Prescripcions Tècniques.

Tot seguit s'adjunta una fitxa amb les accions de minimització i prevenció, o d'altres que ajudaran a una millor gestió dels residus abans de començar el projecte, i que s'ha de complimentar una vegada finalitzada la seva redacció, assenyalant o afegint aquelles bones pràctiques que s'han considerat en el projecte.

| **FITXA PER A ASSENYALAR LES ACCIONS DE MINIMITZACIÓ I PREVENCIÓ DES DE LA FASE DE PROJECTE** | | **SI** | **NO** |
|---|---|---|---|
| 1 | S'ha programat el volum de terres excavades per minimitzar els sobrants de terra i per utilitzar-los al mateix emplaçament? | | X |
| 2 | Els sistemes constructius són sistemes industrialitzats i prefabricats que es munten a obra sense gairebé generar residus? | X | |
| 3 | S'ha optimitzat les seccions resistents, per tendir a reduir el pes de la construcció i, per tant, la quantitat de material a emprar? | X | |

| | | | |
|---|---|---|---|
| 4 | S'empren sistemes d'encofrat reutilitzables? | X | |
| 5 | S'ha detectat aquelles partides que poden admetre materials reutilitzats de la pròpia obra. La reutilització dels materials en la pròpia obra, fa que perdin la consideració de residus, cal reutilitzar aquells materials que continguin unes característiques físiques/químiques adequades i regulades en el Plec de Prescripcions Tècniques. | | X |
| 7 | S'ha modulat el projecte (paviments, barreres, cunetes, etc.) per minimitzar els retalls? | X | |
| 9 | Des d'un punt de vista de la disminució de la producció dels residus d'una forma global, s'han utilitzat materials que incorporin material reciclat (residus) en la seva producció? | | X |

Altres accions de caire particular que s'hauran de tenir present durant l'execució de l'obra per tal de reduir la generació de residus són:

- Realitzar la compra ajustada de materials a l'ús que es realitzi (sense excedents).
- Optimitzar la quantitat de materials, ajustant-los als estrictament necessaris per a l'execució de l'obra.
- Escollir materials i productes ecològics amb certificacions que garanteixin la menor incidència ambiental en el seu cicle de vida (amb contingut de reciclat, etc.).
- Compra de materials al major amb envasos d'una dimensió que permeti reduir la producció de residus d'embalatges.
- Donar preferència a proveïdors que envasin els seus productes amb sistemes d'embalatge que tendeixen a minimitzar els residus o en recipients fabricats amb materials reciclats, biodegradables i que poden ser retornables o, almenys, reutilitzables.
- Donar preferència a aquells proveïdors de materials que informen a l'usuari de les característiques que els composen i del percentatge de material reciclat que incorporen, oferint garanties que el mateix fabricant es fa responsable de la gestió de residus que generin en l'obra els seus productes (pactant prèviament el percentatge i característiques dels residus que acceptaran en cas de retorn) o, si això no és viable, informació sobre recomanacions per la gestió més idònia dels residus produïts tenint en compte les seves possibilitats de valoració.
- Preveure a l'obra una ubicació per l'emmagatzematge i recollida dels materials per garantir les propietats i l'ordre fins el moment de la seva aplicació.
- Planificar l'arribada de productes, segons les necessitats d'execució ("*just-in-time*") en cas de no disposar d'espai suficient per aplicar la recomanació anterior.
- Minimitzar el temps d'emmagatzematge gestionant els estocs de manera que s'eviti la producció de residus per trencament de materials.
- Identificar correctament els materials emmagatzemats.
- Emmagatzemar els materials nous (posant especial atenció en els materials d'acabats) en ordre en un lloc on no es deteriorin les propietats.
- Programar el volum de terres excavades per minimitzar els sobrants de terres i emprar-los en el mateix emplaçament, i l'excedent de terres, es gestiona amb un gestor autoritzat.
- Programar l'obra de manera que hi hagi reblerts que serveixin per reutilitzar els residus reciclats (tot-ú). Utilització d'elements prefabricats reutilitzables per al replanteig de la infraestructura de l'obra.
- Carregar els carretons o els palets de manera adequada, perquè el transport no representi un perill potencial per la seguretat dels treballadors i que no s'espatllin els materials nous.
- Traçat d'itineraris en l'interior de l'obra per la circulació del material i es deixa assenyalat en el plànol general de l'obra.
- Utilització de sistemes d'encofrat reutilitzables.
- Previsió de pas d'instal·lacions, evacuació, etc. durant les tasques d'encofrat per evitar obertures o perforacions posteriors.
- Utilització de materials reutilitzables en les reserves dels passos de conductes d'instal·lació, evacuació, finestres, etc.
- Evitar al màxim el número de retalls durant la posada en obra dels tubs i altres materials d'instal·lacions (plàstics, aïllaments, etc.).
- Els materials col·locats durant la fase d'acabat susceptibles de fer-se malbé es protegeixen amb elements de protecció que es puguin reutilitzar o reciclar.
- Es realitzen a peu d'obra exclusivament aquelles tasques de pintura que no es puguin realitzar en un taller.
- Es calcula amb exactitud la superfície que es requereix pintar i es prepara només la quantitat de pintura necessària.
- Control de preparació de les mescles per les operacions de pintura amb el fi d'evitar errors i, conseqüentment, residus.
- No utilització de les pistoles convencionals d'alta pressió i utilització d'aquelles que redueixen el consum de pintura i la producció de residus.
- Aspiració de la pols que cau al terra i es gestiona, conjuntament amb l'escuma, com a residu especial.
- Rentat de les pistoles en màquines rentadores que permetin la recuperació de dissolvent.
  Reciclat dels dissolvents per mitjà de destil·ladores o per mitjà d'empreses que proporcionen aquest servei.

- Aprofitament per altres obres dels pots de la pintura abans de lliurar-los a un gestor autoritzat.
- Reutilització de dissolvents i les substàncies utilitzades en la neteja d'equips i eines.
- Evitar les barreges amb aigua i altres residus no oleaginosos.

## 5 OPERACIONS DE GESTIÓ DE RESIDUS

En aquest apartat es deixa constància de les operacions i d'instal·lacions destinades a la gestió dels residus que cal preveure des de la fase de projecte.

La fase d'obra del nostre projecte té dos tipus de gestió, la gestió dins de l'obra i fora de l'obra. Per aquest motiu, es considera imprescindible fer una reflexió sobre les diferents possibilitats de gestió "internes" i "externes" més adequades per a la nostra obra, d'acord a:

- L'espai disponible per realitzar la separació selectiva i abocament dels residus a l'obra.
- La possibilitat de reutilització i reciclatge in situ.
- La proximitat de valoritzadors de residus de la construcció i demolició i la distància als dipòsits controlats, els costos econòmics associats a cada opció de gestió, etc.

En qualsevol cas, s'ha de considerar sempre l'abocament en dipòsits controlats com a última opció en la gestió dels residus de construcció i demolició i, s'ha de tendir, per aquest ordre, a la reutilització, al reciclatge o a qualsevol altre tipus de valorització.

Per tal de fer-ho viable, es recomana que la gestió mínima de separació selectiva per a les obres de construcció i demolició estigui formada per la segregació dels residus Inerts, dels residus No Especials i dels residus Especials (aquests sempre han d'anar separats de la resta).

Cal tenir en compte, però, que aquesta gestió mínima pot anar-se ampliant en funció de les possibilitats de valorització (internes i externes) que existeixin a la mateixa obra i a l'entorn proper d'aquesta. En el primer cas ens referim a la capacitat que pugui tenir una determinada obra de construcció d'absorbir part dels residus inerts que genera; en el segon cas ens referim a la viabilitat de comptar amb valoritzadors de residus.

La classificació a l'origen (a la mateixa obra) dels residus de construcció i demolició és el factor que més influeix en el seu destí final. Un contenidor que surt de l'obra amb residus heterogenis té menys opcions de ser valoritzat que un de net, carregat amb un residu homogeni que pot ser transportat directament cap a una central de reciclatge o, fins i tot, si compleix amb les característiques físico-químiques exigides, reutilitzat (en el cas de la runa neta) en la mateixa obra on s'ha produït.

És a dir, qualsevol operació de reciclatge o de reutilització ha d'estar sotmesa a una destria inicial que permeti disposar d'una matèria primera uniforme i d'un material resultant de qualitat.

Quan no sigui viable la classificació selectiva en origen (a la mateixa obra) és obligatori derivar els residus barrejats (inerts i no especials) cap a instal·lacions on es faci un tractament previ i des d'on el residu pugi ser finalment tramés a un gestor autoritzat per la seva valorització o, en el cas més desfavorable, cap a l'abocament a dipòsit controlat.

Per definir les operacions de gestió de residus caldrà deixar constància de:

- El tipus de separació selectiva i el nombre de contenidors en funció de les possibilitats de reutilització, de les tipologies de residu, de l'espai de l'obra.
- La quantitat de material reutilitzat a l'obra procedent del reciclatge in situ dels residus petris generats en el mateix emplaçament. Quantitat de residu petri (m3) que s'ha evitat portar a abocador.
- Els models de senyalitzacions emprades per als contenidors, segons el tipus de residu que poden contenir.
- Les dades sobre destí dels residus (dades dels gestors de les instal·lacions de valorització, separació, transferència o de dipòsits controlats).

A partir dels punts abans esmentats, s'ha considerat convenient col·locar com a zona d'abocador un sector d'escàs o nul interès socioeconòmic i paisatgístic amb poca afectació a la flora i fauna. Aquesta zona també està propera a l'àmbit d'actuació de l'obra i d'aquesta manera reduïm el trànsit per a les zones poblades i alienes a la traça. Hem de considerar també que els abocadors de terra han d'estar situats fora dels límits d'espais que gaudeixin de protecció o bé zones amb alt interès botànic, faunístic o paisatgístic.

En línies generals, s'hauran d'utilitzar com a zones per a la aportació de terres les pedreres actives que estiguin en fase de restauració i tinguin necessitat de terres, minimitzant l'obertura de noves zones d'abocador de terres.

En cas d'haver-ne de fer de noves, per a la utilització dels abocadors definitius de terres i abans de començar a aportar terres, s'haurà de tramitar les corresponents autoritzacions d'acord amb les directrius establertes en el Decret 396/2006, de 17 d'octubre, pel qual es regula la intervenció ambiental en el procediment de llicència urbanística per a millora de finques rústiques que s'efectuen amb aportació de terres procedents d'obres de la construcció.

Caldrà definir els límits concrets de les àrees seleccionades i que es té previst ocupar, marcant els límits de manera clara i visible (amb cinta i estaques o amb malla taronja) procurant afectar el terreny el menys possible mentre d'aquest utilitzant.

Les operacions a portar a terme referent a la gestió de residus durant l'execució de l'obra per part del contractista seran les següents:

- Redactat del Pla de Residus definitiu respectant els criteris establerts en el present Pla de Gestió de Residus.
- Caracterització del terreny mitjançant estudi geotècnic prèvia implantació i es gestiona com a residu especial cas que es tracti d'un terreny contaminat.
- Reutilització de terres, restes de materials que no s'han disposat en obra, encofrats, palets de fusta, bidons...
- Reciclatge de materials com l'acer, cristall, paper, cartró, plàstics, reciclatge de matèria orgànica en abonament...
- Aprofitament energètic de restes inaprofitables de fustes, matèria orgànica, etc.
- Definició de l'escenari més adequat per l'obra en curs i es preveu un emplaçament adequat per situar la zona de classificació, emmagatzematge de residus d'obra, intercanvi amb gestors, de tractament de residus, etc.
- Col·locació d'un plànol a l'entrada de l'obra, on se senyala amb claredat la zona de classificació i disposició dels residus de construcció en els diferents contenidors i els materials que es poden dipositar, a més d'altres propostes dirigides a millora la gestió dels residus.
- Separació dels residus en funció de les possibilitats de valoració.
- Senyalització dels contenidors indicant el tipus de residu que poden admetre.
- Separació i disposició dels residus inerts en contenidors en funció de les possibilitats de recuperació i requisits de gestió (com els elements de guix disminueixen considerablement les possibilitats de reciclatge dels materials petris a causa dels problemes d'expansivitat que ocasionen, es recomana gestionar-los per separat de la fracció pètria anomenada runa neta).
- Matxucat dels residus petris en obra per reaprofitar-los en el mateix emplaçament, deixant constància escrita de la quantitat.
- Gestió dels residus inerts mitjançant un gestor autoritzat.
- Disposició de residus en abocador autoritzat de productes perillosos, materials amb contingut d'asbests o amiant, piles i bateries, pintures, restes amb hidrocarburs, olis, etc.
- Reciclat dels dissolvents per mitjà de destil·ladores o per mitjà d'empreses que proporcionen aquest servei.
- Reutilització de dissolvents i les substàncies utilitzades en la neteja d'equips i eines.
- Previ inici de la fase d'execució, es portaran a terme jornades informatives amb l'objectiu de la sensibilització mediambiental del personal de l'obra o de la subcontracta.
- Es vetllarà perquè els residus siguin gestionats per la subcontracta que els genera, sobretot en el cas dels residus especials, atenent sempre les instruccions del fabricant i d'acord amb la legislació vigent.

# 6 MESURES PER LA SEPARACIÓ DE RESIDUS A L'OBRA

Caldrà fer una separació de forma individualitzada per cadascuna de les fraccions de residus quan la quantitat prevista de generació per al total de l'obra superi les següents quantitats indicades a continuació.

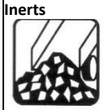
- Formigó: 80 T
- Maons, teules, ceràmics: 40 T
- Metall: 2,0 T
- Fusta: 1,0 T
- Vidre: 1,0 T
- Plàstic: 0,5 T
- Paper i Cartró: 0,5 T

En cas de generar-se algun altre residu per causes excepcionals o circumstancials, i aquest és dels contemplats en el plec de prescripcions de INFRAESTRUCTURES.CAT, i a més excedeix als mínims establerts, haurà d'efectuar-se-li procés de separació igual que els abans considerats.

A continuació s'adjunten, en forma de taula, una fitxa per facilitar la identificació de les operacions de gestió de residus dintre i fora de l'obra, més apropiats per a l'obra a executar:

| FITXA RESUM DE LA GESTIÓ DELS RESIDUS DINS DE L'OBRA | | |
|---|---|---|
| 1 | **Separació segons tipologia de residu** | Especificar el tipus de separació selectiva prevista per tal de preveure un espai a l'obra.<br>Cal recordar que, segons el RD 105/2008, d'1 de febrer, s'ha de preveure una separació en obra de les següents fraccions, quan de forma individualitzada per cadascuna d'elles, la quantitat prevista de generació per al total de l'obra superi les següents quantitats indicades a continuació.<br>Formigó: 80 T<br>Maons, teules, ceràmics: 40 T<br>Metall: 2,0 T<br>Fusta: 1,0 T<br>Vidre: 1,0 T<br>Plàstic: 0,5 T<br>Paper i Cartró: 0,5 T |
| | **Especials** | □ Zona habilitada pels Residus Especials (amb tants bidons com calgui).<br>La legislació de Residus Especials obliga a tenir una zona adequada per a l'emmagatzematge d'aquest tipus de residu. Entre d'altres recomanacions, es destaquen les següents:<br>● No tenir-los emmagatzemats a l'obra més de 6 mesos.<br>● El contenidor de residus especials haurà de situar-se en un lloc pla i fora del trànsit habitual de la maquinària d'obra, per tal d'evitar vessaments accidentals<br>● Senyalitzar correctament els diferents contenidors on s'hagin de situar els envasos dels productes Especials, tenint en compte les incompatibilitats, segons els símbols de perillositat representats en les etiquetes.<br>● Tapar els contenidors i protegir-los de la pluja, la radiació, etc.<br>● Emmagatzemar els bidons que contenen líquids perillosos (olis, desencofrants, etc.) en posició vertical i sobre cubetes de retenció de líquids per tal d'evitar fuites.<br>● Impermeabilitzar el terra on se situïn els contenidors de residus especials |
| | **Inerts** | □ Contenidor per Inerts barrejats<br>□ Contenidor per Inerts Formigó |

| | | |
|---|---|---|
| | | □ Contenidor per Inerts Ceràmica<br>□ Contenidor per altres inerts<br>□ Contenidor o zona d'aplec per terres que van a abocador |
| | **No Especials** | □ Contenidor per metall □ Contenidor per fusta<br>□ Contenidor per plàstic □ Contenidor per paper i cartró<br>□ Contenidor per ... □ Contenidor per ...<br>□ Contenidor per la resta de residus No Especials barrejats<br>□ Contenidor per TOTS els residus No Especials barrejats |
| | | |

| | | |
|---|---|---|
| | **Inerts+No Especials** | Inerts + No Especials: □ contenidor amb Inerts i No Especials barrejats (**)<br>(**) Només quan sigui tècnicament inviable. En aquest cas, derivar-ho cap a un gestor que li faci un tractament previ. |
| 2 | **Reciclatge de residus petris inerts en la pròpia obra** | Indicar, si s'escau, la quantitat de residus petris que es preveu matxucar a l'obra per reutilitzar, posteriorment, en el mateix emplaçament.<br>Quantitat de residus que es preveu reciclar i que s'evita portar a abocador:<br>(kg): (m3):<br><br>Quantitat d'àrid matxucat resultant: (cal tenir en compte que l'àrid resultant, una vegada matxucat serà, aproximadament, un 30% menor al volum inicial de residus petris)<br>(kg): (m3): |
| 3 | **Senyalització dels contenidors** | Els contenidors s'hauran de senyalitzar en funció del tipus de residu que continguin, d'acord amb la separació selectiva prevista. |
| | **Inerts**  | Residus admesos: ceràmica, formigó, pedres, etc.<br>CODIS CER: 17 01 07, 17 05 04, ... (codis admesos en els dipòsits de terres i runes) |
| | **No Especials barrejats**  | Residus admesos: fusta, metall, plàstic, paper i cartró, cartró-guix, etc.<br>CODIS CER: 17 02 01, 17 04 07, 15 01 01, 17 02 03, 17 04 01... (codis admesos en dipòsits de residus No Especials). Aquest símbol identifica als residus No Especials barrejats, no obstant, en cas d'optar per una separació selectiva més exigent, caldria un cartell específic per a cada tipus de residu:<br>fusta ferralla paper i cartró plàstic cables elèctrics<br>  |
| | **Especials**  | CODIS CER: (els codis dependran dels tipus de residus). Aquest símbol identifica als residus Especials de manera genèrica i pot servir per senyalitzar la zona d'aplec habilitada pels residus Especials, no obstant, a l'hora d'emmagatzemar-los cal tenir en compte els símbols de perillositat que identifiquen a cadascun i senyalitzar els bidons o contenidors d'acord amb la legislació de residus Especials. |

| **Destí dels residus segons tipologia** | Identificar els recicladors, plantes de transferència o dipòsits propers a l'entorn de l'obra on es proposa gestionar els residus de la construcció: | | | | |
|---|---|---|---|---|---|
| *Inerts* | Quantitat estimada | | Gestor | | Observ |
| | Tones | m³ | Codi | Nom | |
| □ Reciclatge | | | | | |
| □ Planta de transferència | | | | | |
| □ Planta de selecció | | | | | |
| □ Dipòsit | 9.54 | 6.81 | 101 | Planta de triatge de pont de Vilomara i Rocafort | |

| *Residus No Especials* | Quantitat estimada | | Gestor | | Observ |
|---|---|---|---|---|---|
| | Tones | m³ | Codi | Nom | |
| Reciclatge: | | | | | |
| □ Reciclatge de metall | 0.2 | 0.57 | E-1225.11 | ALFAMETAL INTERNATIONAL BCN,SL | |
| □ Reciclatge de fusta | 1.45 | 5.8 | E-272.96 | ADOBS ORGÀNICS, SL | |
| □ Reciclatge de plàstic | 0.57 | 3.7 | E-1395.13 | ANTONI ESCOLA SOLÉ | |
| □ Reciclatge paper-cartró | 0.26 | 3.65 | E-272.96 | ADOBS ORGÀNICS, SL | |
| □ Reciclatge altres (vidre) | | | | | |
| □ Planta de transferència | | | | | |
| □ Planta de selecció | | | | | |
| □ Dipòsit | 0.07 | 0.16 | 101 | Planta de triatge de pont de Vilomara i Rocafort | |

# 7 PLEC DE PRESCRIPCIONS TÈCNIQUES PARTICULARS

PARTIDES D'OBRA DE GESTIÓ DE RESIDUS

I2 - DEMOLICIONS, ENDERROCS, MOVIMENTS DE TERRES I GESTIÓ DE RESIDUS

I2R - GESTIÓ DE RESIDUS

I2R2 - CLASSIFICACIÓ DE RESIDUS

0.- ELEMENTS QUE CONTEMPLA EL PLEC

I2R24200.

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Operacions destinades a la gestió dels residus generats en l'obra: residu de construcció o demolició o material d'excavació.

S'han considerat les operacions següents:

- Classificació dels residus en obra

CLASSIFICACIÓ DE RESIDUS:

S'han de separar els residus en les fraccions mínimes següents si es supera el límit especificat, d'acord amb el que especifica l'article 5.5 del REAL DECRETO 105/2008 :

- Formigó LER 170101 (formigó): >= 80 t

- Maons, teules, ceràmics LER 170103 (teules i materials ceràmics): >= 40 t
- Metall LER 170407 (metalls barrejats) >= 2 t
- Fusta LER 170201 (fusta): >= 1 t
- Vidre LER 170202 (vidre): >= 1 t
- Plàstic LER 170203 (plàstic) >= 0,5 t
- Paper i cartró LER 150101 (envasos de paper i cartró): >= 0,5 t

Els materials que no superin aquest límits o que no es corresponguin amb cap de les fraccions anteriors, han de quedar separats com a mínim en les fraccions següents:

- Inerts LER 170107 (mescles de formigó, maons, teules i materials ceràmics que no contenen substàncies perilloses)
- No especials LER 170904 (residus barrejats de construcció i demolició que no contenen, mercuri, PCB ni substàncies perilloses)
- Especials LER 170903* (altres residus de construcció i demolició (inclosos els residus barrejats, que contenen substàncies perilloses)

Els residus separats en les fraccions establertes al "Pla de Gestió de Residus de la Construcció i Enderroc" de l'obra, s'emmagatzemaran en els espais previstos a l'obra per a aquesta finalitat.

Els contenidors han d'estar senyalitzats clarament, en funció del tipus de residu que continguin, d'acord amb la separació selectiva prevista.

Els materials destinats a ser reutilitzats han de quedar separats, en funció del seu destí final.

RESIDUS ESPECIALS:

Els residus especials sempre s'han de separar.

Els residus especials s'han de dipositar en una zona d'emmagatzematge separada de la resta.

Temps màxim d'emmagatzematge: 6 mesos.

Els materials potencialment perillosos han d'estar separats per tipus compatibles i emmagatzemats en bidons o contenidors adequats, amb indicació del tipus de perillositat.

El contenidor de residus especials ha de situar-se en un lloc pla, fora del trànsit habitual de la maquinària d'obra, per tal d'evitar vessaments accidentals

Cal senyalitzar convenientment els diferents contenidors de residus especials, tenint en compte les incompatibilitats segons els símbols de perillositat representat en les etiquetes.

Els contenidors de residus especials han d'estar tapats i protegits de la pluja i la radiació solar excessiva.

Els bidons que contenen líquids perillosos (olis, desencofrants, etc.) s'han d'emmagatzemar en posició vertical i sobre cubetes de retenció de líquids per tal d'evitar fuites.

Els contenidors de residus especials s'han de col·locar sobre un terra impermeabilitzat.

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

RESIDUS DE LA CONSTRUCCIÓ:

La manipulació dels materials s'ha de fer amb les proteccions adequades a la perillositat del mateix.

3.- UNITAT I CRITERIS D'AMIDAMENT

CLASSIFICACIÓ DE RESIDUS:

m3 de volum realment classificat d'acord amb les especificacions del "Pla de Gestió de Residus de Construcció i Enderrocs" de l'obra.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

Reial decret 105/2008, d'1 de febrer, pel qual es regula la producció i la gestió dels residus de construcció i demolició.

Ordre MAM/304/2002, de 8 de febrer, per la qual es publiquen les operacions de valorització i eliminació de residus i la llista europea de residus.

Correcció d'errades de l'Ordre MAM/304/2002, de 8 de febrer, per la qual es publiquen les operacions de valorització i d'eliminació de residus i de la llista europea de residus.

Reial decret 108/1991, d'1 de febrer, sobre la prevenció i la reducció de la contaminació del medi ambient produïda per l'amiant.

Decret 89/2010, de 29 de juny, pel qual s'aprova el Programa de gestió de residus de la construcció de Catalunya (PROGROC), es regula la producció i gestió dels residus de la construcció i demolició, i el cànon sobre la deposició controlada dels residus de la construcció.

I2 - DEMOLICIONS, ENDERROCS, MOVIMENTS DE TERRES I GESTIÓ DE RESIDUS

I2R - GESTIÓ DE RESIDUS

I2R5 - TRANSPORT DE RESIDUS DE CONSTRUCCIÓ O DEMOLICIÓ A INSTAL·LACIÓ AUTORITZADA DE GESTIÓ DE RESIDUS

0.- ELEMENTS QUE CONTEMPLA EL PLEC

2R540R0.

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Operacions destinades a la gestió dels residus generats en l'obra: residu de construcció o demolició o material d'excavació.

S'han considerat les operacions següents:

- Transport o càrrega i transport del residu: material procedent d'excavació o residu de construcció o demolició
- Subministrament i recollida del contenidor dels residus

RESIDUS ESPECIALS:

Els residus especials sempre s'han de separar.

Els residus especials s'han de dipositar en una zona d'emmagatzematge separada de la resta.

Temps màxim d'emmagatzematge: 6 mesos.

Els materials potencialment perillosos han d'estar separats per tipus compatibles i emmagatzemats en bidons o contenidors adequats, amb indicació del tipus de perillositat.

El contenidor de residus especials ha de situar-se en un lloc pla, fora del trànsit habitual de la maquinària d'obra, per tal d'evitar vessaments accidentals

Cal senyalitzar convenientment els diferents contenidors de residus especials, tenint en compte les incompatibilitats segons els símbols de perillositat representat en les etiquetes.

Els contenidors de residus especials han d'estar tapats i protegits de la pluja i la radiació solar excessiva.

Els bidons que contenen líquids perillosos (olis, desencofrants, etc.) s'han d'emmagatzemar en posició vertical i sobre cubetes de retenció de líquids per tal d'evitar fuites.

Els contenidors de residus especials s'han de col·locar sobre un terra impermeabilitzat.

CÀRREGA I TRANSPORT DE MATERIAL D'EXCAVACIÓ I RESIDUS:

L'operació de càrrega s'ha de fer amb les precaucions necessàries per a aconseguir unes condicions de seguretat suficients.

Els vehicles de transport han de portar els elements adequats a fi d'evitar alteracions perjudicials del material.

El contenidor ha d'estar adaptat al material que ha de transportar.

El trajecte que s'ha de recórrer ha de complir les condicions d'amplària lliure i de pendent adequades a la maquinària que s'utilitzi.

TRANSPORT A OBRA:

Transport de terres i material d'excavació o del rebaix, o residus de la construcció, entre dos punts de la mateixa obra o entre dues obres.

Les àrees d'abocada han de ser les que defineixi el "Pla de Gestió de Residus de la Construcció i Enderrocs" de l'obra.

L'abocada s'ha de fer al lloc i amb el gruix de capa indicats al "Pla de Gestió de Residus de la Construcció i els Enderrocs" de l'obra.

Les terres han de complir les especificacions del seu plec de condicions en funció del seu ús, i cal que tinguin l'aprovació de la DF.

TRANSPORT A INSTAL.LACIÓ EXTERNA DE GESTIÓ DE RESIDUS:

El material de rebuig que el "Pla de Gestió de Residus de la Construcció i els Enderrocs" i el que la DF no accepti per a reutilitzar en obra, s'ha de transportar a una instal·lació externa autoritzada, per tal de rebre el tractament definitiu.

El contractista ha de lliurar al promotor un certificat on s'indiqui, com a mínim:

- Identificació del productor dels residus
- Identificació del posseïdor dels residus
- Identificació de l'obra de la qual prové el residu i en el seu cas, el número de llicència d'obra
- Identificació del gestor autoritzat que ha rebut el residu i si aquet no fa la gestió de valorització o eliminació final del residu, la identificació, cal indicar també qui farà aquesta gestió
- Quantitat en t i m3 del residu gestionat i la seva codificació segons codi LER

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

CÀRREGA I TRANSPORT DE MATERIAL D'EXCAVACIÓ I RESIDUS:

El transport s'ha de realitzar en un vehicle adequat, per al material que es desitgi transportar, proveït dels elements que calen per al seu desplaçament correcte.

Durant el transport s'ha de protegir el material de manera que no es produeixin pèrdues en els trajectes utilitzats.

RESIDUS DE LA CONSTRUCCIÓ:

La manipulació dels materials s'ha de fer amb les proteccions adequades a la perillositat del mateix.

3.- UNITAT I CRITERIS D'AMIDAMENT

TRANSPORT DE MATERIAL D'EXCAVACIÓ O RESIDUS:

m3 de volum amidat amb el criteri de la partida d'obra d'excavació que li correspongui, incrementat amb el coeficient d'esponjament indicat en el plec de condicions tècniques, o qualsevol altre acceptat prèviament i expressament per la DF.

La unitat d'obra no inclou les despeses d'abocament ni de manteniment de l'abocador.

RESIDUS DE LA CONSTRUCCIÓ:

Es considera un increment per esponjament d'un 35%.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

Real Decreto 105/2008, de 1 de febrero, por el que se regula la producción y gestión de los residuos de construcción y demolición.

Orden MAM/304/2002, de 8 de febrero, por la cual se publican las operaciones de valorización y eliminación de residuos y la lista europea de residuos.

Corrección de errores de la Orden MAM/304/2002, de 8 de febrero, por la que se publican las operaciones de valorización y eliminación de residuos y lista europea de residuos.

Real Decreto 108/1991, de 1 de febrero, sobre la prevención y reducción de la contaminación del medio ambiente producida por el amianto.

Decret 89/2010, de 29 de juny, pel qual s'aprova el Programa de gestió de residus de la construcció de Catalunya (PROGROC), es regula la producció i gestió dels residus de la construcció i demolició, i el cànon sobre la deposició controlada dels residus de la construcció.

I2 - DEMOLICIONS, ENDERROCS, MOVIMENTS DE TERRES I GESTIÓ DE RESIDUS

I2R - GESTIÓ DE RESIDUS

2R6 - CÀRREGA I TRANSPORT DE RESIDUS DE CONSTRUCCIÓ O DEMOLICIÓ A INSTAL·LACIÓ AUTORITZADA DE GESTIÓ DE RESIDUS

0.- ELEMENTS QUE CONTEMPLA EL PLEC

I2R642M0.

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Operacions destinades a la gestió dels residus generats en l'obra: residu de construcció o demolició o material d'excavació.

S'han considerat les operacions següents:

- Transport o càrrega i transport del residu: material procedent d'excavació o residu de construcció o demolició
- Subministrament i recollida del contenidor dels residus

CÀRREGA I TRANSPORT DE MATERIAL D'EXCAVACIÓ I RESIDUS:

L'operació de càrrega s'ha de fer amb les precaucions necessàries per a aconseguir unes condicions de seguretat suficients.

Els vehicles de transport han de portar els elements adequats a fi d'evitar alteracions perjudicials del material.

El contenidor ha d'estar adaptat al material que ha de transportar.

El trajecte que s'ha de recórrer ha de complir les condicions d'amplària lliure i de pendent adequades a la maquinària que s'utilitzi.

TRANSPORT A OBRA:

Transport de terres i material d'excavació o del rebaix, o residus de la construcció, entre dos punts de la mateixa obra o entre dues obres.

Les àrees d'abocada han de ser les que defineixi el "Pla de Gestió de Residus de la Construcció i Enderrocs" de l'obra.

L'abocada s'ha de fer al lloc i amb el gruix de capa indicats al "Pla de Gestió de Residus de la Construcció i els Enderrocs" de l'obra.

Les terres han de complir les especificacions del seu plec de condicions en funció del seu ús, i cal que tinguin l'aprovació de la DF.

TRANSPORT A INSTAL.LACIÓ EXTERNA DE GESTIÓ DE RESIDUS:

El material de rebuig que el "Pla de Gestió de Residus de la Construcció i els Enderrocs" i el que la DF no accepti per a reutilitzar en obra, s'ha de transportar a una instal·lació externa autoritzada, per tal de rebre el tractament definitiu.

El contractista ha de lliurar al promotor un certificat on s'indiqui, com a mínim:

- Identificació del productor dels residus
- Identificació del posseïdor dels residus
- Identificació de l'obra de la qual prové el residu i en el seu cas, el número de llicència d'obra
- Identificació del gestor autoritzat que ha rebut el residu i si aquet no fa la gestió de valorització o eliminació final del residu, la identificació, cal indicar també qui farà aquesta gestió
- Quantitat en t i m3 del residu gestionat i la seva codificació segons codi LER

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

CÀRREGA I TRANSPORT DE MATERIAL D'EXCAVACIÓ I RESIDUS:

El transport s'ha de realitzar en un vehicle adequat, per al material que es desitgi transportar, proveït dels elements que calen per al seu desplaçament correcte.

Durant el transport s'ha de protegir el material de manera que no es produeixin pèrdues en els trajectes utilitzats.

RESIDUS DE LA CONSTRUCCIÓ:

La manipulació dels materials s'ha de fer amb les proteccions adequades a la perillositat del mateix.

3.- UNITAT I CRITERIS D'AMIDAMENT

TRANSPORT DE MATERIAL D'EXCAVACIÓ O RESIDUS:

m3 de volum amidat amb el criteri de la partida d'obra d'excavació que li correspongui, incrementat amb el coeficient d'esponjament indicat en el plec de condicions tècniques, o qualsevol altre acceptat prèviament i expressament per la DF.

La unitat d'obra no inclou les despeses d'abocament ni de manteniment de l'abocador.

RESIDUS DE LA CONSTRUCCIÓ:

Es considera un increment per esponjament d'un 35%.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

Real Decreto 105/2008, de 1 de febrero, por el que se regula la producción y gestión de los residuos de construcción y demolición.

Orden MAM/304/2002, de 8 de febrero, por la cual se publican las operaciones de valorización y eliminación de residuos y la lista europea de residuos.

Corrección de errores de la Orden MAM/304/2002, de 8 de febrero, por la que se publican las operaciones de valorización y eliminación de residuos y lista europea de residuos.

Real Decreto 108/1991, de 1 de febrero, sobre la prevención y reducción de la contaminación del medio ambiente producida por el amianto.

Decret 89/2010, de 29 de juny, pel qual s'aprova el Programa de gestió de residus de la construcció de Catalunya (PROGROC), es regula la producció i gestió dels residus de la construcció i demolició, i el cànon sobre la deposició controlada dels residus de la construcció.

I2 - DEMOLICIONS, ENDERROCS, MOVIMENTS DE TERRES I GESTIÓ DE RESIDUS

I2R - GESTIÓ DE RESIDUS

I2RA - DISPOSICIÓ DE RESIDUS A INSTAL·LACIO AUTORITZADA DE GESTIÓ DE RESIDUS

0.- ELEMENTS QUE CONTEMPLA EL PLEC

I2RA75A0,I2RA6770,I2RA6680,I2RA6890,I2RA6960,I2RA8V00.

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Operacions destinades a la gestió dels residus generats en l'obra: residu de construcció o demolició o material d'excavació.

S'han considerat les operacions següents:

- Deposició del residu no reutilitzat en la instal·lació autoritzada de gestió on se li aplicarà el tractament de valorització, selecció i emmagatzematge o eliminació

DISPOSICIÓ DE RESIDUS:

Cada fracció s'ha de dipositar al lloc adequat legalment autoritzat per a que se li apliqui el tipus de tractament especificat en la DT: valorització, emmagatzematge o eliminació.

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

RESIDUS DE LA CONSTRUCCIÓ:

La manipulació dels materials s'ha de fer amb les proteccions adequades a la perillositat del mateix.

3.- UNITAT I CRITERIS D'AMIDAMENT

DISPOSICIÓ DE RESIDUS DE CONSTRUCCIÓ O DEMOLICIO INERTS O NO ESPECIALS I DE MATERIAL D'EXCAVACIÓ:

m3 de volum de cada tipus de residu dipositat a l'abocador o centre de recollida corresponent.

DISPOSICIÓ DE RESIDUS DE CONSTRUCCIÓ O DEMOLICIÓ ESPECIALS:

kg de pes de cada tipus de residu dipositat a l'abocador o centre de recollida corresponent.

DISPOSICIÓ DE RESIDUS:

La unitat d'obra inclou totes les despeses per la disposició de cada tipus de residu al centre corresponent.

Inclou el cànon d'abocament del residu a dipòsit controlat segons el que determina la Llei 8/2008, el pagament del qual queda suspès segons la Llei 7/2011.

La empresa receptora del residu ha de facilitar al constructor la informació necessària per complimentar el certificat de disposició de residus, d'acord amb l'article 5.3 del REAL DECRETO 105/2008.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

Real Decreto 105/2008, de 1 de febrero, por el que se regula la producción y gestión de los residuos de construcción y demolición.

Orden MAM/304/2002, de 8 de febrero, por la cual se publican las operaciones de valorización y eliminación de residuos y la lista europea de residuos.

Corrección de errores de la Orden MAM/304/2002, de 8 de febrero, por la que se publican las operaciones de valorización y eliminación de residuos y lista europea de residuos.

Real Decreto 108/1991, de 1 de febrero, sobre la prevención y reducción de la contaminación del medio ambiente producida por el amianto.

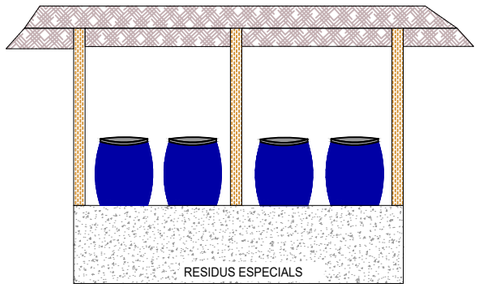
Llei 8/2008, del 10 de juliol, de finançament de les infraestructures de gestió dels residus i dels cànons sobre la disposició del rebuig dels residus.

Llei 7/2011, del 27 de juliol, de mesures fiscals i financeres.

Decret 89/2010, de 29 de juny, pel qual s'aprova el Programa de gestió de residus de la construcció de Catalunya (PROGROC), es regula la producció i gestió dels residus de la construcció i demolició, i el cànon sobre la deposició controlada dels residus de la construcció.

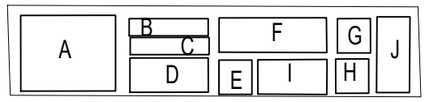
## 8 VALORACIÓ ECONÒMICA

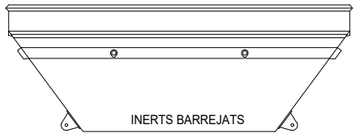
El pressupost de gestió de residus teòricament amb les dades de la taula de previsions de generació de sobrats de materials surt uns 529.94€. Veient el volum de treball i el cost dels mitjans auxiliars per a la retirada de residus de la zona del treball, també amb experiència previs d'altres projectes es decideix pujar a 2500€.



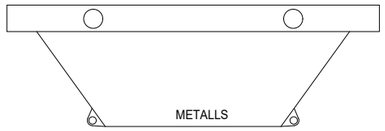

D

UBICACIÓ CONTENIDORS

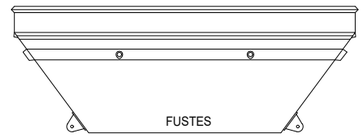


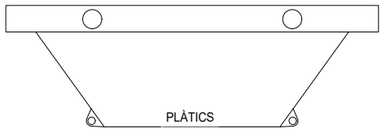

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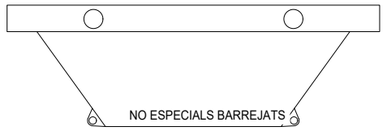

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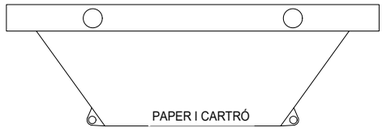

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G




I




J

PLANTA ACTUAL

ESCALA S/E




ZONA D'ACOPI

A. ZONA D'ACOPI DE MATERIAL PETRIS
B. ZONA D'ACOPI DE METALLS A REUTILITZAR
C. ZONA D'ACOPI DE FUSTES A REUTILITZAR
D. ZONA HABILITADA DE RESIDUS ESPECIALS
E. CONTENIDOR D'INERTS BARREJATS
F. CONTENIDOR DE FUSTA
G. CONTENIDOR DE PLÀSTICS
H. CONTENIDOR DE METALLS
I. CONTENIDOR DE NO ESPECIALS BARREJATS
J. CONTENIDOR DE PAPER I CARTRÓ

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\A7F03.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
IMPLANTACIÓ I SERVEIS

DATA: GENER 2024

PLÀNOL NÚM.: A7

NOM FITXER: A7F03.dwg

FULL 03 DE 15

# APÈNDIX 1 PRESSUPOST DE GESTIÓ DE RESIDUS DE LA CONSTRUCCIÓ

# AMIDAMENTS



Obra 01 PROJECTE REPARACIÓ 23B117PMAN-RESIDUS
Capítol 01 GESTIÓ RESIDUS
Titol 3 01 CLASIFICACIÓ RESIDUS

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | I2R24200 | m3 | Classif.obra residus construcció/demoliciós/construcció/demolició,m.man. |

Classificació a peu d'obra de residus de construcció o demolició en fraccions segons REAL DECRETO 105/2008, amb mitjans manuals

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Residus embalatge | C | Unitats | Volum | Ample | Alçada | |
| 2 | 150101 paper i cartró | | 1,000 | 3,650 | | | 3,650 |

TOTAL AMIDAMENT 3,650

Obra 01 PROJECTE REPARACIÓ 23B117PMAN-RESIDUS
Capítol 01 GESTIÓ RESIDUS
Titol 3 02 CARGA, TRANSPORT I DEPOSICIÓ RESIDUS

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | I2R642M0 | m3 | Càrr.mec. residus inerts o no especials instal.gestió residus,contenidor 12m3 |

Càrrega amb mitjans mecànics i transport de residus inerts o no especials a instal·lació autoritzada de gestió de residus, amb contenidor de 12 m3 de capacitat

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | C | Unitats | Volum | Ample | Alçada | |
| 2 | 170101 Formigó | | 1,000 | 6,810 | | | 6,810 |
| 3 | 170201 Fusta | | 1,000 | 5,800 | | | 5,800 |
| 4 | 170203 Plàstic | | 1,000 | 3,700 | | | 3,700 |
| 5 | 170904 Residus barrejats | | 1,000 | 0,160 | | | 0,160 |
| 6 | 150101 Envasos de paper i cartró | | 1,000 | 3,654 | | | 3,654 |

TOTAL AMIDAMENT 20,124

Obra 01 PROJECTE REPARACIÓ 23B117PMAN-RESIDUS
Capítol 01 GESTIÓ RESIDUS
Titol 3 03 DISPOSICIÓ RESIDUS A INSTAL.LACIÓ AUTORITZADA

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | I2RA61H0 | m3 | Deposició controlada centre reciclatge,residus form. inerts,1.45t/m3,LER 170101 |

Deposició controlada a centre de reciclatge de residus de formigó inerts amb una densitat 1.45 t/m3, procedents de construcció o demolició, amb codi 170101 segons la Llista Europea de Residus (ORDEN MAM/304/2002)

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Residus de l'obra | C | Unitats | Volum | Ample | Alçada | |
| 2 | 170101 (formigó) | | 1,000 | 6,810 | | | 6,810 |

TOTAL AMIDAMENT 6,810



Redacció delprojecte de reparació a nivel constructiu del pont sobre la carretera Vic, Manresa

# AMIDAMENTS



| | | | |
|---|---|---|---|
| 2 | I2RA6890 | m3 | Deposició controlada centre reciclatge,residus fusta no perillosos,0,19t/m3,LER 170201 |

Deposició controlada a centre de reciclatge de residus de fusta no perillosos amb una densitat 0,19 t/m3, procedents de construcció o demolició, amb codi 170201 segons la Llista Europea de Residus (ORDEN MAM/304/2002)

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | C | Unitats | Volum | Ample | Alçada | |
| 2 | Residus de l'obra (170201) | | 1,000 | 5,800 | | | 5,800 |

TOTAL AMIDAMENT 5,800

| | | | |
|---|---|---|---|
| 3 | I2RA6770 | m3 | Deposició controlada centre reciclatge,residus plàstic no perillosos,0,035t/m3,LER 170203 |

Deposició controlada a centre de reciclatge de residus de plàstic no perillosos amb una densitat 0,035 t/m3, procedents de construcció o demolició, amb codi 170203 segons la Llista Europea de Residus (ORDEN MAM/304/2002)

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | C | Unitats | Volum | Ample | Alçada | |
| 2 | Residus de l'obra (170203) | | 1,000 | 3,700 | | | 3,700 |

TOTAL AMIDAMENT 3,700

| | | | |
|---|---|---|---|
| 4 | I2RA6580 | m3 | Deposició controlada centre reciclatge,residus barrej. no perillosos,0.17t/m3,LER 170904 |

Deposició controlada a centre de reciclatge de residus barrejats no perillosos amb una densitat 0.17 t/m3, procedents de construcció o demolició, amb codi 170904 segons la Llista Europea de Residus (ORDEN MAM/304/2002)

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Residus de l'obra | C | Unitats | Volum | | | |
| 2 | 170904 (residus barrejats) | | 1,000 | 0,160 | | | 0,160 |

TOTAL AMIDAMENT 0,160

| | | | |
|---|---|---|---|
| 5 | I2RA6960 | m3 | Deposició controlada centre reciclatge,residus paper/cartró no perillosos,0,04t/m3,LER 1501 |

Deposició controlada a centre de reciclatge de residus de paper i cartró no perillosos amb una densitat 0,04 t/m3, procedents de construcció o demolició, amb codi 150101 segons la Llista Europea de Residus (ORDEN MAM/304/2002)

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Residus embalatge | C | Unitats | Volum | Ample | Alçada | |
| 2 | 150101 paper i cartró | | 1,000 | 3,650 | | | 3,650 |

TOTAL AMIDAMENT 3,650

| | | |
|---|---|---|
| Obra | 01 | PROJECTE REPARACIÓ 23B117PMAN-RESIDUS |
| Capítol | 01 | GESTIÓ RESIDUS |
| Titol 3 | 01 | CLASIFICACIÓ RESIDUS |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | I2R24200 | m3 | **Classif.obra residus construcció/demoliciós/construcció/demolició,m.man.**<br>Classificació a peu d'obra de residus de construcció o demolició en fraccions segons REAL DECRETO 105/2008, amb mitjans manuals (P - 1) | 21,70 | 3,650 | 79,21 |

TOTAL Titol 3 01.01.01 79,21

| | | |
|---|---|---|
| Obra | 01 | PROJECTE REPARACIÓ 23B117PMAN-RESIDUS |
| Capítol | 01 | GESTIÓ RESIDUS |
| Titol 3 | 02 | CARGA, TRANSPORT I DEPOSICIÓ RESIDUS |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | I2R642M0 | m3 | **Càrr.mec. residus inerts o no especials instal.gestió residus,contenidor 12m3**<br>Càrrega amb mitjans mecànics i transport de residus inerts o no especials a instal·lació autoritzada de gestió de residus, amb contenidor de 12 m3 de capacitat (P - 2) | 16,18 | 20,124 | 325,61 |

TOTAL Titol 3 01.01.02 325,61

| | | |
|---|---|---|
| Obra | 01 | PROJECTE REPARACIÓ 23B117PMAN-RESIDUS |
| Capítol | 01 | GESTIÓ RESIDUS |
| Titol 3 | 03 | DISPOSICIÓ RESIDUS A INSTAL.LACIÓ AUTORITZADA |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | I2RA61H0 | m3 | **Deposició controlada centre reciclatge,residus form. inerts,1.45t/m3,LER 170101**<br>Deposició controlada a centre de reciclatge de residus de formigó inerts amb una densitat 1.45 t/m3, procedents de construcció o demolició, amb codi 170101 segons la Llista Europea de Residus (ORDEN MAM/304/2002) (P - 3) | 11,60 | 6,810 | 79,00 |
| 2 | I2RA6890 | m3 | **Deposició controlada centre reciclatge,residus fusta no perillosos,0,19t/m3,LER 170201**<br>Deposició controlada a centre de reciclatge de residus de fusta no perillosos amb una densitat 0,19 t/m3, procedents de construcció o demolició, amb codi 170201 segons la Llista Europea de Residus (ORDEN MAM/304/2002) (P - 6) | 7,60 | 5,800 | 44,08 |
| 3 | I2RA6770 | m3 | **Deposició controlada centre reciclatge,residus plàstic no perillosos,0,035t/m3,LER 170203**<br>Deposició controlada a centre de reciclatge de residus de plàstic no perillosos amb una densitat 0,035 t/m3, procedents de construcció o demolició, amb codi 170203 segons la Llista Europea de Residus (ORDEN MAM/304/2002) (P - 5) | 0,00 | 3,700 | 0,00 |
| 4 | I2RA6580 | m3 | **Deposició controlada centre reciclatge,residus barrej. no perillosos,0.17t/m3,LER 170904**<br>Deposició controlada a centre de reciclatge de residus barrejats no perillosos amb una densitat 0.17 t/m3, procedents de construcció o demolició, amb codi 170904 segons la Llista Europea de Residus (ORDEN MAM/304/2002) (P - 4) | 12,75 | 0,160 | 2,04 |



Redacció delprojecte de reparació a nivel constructiu del pont sobre la carretera Vic, Manresa



| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | I2RA6960 | m3 | **Deposició controlada centre reciclatge,residus paper/cartró no perillosos,0,04t/m3,LER 150101**<br>Deposició controlada a centre de reciclatge de residus de paper i cartró no perillosos amb una densitat 0,04 t/m3, procedents de construcció o demolició, amb codi 150101 segons la Llista Europea de Residus (ORDEN MAM/304/2002) (P - 7) | 0,00 | 3,650 | 0,00 |

TOTAL Titol 3 01.01.03 125,12




# ANNEX NÚM. 12: ESTUDI DE SEGURETAT I SALUT

# DOCUMENT NÚM. 1: MEMÒRIA

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 31/01/2023 | MAP+DJS | JJO | JJO |
| 1 | 11/03/2024 | DJS | JJO | JJO |
| | | | | |
| | | | | |

ACTUALIZACIONS

| Apartats | Descripció |
|---|---|
| Totes | Creació del document |
| | |
| | |

FICHERO: 240311 PMAN-FGC-PED- MEMORIA_ESS-V01

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# 1 MEMÒRIA

## 1.1 OBJECTIU DEL ESTUDI DE SEGURETAT I SALUD

### 1.1.1 IDENTIFICACIÓ DE LES OBRES

L'objecte del present projecte constructiu és la definició i valoració de totes les obres necessàries per a l'execució de les obres del Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya.

### 1.1.2 OBJECTE

El present E.S. S. té com objectiu establir les bases tècniques, per a fixar els paràmetres de la prevenció de riscos professionals durant la realització dels treballs d'execució de les obres del Projecte objecte d'aquest estudi, així com complir amb les obligacions que es desprenen de la Llei 31/1995 i del RD 1627/1997, amb la finalitat de facilitar el control i el seguiment dels compromisos adquirits sobre aquest tema per part del/els Contractista/as.

En el present Estudi de Seguretat i Salut s'ha dut a terme un estudi exhaustiu dels riscos inherents a l'execució de l'obra i de les mesures preventives i cautelars conseqüents per a garantir la seguretat de les persones en l'execució de les obris en compliment del que determina la Llei 3/2007 del 4 de juliol de l'obra pública en el seu article 18.3.h).

D'aquesta manera, s'integren en el Projecte Executiu/Constructiu les premies bàsiques per a les quals el/els Contractista/as constructor/es pugui/in preveure i planificar els recursos tècnics i humans necessaris per al compliment de les obligacions preventives en aquest centre de treball, de conformitat al seu pla d'Acció Preventiva propi d'empresa, la seva organització funcional i els mitjans a utilitzar, havent de quedar tot això recollit en el Pla de Seguretat i Salut, que haurà de presentar-se al Coordinador de Seguretat i Salut en Fase d'Execució, amb antelació a l'inici de les obres, per a la seva aprovació i inici dels tràmits de Declaració d'Obertura davant de l'Autoritat Laboral.

En cas que sigui necessari implementar mesures de seguretat no previstes en el present Estudi, a petició expressa del coordinador de seguretat i salut en fase d'execució de l'obra, el contractista elaborarà el corresponent annex al Pla de Seguretat i Salut de l'obra que es desenvoluparà i determinarà les mesures de seguretat a dur a terme amb la memòria, plec de condicions, mesuraments, preus i pressupost que li siguin aplicable si és el cas

## 1.2 PROMOTOR-PROPIETARI

- Promotor: Ferrocarrils de la Generalitat de Catalunya

## 1.3 AUTOR/ES DEL ESTUDI DE SEGURETAT I SALUD

- Redactor E.S.S.: Jordi Pons
- Titulació/ns: Enginyer de Camins, Canals i Ports
- Col·legiat Núm.: 25114
- Despatx professional: PEDELTA SL
- Població: Barcelona

## 1.4 DADES DEL PROJECTE

### 1.4.1 AUTOR/ES DEL PROJECTE

- Autor del projecte: F. Javier Jordán García
- Titulació/ns: Enginyer de Camins, Canals i Ports
- Col·legiat Núm.: 14066
- Despatx professional: PEDELTA SL
- Població: Barcelona

### 1.4.2 COORDINADOR DE SEGURETAT DURANT L'ELABORACIÓ DEL PROJECTE

- Coordinador se S&S: Jordi Pons
- Titulació/ns: Enginyer de Camins, Canals i Ports
- Col·legiat Núm.: 25114
- Despatx professional: PEDELTA SL
- Població: Barcelona

### 1.4.3 TÍPOLOGIA DE L'OBRA

El pont sobre la carretera de Vic de FGC al PK 60+720, es troba a la carretera de Vic al terme municipal de Manresa, Barcelona. Data de l'any 1924 i ha servit durant gran part de la seva vida per al trànsit de vagons carregats de potassa des de les mines de Súria.

És un pont de estructura metàl·lica, el pont té un únic vànol (isostàtic) amb longitud de 17,9m i 8,8m d'amplada.

El pont es constituït per les bigues principals són gelosies a Cruz de Sant Andreu, amb sustentació isostàtica i longitud entre suports de 17,3 m. Consten de 9 mòduls de 1,82 m, amb diagonals creuades a tots ells. El seu cantell màxim és de 2,002 m i la separació entre els seus eixos de 8,8 m. Els cordons estan constituïts per seccions a "T", invertida la inferior, i són variables en anar entrant xapes de reforç. Tant el superior com l'inferior estan reforçats amb perfils angulars simples. Els muntants estan constituïts per xapes i angulars. Les diagonals estan formades per parells d'angulars de diferents mides units entre si per xapes d'ànima. Les unions entre els diferents elements són reblonades. Hi ha cartells als nusos superiors extrems i a les unions amb les biguetes i elements d'arriostraments.

La posició del tauler és inferior en relació amb les bigues principals. Les biguetes tenen una longitud teòrica de 8,8 m i estan modulades cada 1,82 m, coincidint amb els muntants de les bigues principals. Són bigues armades d'ànima plena, constituïdes per xapes i quatre angulars, amb angulars de reforç a les ales inferiors que no és existent al costat exterior de les biguetes extremes. Tenen secció variable amb un cantell màxim de 0,74 m, al centre de va, i cantell mínim de 0,72 m en els suports. Les unions amb les bigues principals són roblonades i es realitzen a través de les cartelles de rigidesa dels muntants.

Els bigues longitudinals han estat substituïts per bigues al calaix. La separació transversal entre eixos és de 1,060 m, sent 1,880 m la distància entre la biga longitudinal exterior i la biga principal, per a ambdues vies, finalment, la separació entre els bigues longitudinals interiors és de 2,92m. Tenen una llum de 1,82m i 0,303m de cantell. S'uneixen a les biguetes mitjançant cargols d'alta resistència a través de casquets d'angular. La unió entre els diferents elements es realitza mitjançant reblons.

El pont disposa d'un arriostrament horitzontal contravent entre les dues bigues, amb modulació cada tres mòduls de biga, a nivell del seu cordó inferior, constituït per una gelosia a la Creu de Sant Andreu.

A més, recentment, s'ha disposat un arriostrament contravent nou entre els bigues longitudinals interiors de cada via, resolt també mitjançant una gelosia a Cruz de San Andreu, modulada igual queles biguetes del tauler.

Finalment, hi ha pòrtics de frenada disposats en els mòduls 2 i 8, resolts mitjançant mòduls a "K" entre el travesser exterior i el cordó inferior de la biga principal adjacent, i per mòduls a Cruz de San Andreu entre els bigues longitudinals dels mòduls afectats.

Totes les unions són reblonades, excepte a les diagonals de l'arriostrament inferior reforçades. Les unions es fan a través de cartel·les, presentant excentricitat totes les diagonals.

El pont també disposa de dues passejades de servei interiors a les bigues principals que han estat producte de les feines de renovació. A més, s'han disposat pòrtics de suport de canonades a la zona d'entrevies, cobertes per una xapa estriada que dona lloc a un tercer passeig.

La xapa de pis és metàl·lica estriada, i està reblonada als perfils que les sustenten. Existeix unes baranes als passeigs laterals.

Els estreps del pont presenten paraments frontals plans de maçoneria carejada amb carreus en cantonades i imposta de coronació. Els paraments laterals són murs envoltats de la mateixa tipologia que els frontals. Amb l'existència de dos passos inferiors, en ambdós estreps. Els murs guardabalast són de carreuat, a l'estrep d'entrada, i de formigó, al de sortida. Les coronacions de suports són de carreuat.

Els aparells de suport fixos es troben a l'estrep de sortida. La biga s'uneix a una peça metàl·lica alleugerida que descansa sobre la coronació dels suports. Els mòbils estan a l'estrep d'entrada i compten amb una peça esfèrica que permet el moviment i una base que recolza sobre la coronació. Les bigues estan unides amb quatre cargols a la peça superior dels aparells

### 1.4.4 SITUACIÓ

- Emplaçament: Pont de pas superior de FGC sobre carretera
- Carrer, plaça: Carretera de Vic
- Codi Postal: 08241
- Població: Barcelona

### 1.4.5 LOCALITZACIÓ DE SERVEIS ASSISTENCIALS, SALVAMENT I SEGURETAT I MEDIS D'EVACUACIÓ

- Centre Mèdic del Bages: C/ Pare Clotet, 12, 08243
- Centre Hospitalari de Manresa: C/ Flor de Lis, 33, 08242
- Hospital Sant Andreu. C/ Remei de Dalt, 3, 08241

### 1.4.6 PRESSUPOST D'EXECUCIÓ MATERIAL DEL PROJECTE

El Pressupost d'Execució Material (PEM) estimat de referència per a aquest projecte, exclòs les Despeses Generals i Benefici Industrial, és de 176.737,94 € (CENT SETANTA-SIS MIL SET-CENTS TRENTA-SET EUROS AMB NORANTA-QUATRE CÈNTIMS).

### 1.4.7 PLAÇ D'EXECUCIÓ

El plaç estimat de duració dels treballs d'execució e l'obra es de 6 mesos.

### 1.4.8 MÀ D'OBRA PREVISTA

La estimació de mà d'obra en la punta d'execució es de 8 persones.

### 1.4.9 OFICIS QUE INTERVENEN EN EL DESENVOLUPAMENT DE L'OBRA

| CODI | UA | DESCRIPCIÓ |
|---|---|---|
| A01-FEOZ | h | Ayudante encofrador |
| A01-FEP1 | h | Ayudante soldador |
| A01-FEP9 | h | Ayudante pintor |
| A01-FEPH | h | Ayudante montador |
| A0121000 | h | Oficial 1a |
| A0122000 | h | Oficial 1a paleta |
| A013U001 | h | Ajudant |
| A0140000 | h | Manobre |
| A0150000 | h | Manobre especialista |
| A0D-0007 | h | Peón |
| A0E-000A | h | Peón especialista |
| A0F-000T | h | Oficial 1a albañil |
| A0F-000U | h | Oficial 1a picapedrer |
| A0F-000V | h | Oficial 1a pintor |
| A0F-000Y | h | Oficial 1a soldador |
| A0J-0029 | h | Conservador-restaurador |
| A0J-002A | h | Conservador- restaurador responsable de la intervenció |

TIPOLOGÍA DELS MATERIALS A UTILITZAR EN L'OBRA

| CODI | UA | DESCRIPCIÓ |
|---|---|---|
| B0111000 | m3 | Aigua |
| B011-05MF | l | Aigua desionitzada no polaritzada |
| B015-16HS | l | Diluent de pintura mineral al silicat, per a interiors i exteriors |
| B03L-05MU | t | Arena de sílice de 0 a 3,5 mm |
| B03L-05N7 | t | Sorra de pedrera per a morters |
| B0512401 | t | Ciment pòrtland amb filler calcari CEM II/B-L 32,5 R segons UNE-EN 197-1, en sacs |
| B054-06DH | kg | Calç aèria hidratada CL 90-S, en sacs |
| B055-067M | t | Cemento pórtland con caliza CEM II/B-L 32,5 R según UNE-EN 197-1, en sacos |
| B0714000 | kg | Morter sintètic epoxi de resines epoxi |
| B079-06TD | kg | Mortero polimérico de cemento con resinas epoxi para imprimación anticorrosiva y puente de unión |
| B0AP-07IU | u | Tornillos en calidad 10.9, pretensados, arandela y tuerca de acero, 130 mm de longitud |
| B0G3-1GB4 | m3 | Pedra calcària/arenítica Vinaixa en blocs escollits, deixat de serra, per a dovelles, traceries, capitells i treballs escultòrics |
| B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant |
| B44Z-0M0Y | kg | Acer S275JR segons UNE-EN 10025-2, format per peça simple, en perfils laminats en calent sèrie IPN, IPE, HEB, HEA, HEM i UPN, treballat al taller per a col·locar amb cargols i galvanitzat |
| B44Z-0M1P | kg | Acero S355J0 según UNE-EN 10025-2, formado por pieza simple, para refuerzo de elementos de empotramiento, apoyo y rigidizado, en perfiles laminados en caliente serie L, LD, T, redondo, cuadrado, rectangular y plancha, trabajado en el taller para colocar con soldadura y con una capa de imprimación antioxidante |
| B7J50060 | dm3 | Massilla per a segellats, d'aplicació amb pistola, de base polisulfurs bicomponent |
| B7JZ1010 | dm3 | Imprimació prèvia per a segellats de massilla de silicona neutra |
| B896-HYC4 | kg | Pintura al silicat, per a exteriors |

| CODI | UA | DESCRIPCIÓ |
|---|---|---|
| B898-2MHX | l | Pintura epoxi bicomponente, para sistemas de protección de del acero |
| B898-2MHY | l | Pintura de poliuretano bicomponente, para sistemas de protección de del acero |
| B8ZAS000 | kg | Consolidant de silicat d'etil per a pedra natural |
| B8ZH-358R | kg | Pintura de fons al silicat, per a exteriors |

### 1.4.10 TIPOLOGÍA DE MAQUINARIA A UTILITZAR EN L'OBRA

| CODI | UA | DESCRIPCIÓ |
|---|---|---|
| C15018U0 | h | Camió de 150 hp, de 12 t (5,8 m3) |
| C152-0039 | h | Camión grúa de 5 t |
| C176-00FX | h | Formigonera de 165 l |
| C206-00DW | h | Equipo y elementos auxiliares para soldadura eléctrica |
| C207-00E1 | h | Equipo y elementos auxiliares para corte oxiacetilénico |
| C20G-00DT | h | Máquina taladradora |
| CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA |
| CZ16-00EH | h | Equipo de chorro de arena |
| CZ172000 | h | Màquina de raig d'aigua a pressió |

## 1.5 INSTAL·LACIONS PROVISIONALS

### 1.5.1 INSTAL·LACIÓ ELÈCTRICA PROVISIONAL D'OBRA

Es duran a terme els tràmits corresponents, perquè la companyia subministradora d'electricitat o una acreditada faci la connexió des de la línia subministradora fins als quadres on s'ha d'instal·lar la caixa general de protecció i els comptadors, des dels quals els Contractistes procediran a muntar la resta de la instal·lació elèctrica de subministrament provisional en l'obra, conforme al Reglament Electrotècnic de Baixa Tensió, segons el projecte d'un instal·lador autoritzat.

Es realitzarà una distribució satiritzada, que garanteixi el correcte subministrament a tots els talls i punts de consum de l'obra, amb conductor tipus V -750 de coure de seccions adequades canalitzades en tub de PVC, rígid blindat o flexible segons el seu recorregut, però sempre amb l'apantallament suficient per a resistir el pas de vehicles i trànsit normal d'una obra.

La instal·lació elèctrica tindrà una xarxa de protecció de terra mitjançant cable de coure nu que estarà connectat a una javelina, plaques de connexió a terra, segons càlcul del projectista i comprovació de l'instal·lador.

Les mesures generals de seguretat en la instal·lació elèctrica són les següents:

- Connexió de servei
  - Es realitzarà d'acord amb la companyia de subministrament.
  - La seva secció vindrà determinada per la potència instal·lada.
  - Existirà un mòdul de protecció (fusibles i limitadors de potència).
  - Estarà situada sempre fora del proveïment de la maquinària d'elevació i de zones sense pas de vehicles.

- Quadre General
  - Disposarà de protecció cap als contactes indirectes mitjançant diferencial de sensibilitat mínima de 300 mA. Per a enllumenat i eines elèctriques de doble aïllament, la seva sensibilitat haurà de ser de 30 mA.
  - Disposarà de protecció cap als contactes directes perquè no hi hagi parts en tensió al descobert (embornals, rosques de connexió, terminals automàtics, etc.).
  - Disposarà d'interruptors de tall magnetotèrmics per a cadascun dels circuits independents. Els dels aparells d'elevació hauran de ser de tall omnipolar (tallaran tots els conductors, fins i tot el neutre).
  - Anirà connectat a terra (resistència màxima 78 W). A l'inici de l'obra es realitzarà una connexió a terra provisional que haurà d'estar connectada a l'anell de terres, seguidament després de la realització dels fonaments.
  - Estarà protegit de la intempèrie.
  - És recomanable l'ús de clau especial per a la seva obertura.
  - Se senyalitzarà amb senyal normalitzat d'advertiment de risc elèctric (RD 485/97).

- Conductors
  - Disposaran d'un aïllament de 1000 v de tensió nominal, que es pot reconèixer per la seva impressió sobre el mateix aïllament.
  - Els conductors aniran enterrats, o engrapats als paraments verticals o sostres allunyats de les zones de pas de vehicles i/o persones.

- Les unions hauran de ser realitzades mitjançant “jocs” d'endolls, mai amb regletes de connexió, retorciments ni encintats.

- Quadres secundaris
  - Seguiran les mateixes especificacions establertes per al quadre general i hauran de ser de doble aïllament.
  - Cap punt de consum pot estar a més de 25 m d'un d'aquests quadres.
  - Encara que la seva composició variarà segons les necessitats, el aparellatge més convencional dels equips secundaris per planta és el següent:
    - -1 Magnetotèrmic general de 4P : 30 A.
    - -1 Diferencial de 30 A : 30 dt..
    - · 1 Magnetotèrmic 3P : 20 dt..
    - · 4 Magnetotèrmics 2P : 16 A.
    - · 1 Connexió de corrent 3P + T : 25 A.
    - · 1 Connexió de corrent 2P + T : 16 A.
    - · 2 Connexió de corrent 2P : 16 A.
    - · 1 Transformador de seguretat : (220 v./ 24 v.).
    - · 1 Connexió de corrent 2P :16 A.

- Connexions de corrent
  - Iran proveïdes d'embornals de connexió a terra, excepció feta per a la connexió d'equips de doble aïllament.
  - Es protegiran mitjançant un magnetotèrmic que faciliti la seva desconnexió.
  - S'usaran els següents colors:
    - Connexió de 24 v : Violeta.
    - Connexió de 220 v : Blau.
    - Connexió de 380 v : Rojo
  - No s'empraran connexions tipus “lladre”.

- Maquinària elèctrica
  - Disposarà de connexió a terra.
  - Els aparells d'elevació aniran proveïts d'interruptor de tall omnipolar.
  - Es connectaran a terra les guies dels elevadors i els carrils de grua o altres aparells d'elevació fixos.
  - L'establiment de connexió a les bases de corrent es farà sempre amb clavilla normalitzada.

- Enllumenat provisional
  - El circuit disposarà de protecció diferencial d'alta sensibilitat, de 30 dt..
  - Els portalàmpades hauran de ser de tipus aïllat.
  - Es connectarà la fase al punt central del portalàmpades i el neutre al lateral més pròxim a la virola.
  - Els punts de llum en les zones de pas s'instal·laran en els sostres per a garantir la inaccessibilitat a les persones.
- Enllumenat portàtil
  - La tensió de subministrament no superarà els 24 v o alternativament disposarà de doble aïllament, Classe II de protecció intrínseca en previsió de contactes indirectes.
  - Disposarà de mànec aïllat, carcassa de protecció de la bombeta amb capacitat anticops i suport de sustentació.

### 1.5.2 INSTAL·LACIÓ D’AIGUA PROVISONAL D’OBRA

Per part del Contractista Principal, es realitzaran les gestions precises davant la companyia subministradora de l'aigua perquè instal·li una derivació des de la canonada general fins al punt on hagi de col·locar-se el corresponent comptador i poder continuar amb la resta de la canalització provisional per l'interior de l'obra.

La distribució interior d'obra podrà realitzar-se amb canonada de PVC flexible amb els ronsals de distribució i la canya galvanitzada o coure, dimensionada segons el Codi Tècnic de l'Edificació relatives a lampisteria en els punts de consum, tot això garantint una total estanquitat i aïllament dielèctric en les zones necessàries.

### 1.5.3 INSTAL·LACIÓ DE SANEJAMENT

Des de l'inici de l'obra, es connectaran a la xarxa de clavegueram públic, les instal·lacions provisionals d'obra que produeixin abocaments d'aigües brutes.

Si es produeix algun retard en l'obtenció del permís municipal de connexió, s'haurà de realitzar, a compte del contractista, un sistema de tractament provisional que contempli fossa sèptica o pou negre tractat amb bactericides.

### 1.5.4 ALTRES INSTAL·LACIONS, PREVENCIÓ I PROTECCIÓ CONTRA INCENDIS

Per als treballs que comportin la introducció de flama o d'equip productor d'espurnes en zones amb el risc d'incendi o d'explosió, serà necessari tenir un permís de manera explícita, fet per una persona responsable, on a part de les dates inicial i final, la naturalesa i la localització del treball i l'equip a usar, s'indicaran les precaucions a adoptar respecte als combustibles

presents (sòlids, líquids, gasos, vapors, pols), neteja prèvia de la zona i els mitjans addicionals d'extinció, vigilància i ventilació adequats.

Les precaucions generals per a la prevenció i la protecció contra incendis seran les següents:

- La instal·lació elèctrica haurà d'estar d'acord amb allò establert en la Instrucció M.I.B.T. 026 del vigent Reglament Electrotècnic de Baixa Tensió per a locals amb el risc d'incendis o explosions.
- Es limitarà la presència de productes inflamables en els llocs de treball en les quantitats estrictament necessàries perquè el procés productiu no es detingui. La resta, es guardarà en locals diferents al de treball, i si això no fos possible es farà en recintes aïllats i condicionats. En qualsevol cas, els locals i els recintes aïllats compliran allò especificat en la Norma Tècnica "MIE-*APQ-001 Emmagatzematge de líquids inflamables i combustibles" del Reglament sobre Magatzematge de Productes Químics.
- S'instal·laran recipients contenidors hermètics i incombustibles en els quals s'hauran de dipositar els residus inflamables, retalls, etc.
- Es col·locaran vàlvules antiretorn de flama en el bufador o en les mànegues de l'equip de soldadura oxiacetilènica.
- El Magatzematge i ús de gasos liquats compliran amb tot allò establert en la instrucció MIE-AP7 del vigent Reglament d'Aparells a pressió en la norma 9, apartats 3 i 4 en allò referent al magatzematge, la utilització, l'inici del servei i les condicions particulars de gasos inflamables.
- Els camins d'evacuació estaran lliures d'obstacles. Existirà una senyalització indicant els llocs de prohibició de fumar, situació d'extintors, camins d'evacuació, etc.
- Han de separar-se clarament els materials combustibles, i tots ells han d'evitar qualsevol tipus de contacte amb equips i canalitzacions elèctriques.
- La maquinària, tant fixa com mòbil, accionada per energia elèctrica, ha de tenir les connexions de corrent ben realitzades, i en els llocs fixos, se li haurà de proveir d'aïllament en la terra. Tots els degotejos, encallades i deixalles que es produeixin durant el treball han de ser retirats amb regularitat, deixant nets diàriament els voltants de les màquines.
- Les operacions de transvasament de combustible han d'efectuar-se amb bona ventilació, fora de la influència d'espurnes i fonts d'ignició. Ha de preveure's les conseqüències de possibles abocaments durant l'operació, per la qual cosa serà necessari tenir a mà terra o sorra.
- La prohibició de fumar o encendre qualsevol tipus de flama ha de formar part de la conducta a seguir en aquests treballs.
- Quan es transvasen líquids combustibles o s'omplin dipòsits hauran de parar-se els motors accionats amb el combustible que s'està transvasant.
- Quan es fan regates o forats per a permetre el pas de canalitzacions, deuen obturar-se ràpidament per a evitar el pas de fum o flama d'un recinte d'un edifici a un altre, evitant-se així la propagació d'incendis. Si aquests forats s'han practicat en parets tallafocs o en sostres, l'esmentada obturació haurà de realitzar-se de manera immediata i amb productes que assegurin l'estanquitat contra fum, calor i flames.
- En les situacions descrites anteriorment (magatzems, maquinària fixa o mòbil, transvasament de combustible, muntatge d'instal·lacions energètiques) i en aquelles altres en què es manipuli una font d'ignició, és necessari col·locar extintors la càrrega i la capacitat dels quals estigui d'acord amb la naturalesa del material combustible i amb el seu volum, així com sorra i terra on s'utilitzin líquids inflamables, amb l'eina pròpia per a estendre-la. En cas de grans quantitats d'apilaments, magatzematge o concentració d'embalatges, han de completar-se els mitjans de protecció amb mànegues de reg que proporcionin aigua abundant.

- Emplaçament i distribució dels extintors en l'obra

  Els principis bàsics per a la ubicació dels extintors són:

  - Els extintors manuals es col·locaran, senyalitzats, sobre suports fixats a paraments verticals o pilars, de manera que la part superior de l'extintor quedi com a màxim a 1,70 m del sòl.
  - En àrees amb possibilitats de focs "A", la distància a recórrer horitzontalment, des de qualsevol punt de l'àrea protegida fins a aconseguir l'extintor adequat més pròxim, no excedirà de 25 m.
  - En àrees amb possibilitats de focs "B", la distància a recórrer horitzontalment, des de qualsevol punt de l'àrea protegida fins a aconseguir l'extintor adequat més pròxim, no excedirà de 15 m.
  - Els extintors mòbils hauran de col·locar-se en aquells punts on s'estimi que existeixi una major probabilitat d'originar-se un incendi, si pot ser, pròxims a les sortides i sempre en llocs de fàcil visibilitat i accés. En locals grans o quan existeixin obstacles que dificultin la seva localització, se senyalitzarà convenientment la seva ubicació.

## 1.6 SERVEIS DE SALUBRITAT I CONFORT DEL PERSONAL

Les instal·lacions provisionals d'obra s'adaptaran a les característiques especificades en l'ANNEX IV del R.D. 1627/97 i al R.D. 486/97, de 24 d'octubre, relatiu a les DISPOSICIONS MÍNIMES DE SEGURETAT I SALUT EN LES OBRES DE CONSTRUCCIÓ.

Per al servei de neteja d'aquestes instal·lacions higièniques, es responsabilitzarà a una persona o un equip, els qui podran alternar aquest treball amb altres propis de l'obra.

*En situació de risc sanitari caldrà preveure un increment de la desinfecció i neteja dels espais destinats a aquests serveis (1 neteja / desinfecció diària), d'acord amb les instruccions de les autoritats sanitàries.*

Per a l'execució d'aquesta obra, es disposarà de les instal·lacions del personal que es defineixen i detallen a continuació:

### 1.6.1 SERVEIS HIGIÈNICS

• Lavabos

Com a mínim un per a cada 10 persones.

En situació de risc sanitari COVID-19 han d'estar dotats d'ampolles amb hidrogel desinfectant amb dosificadors automàtics, i tovalloles de paper, i una galleda específica per a recollir el material de protecció d'un sol ús.

• Cabines d'evacuació

S'ha d'instal·lar una cabina de 1,5 m² x 2,3 m d'altura, dotada de placa turca, com a mínim per a cada 25 persones.

• Local de dutxes

Es disposarà d'una cabina de dutxa per a cada 10 treballadors, de dimensions mínimes de 1,5 m² x 2,3 m d'altura, dotada d'aigua freda-calenta, amb sòl antilliscant.

### 1.6.2 VESTUARIS

Superfície aconsellable de 2 m² per treballador contractat.

*En situació de risc sanitari COVID-19 es recomana una superfície per treballador de 4 m² per a garantir les distàncies entre usuaris de 2 m.*

### 1.6.3 MENJADOR

Diferent del local de vestuari. A l'efecte de càlcul s'haurà de considerar entre 1,5 i 2 m² per treballador que realitzi el seu menjar en l'obra.

*En situació de risc sanitari COVID-19 es recomana una superfície per treballador de 4 m² per a garantir les distàncies entre usuaris de 2 m.*

Equipat amb banc allargat o cadires, pròxim a un punt de subministrament d'aigua (1 aixeta i aigüera - rentaplats per a cada 10 comensals), mitjans per a escalfar menjars (1 microones per a cada 10 comensals), i galleda hermètica (60 l de capacitat, amb tapa) per a dipositar les escombraries.

### 1.6.4 LOCAL DE DESCANS

En aquelles obres en les quals treballin simultàniament més de 50 treballadors durant un període superior a 3 mesos, és recomanable que s'estableixi un recinte destinat exclusivament al descans del personal, situat el més pròxim possible al menjador i serveis.

A l'efecte de càlcul s'haurà de considerar un espai de 3 m² per usuari habitual.

*En situació de risc sanitari COVID-19 es recomana una superfície per treballador de 6 m² per a garantir les distàncies entre usuaris de 2 m.*

### 1.6.5 LOCAL D'ASSISTENCIA A ACCIDENTATS

En aquells centres de treball en els quals es trobin simultàniament més de 50 treballadors durant més d'un mes, s'establirà un recinte destinat exclusivament a les cures del personal de l'obra. Els locals de primers auxilis disposaran, com a mínim, de:

- una farmaciola.
- una llitera.
- una font d'aigua potable.

El material i els locals de primers auxilis hauran d'estar senyalitzats clarament i situats prop dels llocs de treball.

El sòl i parets del local d'assistència a accidentats hauran de ser impermeables, pintats preferiblement en colors clars. Lluminós, caldejat en l'estació freda, ventilat si fos necessari de manera forçada en el cas de dependències subterrànies. Haurà de tenir a la vista el quadre d'adreces i telèfons dels centres assistencials més pròxims, ambulàncies i bombers.

En les obres en les quals el nivell d'ocupació simultani estigui entre els 25 i els 50 treballadors, el local d'assistència a accidentats podrà ser substituït per un armari farmaciola emplaçada en l'oficina de l'obra. L'armari farmaciola, custodiat pel socorrista de l'obra, haurà d'estar dotat com a mínim de: alcohol, aigua oxigenada, pomada antisèptica, gases, benes sanitàries de diferents dimensions, benes elàstiques compressives acte adherents, esparadrap, tiretes, mercurocromo o antisèptic equivalent, analgèsics, bicarbonat, pomada per a picades d'insectes, pomada per a cremades, tisores, pinces, dutxa portàtil per a ulls, termòmetre clínic, caixa de guants esterilitzats i torniquet.

Per a contractacions inferiors, podrà ser suficient disposar d'una farmaciola de butxaca o portàtil, custodiat per l'encarregat.

El Servei de Prevenció de l'empresa contractista establirà els mitjans materials i humans addicionals per a efectuar la Vigilància de la Salut d'acord amb el que estableix la llei 31/95.

A més, es disposarà d'una farmaciola portàtil amb el contingut següent:

- desinfectants i antisèptics autoritzats.
- gases estèrils.
- cotó hidròfil.
- benes.
- esparadrap.
- apòsits adhesius.
- tisores.
- pinces.
- guants d'un sol ús
- *en situació de risc sanitari COVID-19 termòmetre sense contacte*

El material de primers auxilis es revisarà periòdicament, i es reposarà de manera immediata el material utilitzat o caducat.

## 1.7 ÀREES AUXILIARS

### 1.7.1 CENTRALS I PLANTES

Per les característiques de l'obra, no es preveu la necessitat de la implantació de centrals i/o plantes auxiliars en obra.

### 1.7.2 TALLERS

Per les característiques de l'obra, no es preveu la necessitat de la implantació de tallers auxiliars en obra.

### 1.7.3 ZONES D'ACOPI. MAGATZEMS

Els materials apilats en l'obra hauran de ser els compresos entre els valors "mínims-màxims", segons una adequada planificació, que impedeixi estacionaments de materials i/o equips inactius que puguin ser causa d'accident.

Els Mitjans Auxiliars d'Utilitat Preventiva, necessaris per a complementar la manipulació manual o mecànica dels materials apilats, hauran estat previstos en la planificació dels treballs.

Les zones d'apilament provisional estaran abalisades, senyalitzades i il·luminades adequadament.

De manera general el personal d'obra (tant propi com subcontractat) haurà rebut la formació adequada sobre els principis de manipulació manual de materials. De forma més singularitzada, els treballadors responsables de la realització de maniobres amb mitjans mecànics tindran una formació qualificada de les seves comeses i responsabilitats durant les maniobres.

Per les característiques de l'obra, no es preveu la necessitat d'ús de magatzems de FGC o de la implantació de magatzems auxiliars en obra.

## 1.8 TRACTAMENT DE RESIDUS

El Contractista és responsable de gestionar les restes de l'obra de conformitat amb les directrius del Decret 89/2010 de 29 de juny paper que s'aprova el Programa de gestió de residus de la construcció de Catalunya (PROGROC) i del RD 105/2008, d'1 de febrer, regulador dels enderrocaments i altres residus de construcció, amb la finalitat de minimitzar la producció de residus de construcció com a resultat de la previsió de determinats aspectes del procés, que és necessari considerar tant en la fase de projecte com en la d'execució material de l'obra i/o l'enderrocament o desconstrucció.

En el projecte s'han avaluat el volum i les característiques dels residus que previsiblement s'originaran i les instal·lacions de reciclatge més pròximes perquè el Contractista triï el lloc on portarà els seus residus de construcció.

Els residus es lliuraran a un gestor autoritzat, a càrrec del contractista, els costos que això comporti.

Si en les excavacions i buidatges de terres apareixen antics dipòsits o canonades, no detectades prèviament, que continguin o hagin pogut contenir productes tòxics i contaminants, es buidaran prèviament i s'aïllaran els productes corresponents de l'excavació per a ser evacuats independentment de la resta i es lliuraran a un gestor autoritzat.

*En situació de risc sanitari COVID-19, cal gestionar de manera separada de la resta, els residus de les galledes on es recullen els EPI d'un sol ús, i les tovalloles de paper de la rentada de mans i aparells.*

## 1.9 TRACTAMENT DE MATERIALS I/O SUBSTÀNCIES PERILLOSES

El Contractista és responsable d'assegurar-se per mediació de l'Àrea d'Higiene Industrial del seu Servei de Prevenció, la gestió del control dels possibles efectes contaminants dels residus o materials utilitzats en l'obra, que puguin generar potencialment malalties o patologies professionals als treballadors i/o tercers exposats al seu contacte i/o manipulació.

L'assessoria d'Higiene Industrial comprendrà la identificació, quantificació, valoració i propostes de correcció dels factors ambientals, físics, químics i biològics dels materials i/o substàncies perilloses, per a fer-los compatibles amb les possibilitats d'adaptació de la majoria (gairebé totalitat) dels treballadors i/o tercers aliens exposats. A l'efecte d'aquest projecte, els paràmetres de mesura s'establiran mitjançant la fixació dels valors límit TLV (Threshold Limits Values) que fan referència als

nivells de contaminació d'agents físics o químics, per sota dels quals els treballadors poden estar exposats sense perill per a la seva salut. El TLV s'expressa amb un nivell de contaminació mitjana en el temps, per 8 h/dia i 40 h/setmana.

### 1.9.1 MANIPULACIÓ

En funció de l'agent contaminant, del seu TLV, dels nivells d'exposició i de les possibles vies d'entrada a l'organisme humà, el Contractista haurà de reflectir en el seu Pla de Seguretat i Salut les mesures correctores pertinents per a establir unes condicions de treball acceptables per als treballadors i el personal exposat, de manera singular a:

- Amiant.
- Plom, Crom, Mercuri, Níquel.
- Sílice.
- Vinil.
- Urea formol.
- Ciment.
- Soroll.
- Radiacions.
- Productes tixòtrops (bentonita).
- Pintures, dissolvents, hidrocarburs, cues, resines epoxi, grasses, olis.
- Gasos liquats del petroli.
- Baixos nivells d'oxigen respirable.
- Animals.
- Entorn de drogodependència habitual.

### 1.9.2 DELIMITACIÓ / CONDICIONAMENT DE ZONES D'APILAMENT

Les substàncies i/o els preparats es rebran en l'obra etiquetats de manera clara, indeleble i com a mínim amb el text en idioma espanyol.

L'etiqueta ha de contenir:

a. Denominació de la substància d'acord amb la legislació vigent o en defecte d'això nomenclatura de la IUPAC. Si és un preparat, la denominació o nom comercial.
b. Nom comú, si és el cas.
c. Concentració de la substància, si és el cas. Si es tracta d'un preparat, el nom químic de les substàncies presents.
d. Nom, adreça i telèfon del fabricador, importador o distribuïdor de la substància o preparat perillós.
e. Pictogrames i indicadors de perill d'acord amb la legislació vigent.
f. Riscos específics, d'acord amb la legislació vigent
g. Consells de prudència, d'acord amb la legislació vigent.
h. El número CEE, si té.
i. La quantitat nominal del contingut (per preparats).

El fabricant, l'importador o el distribuïdor haurà de facilitar al Contractista destinatari, la fitxa de seguretat del material i/o la substància perillosa abans o en el moment del primer lliurament.

Les condicions bàsiques d'emmagatzematge, apilament i manipulació d'aquests materials i/o substàncies perilloses, estaran adequadament desenvolupades en el Pla de Seguretat del Contractista, partint de les següents premisses:

- Explosius
  No es preveu l'ús d'explosius.

- Comburents, extremadament inflamables i fàcilment inflamables
  Emmagatzematge en lloc ben ventilat. Estarà adequadament senyalitzada la presència de comburents i la prohibició de fumar.
  Estaran separats els productes inflamables dels comburents.
  El possible punt d'ignició més pròxim estarà prou allunyat de la zona d'apilament.

- Tòxics, molt tòxics, nocius, carcinògens, mutagènics, tòxics per a la reproducció
  Estarà adequadament senyalitzada la seva presència i disposarà de ventilació eficaç.
  Es manipularà amb Equips de Protecció Individual adequats que assegurin l'estanquitat de l'usuari, en previsió de contactes amb la pell.

- Corrosius, Irritants, sensibilitzants
  Estarà adequadament senyalitzada la seva presència.
  Es manipularan amb Equips de Protecció Individual adequats (especialment guants, ulleres i màscara de respiració) que assegurin l'estanquitat de l'usuari, en previsió de contactes amb la pell i les mucoses de les vies respiratòries.

## 1.10 CONDICIONS DE L'ENTORN

**Ocupació del tancament de l'obra**

S'entén per àmbit d'ocupació el realment afectat, incloent-hi tanques, elements de protecció, baranes, bastides, contenidors, casetes, etc.

S'ha de tenir en compte que, en aquesta mena d'obres, l'àmbit pot ser permanent al llarg de tota l'obra o pot ser necessari distingir entre l'àmbit de l'obra (el de projecte) i l'àmbit dels treballs en les seves diferents fases, a fi de permetre la circulació de vehicles i vianants o l'accés a edificis i guals.

En el PLA DE SEGURETAT i SALUT EN EL TREBALL s'especificarà la delimitació de l'àmbit d'ocupació de l'obra i es diferenciarà clarament si aquest canvia en les diferents fases de l'obra. L'àmbit o àmbits d'ocupació quedaran clarament dibuixats en plans per fases i interrelacionats amb el procés constructiu.

**Situació de casetes i contenidors**

Es col·locaran preferentment, a l'interior de l'àmbit delimitat pel tancament de l'obra.

Si per les especials característiques de l'obra no és possible la ubicació de les casetes a l'interior de l'àmbit delimitat pel tancament de l'obra, ni és possible el seu trasllat dins d'aquest àmbit, ja sigui durant tota l'obra o durant alguna de les seves fases, s'indicaran en el PLA DE SEGURETAT i SALUT les àrees previstes per a aquest fi.

Les casetes, els contenidors, els tallers provisionals i l'aparcament de vehicles d'obra se situaran segons s'indica en l'apartat "Àmbit d'ocupació de la via pública".

### 1.10.1 CARACTERÍTIQUES METEOROLÒGIQUES

El clima és continental-mediterrani, amb altes temperatures a l'estiu i temperatures moderades a l'hivern. Les precipitacions són escasses a l'estiu i abunden a la tardor i primavera.

### 1.10.2 CARACTERÍSTIQUES DE L'ENTORN

- **Ocupació del tancament de l'obra**

  En aquesta obra el tancament delimitarà la zona d'apilaments i instal·lacions auxiliars com casetes i contenidors.
  La zona d'obra en si no es pot tancar completament però sí estarà senyalitzada i degudament abalisada.

  En el PLA DE SEGURETAT I SALUT EN EL TREBALL s'especificarà la delimitació de l'àmbit d'ocupació de l'obra i es diferenciarà clarament si aquest canvia en les diferents fases de l'obra. L'àmbit o els àmbits d'ocupació quedaran clarament dibuixats en plànols per fases i interrelacionats amb el procés constructiu.

- **Situació de casetes i contenidors**

  Es col·locaran, preferentment, a l'interior de l'àmbit delimitat pel tancament de l'obra.

- **Serveis afectats**

  Durant la inspecció visual realitzat amb data de 01 de desembre 2023 s'ha observat que no es preveu necessari consultar les companyies i organismes de la zona ja que no s'estima cap incidència ni afectació en relació als serveis, atès que les actuacions de la reparació es determinen majoritàriament dins de l'àmbit de l'estructura metàl·lica del pont.

- **Servituds**

  Es un pont de transit ferroviari de FGC per transport de mercaderie i passatgers, i salva una via urbana de transit viari i de vianants . La definició de les actuacions de reparació i conservació ha tingut en compte aquest fet, i per tant la execució de les obres es realitzarà per fases i en horari nocturn en banda de manteniment sempre que sigui necessari.

- **Característiques metereològiques**

  Manresa té un clima mediterrani continental de baixa altitud caracteritzat per una notable oscil·lació tèrmica, marcat per un clima humit amb estius calorosos i hiverns freds.
  La temperatura mitjana al llarg dels últims quaranta anys ha estat de 14,2°. La mínima temperatura registrada a Manresa al llarg dels últims 25 anys va ser en el mes de desembre de 2011 (-11,1°). I la màxima temperatura registrada en aquest període de temps, va ser registrada al juliol del 1994 (42,5°).
  A Manresa ha plogut, de mitjana anual, al llarg de les últimes quatre dècades, 547 litres per metre quadrat, sent els mesos de maig (62 litres per metre quadrat de mitjana), setembre (66 litres per metre quadrat) i octubre (63 litres per metre quadrat) els més plujosos. I els mesos de febrer (25 litres per metre quadrat), març (32 litres per metre quadrat) i juliol (25 litres per metre quadrat) els més secs.

- **Característiques del terreny**

  La zona es situa a la comarca del Bages, emplaçada en el sector oriental de la Conca Cenozoica de l'Ebre, una zona dominada per materials paleògens i neògens, amb una lleugera cobertora de materials quaternaris d'origen al·luvial, col·luvial i eluvial.

- **Característiques del entorn**

  El pont salva la carretera de Vic dins del nucli urbà de Manresa.

## 1.11 UNITATS CONSTRUCTIVES

ACTUACIONS COMUNS A TOTA LA OBRA

PREVENCIÓ DEL RISC SANITARI COVID-19

IMPERMEABILITZACIONS – AILLAMENTS I JUNTES

JUNTES (FORMACIÓ – FARCIMENTS – SEGELLAMENTS)

REVESTIMENTS

PINTATS – VERNISSATS

PAVIMENTS AMORFS (FORMIGÓ, SUBBASES, TERRA, SABLÓN, BITUMINOSOS I REGS)

PROTECCIONS I SENYALITZACIÓ

COL·LOCACIÓ DE BARANES I SENYALS AMB SUPORTS METÀL·LICS

INSTAL·LACIONS ELÈCTRIQUES

INSTAL·LACIONS ELÈCTRIQUES BAIXA TENSIÓ

## 1.12 DETERMINACIÓ DEL PROCÈS CONSTRUCTIU

El Contractista, amb antelació suficient a l'inici de les activitats constructives, haurà de perfilar l'anàlisi de cadascuna d'acord amb els "Principis de l'Acció Preventiva" Art. 15L.31/1995 de 8 de novembre i els "Principis Aplicables durant l'Execució de les Obres" (Art. 10 RD. 1627/1997 de 24 d'octubre).

### 1.12.1 ORDRE D'EXECUCIÓ DELS TREBALLS

- Fase 1: Treballs previs
- Fase 2: Actuacions de reparació i conservació
- Fase 3: Actuacions de reparació i conservació dels vanols d'aproximació
- Fase 4: Neteja i acabat de les obres

### 1.12.2 DETERMINACIÓ DEL TEMPS EFECTIU DE DURACIÓ. PLA D'EXECUCIÓ

Per la programació del material necessari per al desenvolupament de les diferents fases de l'obra, s'han tingut en compte els següents aspectes:

- Llista d'activitats: Relació d'unitats d'obra
- Relacions de dependència: Relació temporal de realització material d'unes unitats respecte unes altres
- Duració de les activitats: Mitjançant la fixació de terminis temporals per la execució de cadascuna de les unitats d'obra

De les dades així obtingudes, s'ha establert en fase de projecte, un programa general orientatiu en el qual s'ha tingut en compte, en principi, únicament les grans unitats (activitats significatives), i una vegada encaixat el termini de durada, s'ha realitzat la programació previsible reflectida en un cronograma de desenvolupament.

El Contractista, en el seu Pla de Seguretat i Salut, haurà de reflectir les variacions introduïdes respecte al procés constructiu inicialment previst en el Projecte Executiu/Constructiu i en el present Estudi de Seguretat i Salut.

## 1.13 SISTEMA I/O ELEMENTS DE SEGURETAT Y SALUD INHERENTS O INCORPORATS AL MATEIX PROCÈS CONSTRUCTIU

Tot projecte constructiu o disseny de equip, mig auxiliar, màquina o eines a utilitzar en l'obra, objecte del present Estudi de Seguretat i Salut, s'integrarà en el procés constructiu, sempre d'acord amb els "Principis de l'Acció Preventiva" (Art.15 L. 31/1995 de 8 de novembre), us "Principis Aplicables durant l'Execució de les Obres" (Art. 10 RD. 1627/1997 de 24 d'octubre)

i el Codi Tècnic de l'Edificació, entre altres reglaments connexos, i atenent les Normes Tecnològiques de l'Edificació, Instruccions Tècniques Complementàries i Normes UNE o Normes Europees, d'aplicació obligatòria i/o aconsellada.

## 1.14 MEDIAMBIENT LABORAL

### 1.14.1 AGENTS ATMOSFÈRICS

S'indiquen els possibles agents atmosfèrics que poden afectar a l'obra i que condicions es deuran tenir en compte per prevenir els riscos que es deriven d'ells.

- Pluja: No es formigonarà en presencia de pluja.
- Temperatura ambient inferior a 5ºc: No s'aplicaran morters ni es realitzaran treballs de soldadures.

### 1.14.2 IL·LUMINACIÓ

Encara que la generalitat dels treballs de construcció es realitzi amb llum natural, hauran de tenir-se presents en el Pla de Seguretat i Salut algunes consideracions respecte a la utilització d'il·luminació artificial, necessària en talls, tallers, treballs nocturns o baix rasant.

Es procurarà que la intensitat lluminosa en cada zona treballo sigui uniforme, evitant els reflexos i enlluernaments al treballador, així com les variacions brusques d'intensitat.

En els locals amb el risc d'explosió pel gènere de les seves activitats, substàncies emmagatzemades o ambients perillosos, la il·luminació elèctrica serà antideflagrant.

En els llocs de treball en els quals una fallada de l'enllumenat normal suposi un risc per als treballadors, es disposarà d'un enllumenat d'emergència d'evacuació i de seguretat.

Les intensitats mínimes d'il·luminació artificial, segons els diferents treballs relacionats amb la construcció, seran els següents:

- 25-50 lux : En celoberts, galeries i llocs de pas en funció del seu ús ocasional – habitual.
- 100 lux : Operacions en les quals la distinció de detalls no sigui essencial, com ara manipulació de materials a granel, apilament de materials o pastat i lligat de conglomerants hidràulics. Baixes exigències visuals.
- 100 lux : Quan sigui necessària una petita distinció de detalls, com ara treballs en sales de màquines, calderes, ascensors, magatzems, dipòsits, vestuaris i locals higiènics de personal de petites dimensions. Baixes exigències visuals.
- 200 lux : Si és essencial una distinció moderada de detalls, com ara muntatges en treballs senzills de bancs de taller, en treballs de màquines, remolinat de paviments i tancaments mecànics. Moderades exigències visuals.
- 300 lux : Sempre que sigui essencial la distinció mitjana de detalls, com a treballs d'ordre mitjà en bancs de taller o en màquines i treballs d'oficina en general.
- 500 lux : Operacions en les quals sigui necessària una distinció mitjana de detalls, com ara treballs d'ordre mitjà en bancs de taller o en màquines i treballs d'oficina en general. Altes exigències visuals
- 1000 lux : En treballs on sigui necessària una fina distinció de detalls sota condicions de constant contrast durant llargs períodes de temps com ara muntatges delicats, treballs fins en bancs de taller o màquines, màquines d'oficina i dibuix tècnic o artístic lineal. Molt altes exigències visuals.

Els serveis de prevenció seran els encarregats d'estimar la magnitud o nivells del risc, les situacions en què aquest es produeixi, així com controlar periòdicament les condicions, l'organització dels mètodes de treball i la salut dels treballadors amb la finalitat de prendre les decisions per a eliminar, controlar o reduir el risc mitjançant mesures de prevenció en l'origen, organitzatives, de prevenció col·lectiva, de protecció individual, formatives i informatives.

### 1.14.3 SOROLL

Per a facilitar el seu desenvolupament, en el Pla de Seguretat i Salut del contractista es reprodueix un quadre sobre els nivells sonors generats habitualment en la indústria de la construcció:

- Compressor ..... 82-94 Db
- Equip de clavar pilotis (a 15 m de distància) ..... 82 dB
- Formigonera petita < 500 lts. ..... 72 dB
- Formigonera mitjana > 500 lts. ..... 60 dB
- Martell pneumàtic (en recinte estret) ..... 103 dB
- Martell pneumàtic (a l'aire lliure) ..... 94 dB
- Esmeriladora dempeus ..... 60-75 dB
- Camions i dúmpers ..... 80 dB
- Excavadora ..... 95 dB
- Grua autoportant ..... 90 dB
- Martell perforador ..... 110 dB
- Mototrailla ..... 105 dB
- Tractor d'erugues ..... 100 dB

- Pala carregadora d'erugues ..... 95-100 dB
- Pala carregadora de pneumàtics ..... 84-90 dB
- Pistoles fixa claus d'impacte ..... 150 dB
- Esmeriladora radial portàtil ..... 105 dB
- Trossadora de taula per a fusta ..... 105 dB

Les mesures a adoptar, que hauran de ser adequadament tractades en el Pla de Seguretat i Salut pel contractista, per a la prevenció dels riscos produïts pel soroll seran, en ordre d'eficàcia:

1. Supressió del risc en origen.
2. Aïllament de la part sonora.
3. Equip de Protecció Individual (EPI) mitjançant taps o orelleres.

Els serveis de prevenció seran els encarregats d'estimar la magnitud o nivells del risc, les situacions en què aquest es produeixi, així com de controlar periòdicament les condicions, l'organització dels mètodes de treball i la salut dels treballadors amb la finalitat de prendre les decisions per a eliminar, controlar o reduir el risc mitjançant mesures de prevenció en l'origen, organitzatives, de prevenció col·lectiva, de protecció individual, formatives i informatives.

### 1.14.4 POLS

La permanència d'operaris en ambients polsosos pot ocasionar les següents afeccions:

- Rinitis.
- Asma bronquial.
- Bronquitis destructiva.
- Bronquitis crònica.
- Emfisemes pulmonars.
- Pneumoconiosi.
- Asbestosi (asbest - fibrociment – amiant).
- Càncer de pulmó (asbest – fibrociment – amiant).
- Mesotelioma (asbest – fibrociment – amiant).

La patologia serà de l'un o l'altre tipus, segons la naturalesa dl pols, s concentració i el temps d'exposició.

En la construcció és freqüent l'existència de pols amb contingut de sílice lliure ((Si O2) que és el component que ho fa especialment nociu, com a causant de la pneumoconiosi. El problema de presència massiva de fibres d'amiant en suspensió necessita un Pla específic de desamiantat que excedeixi a les competències del present Estudi de Seguretat i Salut, i que haurà de ser realitzat per empreses especialitzades.

La concentració de pols màxima admissible en un ambient al qual els operaris es troben exposats durant 8 hores diàries, 5 dies a la setmana, és en funció del contingut de sílice en suspensió, que ve dau per la fórmula:

$$C = \frac{10}{\%\ Si\ O_2 + 2}\ mg / m^3$$

Tenint en compte que la mostra recollida haurà de respondre a la denominada “fracció respirable”, que correspon a la pols realment inhalada, ja que, de l'existent en l'ambient, les partícules més grans són retingudes per la pituïtària i les més fines són expel·lides amb l'aire respirat, sense haver-se fixat en els pulmons.

Els treballs en els quals és habitual la producció de pols són fonamentalment els següents:

- Escombratge i neteja de locals.
- Gestió d'enderrocs.
- Demolicions.
- Treballs de perforació.
- Manipulació de ciment.
- Doll de sorra.
- Cort de materials ceràmics i lítics amb serra mecànica.
- Pols i serradures per troncat mecànic de fusta.
- Esmerilat de materials.
- Pols i fums amb partícules metàl·liques en suspensió, en treballs de soldadura.
- Plantes de machaqueo i classificació.
- Moviments de terres.
- Circulació de vehicles.
- Poliment de paraments.
- Plantes asfàltiques.

A més dels Equips de Protecció Individual necessaris, com a màscares i ulleres contra la pols, convé adoptar les següents mesures preventives:

ACTIVITAT MESURA PREVENTIVA

| | |
|---|---|
| Neteja de locals | Ús d'aspiradora i regat previ |
| Gestió d'enderrocs | Regat previ |
| Demolicions | Regat previ |
| Treballs de perforació | Captació localitzada en carros perforadors o injecció d'aigua. |
| Manipulació de ciment | Filtres en sitges o instal·lacions confinades. |
| Doll de sorra o granalla | Equips semiautònoms de respiració. |
| Talli o poliment de materials ceràmics o lítics | Addició d'aigua micronitzada sobre la zona de tall. |
| Treballs de la fusta, desbarbat i soldadura elèctrica | Aspiració localitzada. |
| Circulació de vehicles | Regat de pistes. |
| Plantes de machaqueo i plantes asfàltiques | Aspiració localitzada. |

Els serveis de prevenció seran els encarregats d'estimar la magnitud o nivells del risc, les situacions en què aquest es produeixi, així com controlar periòdicament les condicions, l'organització dels mètodes de treball i la salut dels treballadors amb la finalitat de prendre les decisions per a eliminar, controlar o reduir el risc mitjançant mesures de prevenció en l'origen, organitzatives, de prevenció col·lectiva, de protecció individual, formatives i informatives.

## 1.14.5 ORDRE I NETEJA

El Pla de Seguretat i Salut del contractista haurà d'indicar com a estima afrontar les actuacions bàsiques d'ordre i neteja en la materialització d'aquest projecte, especialment referent a:

1. Retirada dels objectes i coses innecessàries.
2. Emplaçament de les coses necessàries en el seu respectiu lloc d'apilament.
3. Normalització interna d'obra dels tipus de recipients i plataformes de transport de materials a granel. Pla de manutenció interna d'obra.
4. Ubicació dels baixants d'enderrocs i recipients per a apilament de residus i la seva utilització. Pla d'evacuació d'enderrocs.
5. Neteja de claus i restes de material d'encofrat.
6. Desallotjament de les zones de pas, de cables, mànegues, fleixos i restes de matèria. Il·luminació suficient.
7. Retirada d'equips i ferratges, descansant simplement sobre superfícies de suport provisionals.
8. Drenatge d'abocaments en forma de tolls de carburants o greixos.
9. Senyalització dels riscos puntuals per falta d'ordre i neteja.
10. Manteniment diari de les condicions d'ordre i neteja. Brigada de neteja.
11. Informació i formació exigible als gremis o als diferents participants en els treballs directes i indirectes de cada partida inclosa en el projecte quant al manteniment de l'ordre i neteja inherents a l'operació realitzada.

*En situació de risc sanitari COVID-19, cal garantir una vegada al dia la neteja i desinfecció de les eines de treball, els vehicles utilitzats pels treballadors, els locals sanitaris, vestuaris, menjadors i espais de descans.*

En els punts de radiacions, el consultor hauria d'identificar els possibles treballs on es puguin donar aquest tipus de radiacions i indicar les mesures protectores a prendre.

## 1.14.6 RADIACIONES NO IONIZANTES

Són les radiacions la longitud d'ona de les quals està compresa entre 10-6 cm i 10 cm, aproximadament. Normalment, no solen provocar la separació dels electrons dels àtoms dels quals formen part, però no per això deixen de ser perilloses. Comprenen: Radiació Ultraviolada (UV), infraroja (ANAR), làser, microones, ultrasònica i de freqüència de ràdio.

Les radiacions no ionitzants són aquelles regions de l'espectre electromagnètic on l'energia dels fotons emesos és insuficient. Es considera que el límit més baix de longitud d'ona per a aquestes radiacions no ionitzants és de 100nm (nanòmetre) incloses en aquesta categoria estan les regions comunament conegudes com a bandes infraroges, visibles i ultraviolades.

Els treballadors més freqüents i intensament sotmesos a aquests riscos són els soldadors, especialment els de soldadura elèctrica.

### *1.14.6.1 Radiacions infraroges*

Aquest tipus de radiació és ràpidament absorbida pels teixits superficials, produint un efecte d'escalfament. E el cas dels ulls, en absorbir-se la calor pel cristal·lí i no dispersar-se ràpidament, pot produir cataractes. Aquest tipus de lesió s'ha considerat com a malaltia professional més probable en ferrers, bufadors de vidre i operaris de forns.

Totes les fonts de radiació ANAR intensa hauran d'estar dotades de sistemes de protecció, tan pròxims a la font com sigui possible, per a aconseguir la màxima absorció de calor i prevenir que la radiació penetri en els ulls dels operaris. En el cas d'utilització d'ulleres normalitzades, haurà d'incrementar-se adequadament la il·luminació del recinte, de manera que s'eviti la dilatació de la pupil·la de l'ull.

En les obres de construcció, els treballadors que estan més sovint exposats a aquestes radiacions són els soldadors, especialment quan realitzen soldadures elèctriques. Així mateix, s'ha de considerar l'entorn de l'obra, com a possible font de les radiacions.

La resposta primària a aquestes absorcions d'energia és de tipus tèrmic, afectat principalment a la pell en forma es: cremades agudes, augment de la dilatació dels casos capil·lars i un increment de la pigmentació que pot ser persistent. De manera general, tots aquells processos industrials realitzats en calent fins a l'extrem de desprendre llum generen aquests tipus de radiacions.

*1.14.6.2 Radiacions visibles*

L'òrgan afectat més important és l'ull, sent transmeses aquestes longituds d'ona a través dels mitjans oculars sense apreciable absorció abans d'aconseguir la retina.

*1.14.6.3 Radiació ultraviolada*

La radiació UV és aquella que té la seva longitud d'ona entre els 400 nm (nanòmetre) i els 10 nm. Queda inclosa dins de la radiació solar, i es genera artificialment per a molts propòsits en indústries, laboratoris i hospitals. Es divideix convencionalment en tres regions:

- UVA: 315-400 nm de longitud d'ona.
- UVB: 280-315 nm de longitud d'ona.
- UVC: 200-280 n de longitud d'ona.

La radiació a la regió UVA, la més volten de l'espectre UV, és usada àmpliament en la indústria i representa poc risc, per contra, les radiacions UVB i UVC, són més perilloses. La norma més completa és nord-americana i està acceptada per la EHO (World Health Organization).

Les radiacions a les regions UVB i UVC tenen efectes biològics que varien marcadament amb la longitud d'ona, sent màxims entorn dels 270 nm (el llum de quars amb vapor de mercuri a baixa pressió té una emissió a 254 nm aproximadament). També varien amb el temps d'exposició i amb la intensitat de la radiació. L'exposició radiant d'ulls o pell no protegits, per a un període de vuit hores haurà d'estar limitada.

La protecció contra la sobre exposició de fonts potents que pot constituir riscos, ha de dur-se a terme mitjançant la combinació de mesures organitzatives, d'apantallaments o resguards i de protecció personal. Sense oblidar que s'ha d'intentar substituir el perillós pel que comporti poc o cap risc, d'acord amb la Llei de Prevenció de Riscos Laborals.

S'haurà de posar especial èmfasi en els apantallaments i en les mesures de substitució, per a així minimitzar el tercer, que implica la necessitat de protecció personal. Tots els usuaris de l'equip generador de radiació UV han de conèixer perfectament la naturalesa dels riscos involucrats. En l'equip, o prop d'ell, han de disposar-se senyals d'advertiment adequades al cas. La limitació d'accés a la instal·lació, la distància de l'usuari respecte a la font i la limitació del temps d'exposició, constitueixen mesures organitzatives a tenir en compte.

No es poden emetre de manera indiscriminada radiacions UV en l'espai de treball, per exemple, duent a terme l'operació en un recinte confinat o en una àrea adequadament protegida. Dins de l'àrea de protecció, ha de reduir-se la intensitat de la radiació reflectida, utilitzant pintures de color negre mat. En el cas de fonts potents, on pugui sospitar-se que sigui possible una exposició per sobre del valor límit admissible, ha de disposar-se de mitjans de protecció que dificultin i facin impossible el flux radiant lliure, directe i reflectit. Quan la naturalesa del treball requereixi que l'usuari operi al costat d'una font de radiació UV no protegida, ha de fer-se ús dels mitjans de protecció personal. Els ulls estaran protegits amb ulleres o màscara de protecció facial, de manera que s'absorbeixin les radiacions que sobre ells incideixin. Anàlogament, hauran de protegir-se les mans, usant guants de cotó, i la cara, utilitzant qualsevol tipus de protecció facial.

L'exposició dels ulls i pell no protegits a la radiació UV pot conduir a una inflamació dels teixits, temporal o prolongada, amb riscos variables. En el cas de la pell, pot donar lloc a un eritema similar a una cremada pel sol i, en el cas dels ulls, a una conjuntivitis i queratitis (o inflamació de la còrnia), de resultats imprevisibles.

La font és bàsicament el sol, però també es troben en les activitats industrials de la construcció: llums fluorescents, incandescents i de descàrrega gasosa, operacions de soldadura (TIG-*MIG), bufador d'arc elèctric i làser.

Les mesures de control per a prevenir exposicions indegudes a les radiacions no ionitzants se centren en l'ús de pantalles, blindatges i Equips de Protecció Individual (per exemple, pantalla de soldadura amb visor de cèl·lula fotosensible), procurant mantenir distàncies adequades (tenint en compte l'efecte de proporcionalitat inversa al quadrat de la distància) per a reduir la intensitat de l'energia radiant emesa des de fonts que es propaguin en diferent longitud d'ona.

*1.14.6.4 Làser*

La missió d'un làser és la de produir un raig d'alta densitat i s'ha utilitzat en camps tan diversos com en cirurgia, topografia o comunicació. Es construeixen unitats amb força polsant o contínua de radiació, tant visible com invisible. Tals unitats, si són prou potents, poden danyar la pell i, en particular, els ulls si estan exposats a la radiació. La unitat polsant d'alta energia és particularment perillosa quan el pols curt de radiació impacta en el teixit causant una àmplia lesió al voltant d'aquest. Els làsers d'ona contínua també poden causar danys en els ulls i la pell. Els de radiació ANAR i V presentaran perill per a la retina, en forma de cremades; els de radiació UV i ANAR poden suposar un risc per a la còrnia i el cristal·lí. D'una manera general, la

pell és menys sensible a la radiació làser i en el cas d'unitats de radiació V i ANAR de grans potències, es pot ocasionar cremades.

Els làsers s'han classificat, d'acord amb els riscos associats al seu ús, en els dos grups i quatre classes següents: j) Grup A: unitats intrínsecament segures i aquelles que cauen dins de les classes I i II.

- Classe I: els nivells d'exposició màxima permissible no poden ser excedits.
- Classe II: de risc baix; emissió limitada a 1 mW en menys de 0,25 s, entre 400 nm i 700 nml; es prevenen els riscos per desviament de la radiació reflectida incloent la resposta de centellejo.

k) Grup B: tots els làsers presents o d'ona contínua la potència de la qual sigui major que 1 mW, com es defineix en les classes IIIa, IIIb i IV respectivament.

- Classe IIIa: risc baix; emissió limitada a 5 vegades la corresponent a la classe II; l'ús d'instruments òptics pot resultar perillós.
- Classe IIIb: risc mitjà; major límit d'emissió; l'impacte sobre l'ull pot resultar perillós, però no respecte a la reflexió difusa.

Classe IV: risc alt; major límit d'emissió; l'impacte per reflexió difusa pot ser perillós; poden causar el foc i cremar la pell. El grau de protecció necessari depèn de la longitud d'ona i de l'energia emesa per la radiació. Qualsevol equip basi s'ha de dissenyar d'acord amb mesures de seguretat apropiades, com per exemple: encaixament protector, obturador d'emissió, senyal automàtic d'emissió, etc.

Els làsers poden produir llum visible (400-700 nm), alguna radiació UV (200-400 nm), o comunament radiació ANAR (700 nm – 1 m).

A continuació, es presenta una guia de riscos associats amb unitats concretes de raigs làser:

a. Amb làser de la classe IIIa (< 5 mW), cal prevenir solament la visió directa del raig.
b. Amb els de la classe IIIb i potències compreses entre 5 mW i 500 mW, cal prevenir l'impacte de la radiació directa i de reflexió especular, en els ulls no protegits, que pot resultar perillós.
c. Amb làser de la classe IV i potències majors que 500 mW, s'ha de prevenir l'impacte de la radiació directa, de les reflexions secundàries i de les reflexions difuses, que pot resultar perillós.
   A més dels riscos associats a aquesta mena de radiació, cal tenir en compte els deguts a les unitats d'energia elèctrica utilitzades per a subministrar energia a l'equip làser. A continuació, es dona un codi de pràctica que cobreix personal, àrea de treball, equip i operació, respectivament, en l'ús de làser.
   Tots els usuaris han de sotmetre's a un examen oftalmològic periòdicament, fent especial èmfasi en les condicions de la retina. Les persones que treballin amb classe IIIb i IV, tindran al mateix temps un examen mèdic d'inspecció de danys en la pell.
d. Amb prioritat a qualsevol autorització, el contractista s'assegurarà que els operaris autoritzats estiguin degudament entrenats tant en procediment de treball segur com en el coneixement dels riscos potencials associats amb la radiació i equip que la genera.
e. Qualsevol exposició accidental que suposi impacte en ulls, ha de ser registrada i comunicada al departament mèdic.
f. La pràctica amb làser del grup B requereix la mesura general de protecció ocular, però mai serà usada per a visió directa del raig.

- Àrea de treball:

a. L'equip làser s'instal·larà en una àrea o recinte degudament controlat. La il·luminació del recinte ha de ser de tal mode que eviti la dilatació de la pupil·la de l'ull disminuint així la possibilitat de mal.
b. Els raigs làser reflectits poden ser tan perillosos com els directes, per la qual cosa han d'eliminar-se les superfícies reflectores i polides.
c. En l'àrea de treball s'ha d'investigar periòdicament la presència de qualsevol gas tòxic que pugui generar-se durant el treball, com per exemple, l'ozó.
d. Han de col·locar-se senyals lluminosos d'advertiment en totes les zones d'entrada als recintes en els quals funcionin els làsers. Quan el senyal estigui en acció ha de prohibir-se l'accés a aquest. L'equip de subministrament de potència al làser ha de disposar de protecció especial.
e. Quan i on sigui necessari, ha de prevenir-se la possibilitat de desviació del raig fora de l'àrea de control, mitjançant proteccions i blindatges. En el cas de radiació ANAR, han d'usar-se materials no inflamables per a proporcionar aquestes barreres físiques al voltant del làser. En aquests casos, ha d'evitar-se el veïnatge de materials inflamables o explosius.

- Equip:

a. Qualsevol operació de manteniment ha de dur-se a terme solament si la força està desconnectada.
b. Tots els làsers, han de disposar de rètols d'advertiment que tindran en compte la classe de làser a què correspon i el tipus de radiació visible o invisible que genera l'aparell.
c. Quan els aparells pertanyents al grup B no s'usin, han de llevar-se les claus de control d'encesa, així com la de control de força, que quedaran custodiades per la persona responsable autoritzada per al treball amb làser en el laboratori.
d. Les ulleres protectores normalitzades han de comprovar-se regularment i seleccionar-se d'acord amb la longitud d'ona de la radiació emesa pel làser en ús.

e. Qualsevol protector de pantalla que s'utilitzi, ha de ser de material absorbent que previngui la reflexió especular.

- Operació:

a. Solament es trobaran dins de l'àrea de control el nombre mínim de persones requerides en l'operació; no obstant això, en el cas de làser de la classe IV, almenys dues persones estaran sempre presents durant l'operació.
b. Únicament el personal autoritzat tindrà permís per a muntar, ajustar i operar l'equip de làser.
c. L'equip de làser haurà d'operar el temps mínim requerit per a la realització dels treballs, no havent de deixar que funcioni sense estar vigilat.
d. Com a procediment de protecció general ha d'utilitzar-se ulleres que previnguin el risc de mal ocular.
e. L'equip de làser ha de ser muntat a una altura que mai superi la corresponent del pit de l'operador.
f. Ha de tenir-se una cura especial amb la radiació làser invisible, sent essencial la utilització d'un escudament protector al llarg de tota la trajectòria.
g. Com que els làsers polsants presenten un risc incrementat per a l'operador, com a guia d'alineació del raig, han d'emprar-se làser de baixa potència d'heli o neó que pertanyen a la classe II, i mai conformar-se només amb una indicació succinta de la direcció que adoptarà el raig. En aquests casos, sempre ha de ser utilitzada la protecció ocular.

Els serveis de prevenció seran els encarregats d'estimar la magnitud o nivells del risc, les situacions en què aquest es produeixi, així com de controlar periòdicament les condicions, l'organització dels mètodes de treball i la salut dels treballadors amb la finalitat de prendre les decisions per a eliminar, controlar o reduir el risc mitjançant mesures de prevenció en l'origen, organitzatives, de prevenció col·lectiva, de protecció individual, formatives i informatives.

En construcció acostuma a usar-se monogràficament en l'establiment d'alineacions i nivells topogràfics.

Per la seva extrema perillositat, quan el làser estigui enfocat paral·lel al sòl, l'àrea de perill s'haurà d'acordonar. L'Equip de Protecció Individual contra el làser són les ulleres de protecció completa i el visor dotat del filtre adequat al tipus de làser del qual es tracti.

### 1.14.7 RADIACIONES IONIZANTES

Dins de l'àmbit de la construcció existeixen molt pocs treballs propis en els quals es generin aquest tipus de riscos, encara que sí que existeixen situacions on es puguin donar aquest tipus de radiacions, com:

- Detecció de defectes de soldadura o esquerdes en canonades, estructures i edificis.
- Control de densitats “in situ” pel mètode nuclear.
- Control d'irregularitats en el nivell d'ompliment de recipients o grans dipòsits.
- Identificació de trajectòries, utilitzant traçadors en corrents hidràulics, sediments, etcètera.

Serà obligació del contractista amb la col·laboració del seu servei de prevenció, determinar un procediment de treball segur per a realitzar les citades operacions.

També es pot considerar una possible generació de riscos en treballs realitzats dins d'un entorn o en proximitat de determinades instal·lacions, com pot ser:

- Les instal·lacions on es realitzin exàmens de maletes i embalums en els aeroports; detecció de cartes bomba.
- Les instal·lacions mèdiques on es realitzin pràctiques de teràpia, mitjançant radiacions ionitzants.
- Les instal·lacions mèdiques on es realitzin pràctiques de diagnòstic amb raigs X amb equips el potencial d'operació dels quals per disseny, sigui major de 70 Kilovolts.
- Les instal·lacions mèdiques on es manipuli o tracti material radioactiu, en forma de fonts no segellades, per a ús en teràpia o diagnòstic amb tècniques "in situ".
- Les instal·lacions d'ús industrial on es tracti o manipuli material radioactiu.
- Els acceleradors de partícules de recerca o d'ús industrial.
- Les instal·lacions i equips per a gammagrafia o radiografia industrial, sigui mitjançant l'ús de fonts radioactives o equips emissors de raigs X.
- Els dipòsits de deixalles radioactives, tant transitoris com definitius.
- Les instal·lacions on es produeixi, fabriqui, repari o es faci manutenció de fonts o equips generadors de radiacions ionitzants.
- Control d'irregularitats en el gruix de blocs de paper, làmines de plàstic i fulles de metall o en el nivell d'ompliment de recipients o grans dipòsits.
- Estimació de l'antiguitat de substàncies, utilitzant el carboni-14 o altres isòtops, com l'argó-40 o el fòsfor-32.
- Il·luminació passiva de rellotges o de sortides d'emergència.

Les funcions de protecció radiològica són responsabilitat del titular de la instal·lació, sent el Consell de Seguretat Nuclear qui decidirà si han de ser encomanades a un Servei de Protecció Radiològica propi del titular o a una Unitat Tècnica de Protecció Radiològica contractada a aquest efecte.

La reacció d'un individu a l'exposició a les radiacions depèn de: la dosi, el volum i el tipus dels teixits irradiats.

Encara que poden ocórrer en combinació, habitualment es fa una distinció entre dues classes fonamentals d'accidents per radiació, és a dir: a) Irradiació externa accidental (per exemple, en treballs de radiografiat de soldadura). b) Contaminació radioactiva accidental.

Els nivells màxims de dosi permesa han estat fixats tenint en compte que el cos humà pot tolerar una certa quantitat de radiació sense perjudicar el funcionament del seu organisme en general. Aquests nivells són, per a persones que treballin en Zones Controlades (per exemple, edifici de contenció de central nuclear) i tenint en compte l'efecte acumulatiu de les

radiacions sobre l'organisme, 5 rems per any o 300 milirems per setmana. Per a detectar i mesurar els nivells de radiació, s'usen els comptadors Geiger.

Per al control de la dosi rebuda, s'haurà de tenir en compte tres factors: a) temps de treball. b) distància de la font de radiació. c) Apantallament. El temps de treball permès s'obté dividint la dosi màxima autoritzada per la dosi rebuda en un moment donat. La dosi rebuda és inversament proporcional al quadrat de la distància a la font de radiació. Els materials que s'usen habitualment com a barres d'apantallament són el formigó i el plom, encara que també s'usin uns altres com l'acer, maons massissos d'argila, granit, calcària, etc., en general, el gruix necessari està en funció inversa de la densitat del material.

Per a verificar les dosis de radiació rebudes, s'utilitzen dosímetres individuals que poden consistir en una pel·lícula dosimètrica o un estildosímetre integrador de butxaca. Sempre que no s'especifiqui el contrari, el dosímetre individual s'emportarà en la butxaca o davanter de la roba de treball, tenint especial cura a no col·locar els dosímetres sobre cap objecte que absorbeixi radiació (per exemple, objectes metàl·lics).

Haurà d'emportar-se un Llibre de registre, on figuraran les dosis rebudes per a cadascun dels treballadors professionalment exposats a radiacions.

## 1.15 MANIPULACIÓ DE MATERIALS

Tota manutenció de material comporta un risc, per tant, des del punt de vista preventiu, s'ha de tendir a evitar tota manipulació que no sigui estrictament necessària, en virtut del conegut axioma de seguretat que diu que "el treball més segur és aquell que no es realitza".

Per a manipular materials és preceptiu prendre les següents precaucions elementals:

- Començar per la càrrega o material que apareix més superficialment, és a dir el primer i més accessible.
- Lliurar el material, no tirar-lo.
- Col·locar el material ordenat i en cas d'apilar-lo estratificat, que aquest es realitzi en piles estables, lluny de passadissos o llocs on pugui rebre cops o desgastar-se.
- Utilitzar guants de treball i calçat de seguretat amb capdavantera metàl·lica i embuatat en empenya i turmells.
- En el maneig de càrregues llargues entre dues o més persones, la càrrega pot mantenir-se a la mà, amb el braç estirat al llarg del cos, o bé sobre l'esquena.
- S'utilitzaran les eines i mitjans auxiliars adequats per al transport de cada tipus de material.
- En les operacions de càrrega i descàrrega, es prohibirà col·locar-se entre la part posterior del camió i una plataforma, pal, pilar o estructura vertical fixa.
- Si durant la descàrrega s'utilitzen eines, com a braços de palanca, ungles, potes de cabra o similar, cal disposar la maniobra de tal manera que es garanteixi que no es venja la càrrega damunt i que no rellisqui.

Quant a la manipulació de materials, el contractista en l'elaboració del Pla de Seguretat i Salut haurà de tenir en compte les següents premisses:

Intentar evitar la manipulació manual de càrregues mitjançant:

- Automatització i mecanització dels processos.
- Mesures organitzatives que eliminin o minimitzin el transport.

Adoptar mesures preventives quan no es pugui evitar la manipulació com:

- Utilització d'ajudes mecàniques.
- Reducció o redissenyo de la càrrega.
- Actuació sobre l'organització del treball.
- Millora de l'entorn de treball.

Dotar als treballadors de la formació i informació en temes que incloguin:

- Ús correcte de les ajudes mecàniques.
- Ús correcte dels equips de protecció individual.
- Tècniques segures per a la manipulació de càrregues.
- Informació sobre el pes i centre de gravetat.

Els principis bàsics de la manutenció de materials

1. El temps dedicat a la manipulació de materials és directament proporcional a l'exposició al risc d'accident derivat d'aquesta activitat.
2. Procurar que els diferents materials, així com la plataforma de suport i de treball de l'operari, estiguin a la mateixa altura en què s'ha de treballar amb ells.
3. Evitar dipositar els materials directament sobre el sòl, fer-lo sempre sobre catúfols o contenidors que permetin el seu trasllat en abundància.
4. Escurçar tant com sigui possible les distàncies a recórrer pel material manipulat, evitant estacionaments intermedis entre el lloc de partida del material manipulat i l'emplaçament definitiu de la seva posada en obra.
5. Implicar sempre els materials en abundància, mitjançant "palonniers", catúfols, contenidors o palets, en lloc de portar-los d'un en un.
6. No tractar de reduir el nombre d'ajudants que recullin i impliquin els materials, si això comporta ocupar els oficials o caps d'equip en operacions de manutenció, coincidint en franges de temps perfectament aprofitables per a l'avanç de la producció.
7. Mantenir esclarits, senyalitzats i il·luminats, els llocs de pas dels materials a manipular.

### 1.15.1 MANEIG DE CÀRREGUES SENSE MEDIS MECÀNICS

Per a l'hissat manual de càrregues la totalitat del personal d'obra haurà de rebre la formació bàsica necessària, comprometent-se a seguir els següents passos:

1. Acostar-se el màxim possible a la càrrega.
2. Assentar els peus fermament.
3. Ajupir-se doblegant els genolls.
4. Mantenir l'esquena dreta.
5. Subjectar l'objecte fermament.
6. L'esforç d'alçament de càrregues ha de recaure sobre els músculs de les cames.
7. Durant el transport, la càrrega haurà de romandre el més pròxima possible al cos.
8. Per al maneig de peces llargues per una sola persona s'actuarà segons els següents criteris preventius:

- Portarà la càrrega inclinada per un dels seus extrems, fins a l'altura de l'esquena.
- Avançarà desplaçant les mans al llarg de l'objecte, fins a arribar al centre de gravetat de la càrrega.
- Es col·locarà la càrrega en equilibri sobre l'esquena.
- Durant el transport, mantindrà la càrrega en posició inclinada, amb l'extrem davanter aixecat.

9. És obligatòria la inspecció visual de l'objecte pesat a aixecar, per a eliminar arestes esmolades.
10. Està prohibit aixecar més de 50 Kg de manera individual. El valor límit de 30 Kg per a homes, pot superar-se puntualment a 50 Kg quan es tracti de descarregar un material per a col·locar-lo sobre un mitjà mecànic de manutenció. En el cas de tractar-se de dones, es redueixen aquests valors a 15 i 25 Kg respectivament.
11. És obligatòria la utilització d'un codi de senyals quan es necessita aixecar un objecte entre diversos individus, per a suportar l'esforç al mateix temps. Pot ser qualsevol sistema sempre que sigui conegut o convingut per l'equip.

## 1.16 SISTEMAS DE PROTECCIÓ COL·LECTIVA (SPC)

A l'efecte del present Estudi de Seguretat i Salut, tindran la consideració de Sistemes de Protecció Col·lectiva, el conjunt d'elements associats, incorporats al sistema constructiu, de manera provisional i adaptada a l'absència de protecció integrada de major eficàcia (MAUP), destinats a apantallar o condonar la possibilitat de coincidència temporal de qualsevol tipus d'energia fora de control, present en l'ambient laboral, amb els treballadors, personal aliè a l'obra i/o materials, màquines, equips o ferratges pròxims a la seva àrea d'influència, anul·lant o reduint les conseqüències d'accident. La seva operativitat garanteix la integritat de les persones i objectes protegits, sense necessitat d'una participació per a assegurar la seva eficàcia. Aquest últim aspecte és el que estableix la seva diferència amb un Equip de Protecció Individual (EPI).

En absència d'homologació o certificació d'eficàcia preventiva del conjunt d'aquests Sistemes instal·lats, el contractista fixarà en el seu Pla de Seguretat i Salut, referència i relació dels Protocols d'Assaig, Certificats o Homologacions adoptats i/o requerits als instal·ladors, fabricadors i/o proveïdors, per al conglomerat dels esmentats Sistemes de Protecció Col·lectiva.

Els SPC més rellevants prevists per a l'execució del present projecte són els indicats en l'annex d'aquesta memòria que contindrà les fitxes RISC-AVALUACIÓ-MESURES

## 1.17 CONDICIONS DELS EQUIPS DE PROTECCIÓ INDIVIDUAL (EPI)

A l'efecte del present Estudi de Seguretat i Salut, tindran la consideració d'Equips de Protecció Individual, aquelles peces de treball que actuïn a mode de coberta o pantalla portàtil, individualitzada per a cada usuari, destinades a reduir les conseqüències derivades del contacte de la zona del cos protegit, amb una energia fora de control, d'intensitat inferior a la previsible resistència física del EPI.

La seva utilització haurà de quedar restringida a l'absència de garanties preventives adequades, per inexistència de MAUP, o en defecte d'això SPC d'eficàcia equivalent.

Tots els equips de protecció individual estaran degudament certificats, segons normes harmonitzades CE., sempre de conformitat amb l'RD 1407/92, R.D.159/95 i l'RD 773/97.

El Contractista Principal portarà un control documental del seu lliurament individualitzat al personal (propi o subcontractat) amb el corresponent avís de recepció signat pel beneficiari.

En els casos en què no existeixin normes d'homologació oficial, els equips de protecció individual seran normalitzats pel constructor, per al seu ús en aquesta obra, triats entre els quals existeixin en el mercat i reuneixin una qualitat adequada a les respectives prestacions. Per a aquesta normalització interna s'haurà de comptar amb el vistiplau del tècnic que supervisa el compliment del Pla de Seguretat i Salut per part de la Direcció d'Obra o Direcció Facultativa/Execució.

En el magatzem d'obra hi haurà permanentment una reserva d'aquests equips de protecció, de manera que pugui garantir el subministrament a tot el personal sense que es produeixi, raonablement, la seva manca.

En aquesta previsió, ha de tenir-se en compte: la rotació del personal, la vida útil dels equips i la data de caducitat, la necessitat de facilitar-los en les visites d'obra, etc.

Els EPI més rellevants, prevists per a l'execució material del present projecte, són els indicats en l'annex d'aquesta memòria que contindrà les fitxes RISC-AVALUACIÓ-MESURES.

## 1.18 RECURSOS PREVENTIUS

La legislació que s'ha de complir respecte a la presència de recursos preventius en les obres de construcció està contemplada en la llei 54/2003. D'acord amb aquesta llei, la presència dels recursos preventius en les obres de construcció serà preceptiva en els següents casos:

- Quan els riscos puguin veure's agreujats o modificats en el desenvolupament del procés o l'activitat, per la concurrència d'operacions diverses que es desenvolupen successiva o simultàniament i que facin precís el control de la correcta aplicació dels mètodes de treball. La presència de recursos preventius de cada contractista serà necessària quan, durant l'obra, es desenvolupin treballs amb riscos especials, tal com es defineixen en l'RD 1627/97.
- Quan es realitzin activitats o processos que reglamentàriament siguin considerats com a perillosos o amb riscos especials.
- Quan la necessitat d'aquesta presència sigui requerida per la Inspecció de Treball i Seguretat Social, si les circumstàncies del cas així ho exigissin a causa de les condicions de treball detectades.

Quan en les obres de construcció coexisteixen contractistes i subcontractistes, que de manera successiva o simultània puguin constituir un risc especial per interferència d'activitats, la presència dels ''Recursos preventius'' és en tals casos necessària.

*En situació de risc sanitari COVID-19 es recomana preveure un equip de neteja i desinfecció dels equips i eines de l'obra per tant es recomana incrementar les hores previstes de recurs preventiu.*

Els recursos preventius són necessaris quan es desenvolupin treballs amb riscos especials, definits en l'annex II del RD 1627/97:

- Treballs amb riscos especialment greus de sepultament, enfonsament o caiguda d'altura, per les particulars característiques de l'activitat desenvolupada, els procediments aplicats, o l'entorn del lloc de treball.
- Treballs en els quals l'exposició a agents químics o biològics suposi un risc d'especial gravetat, o per als quals la vigilància específica de la salut dels treballadors sigui legalment exigible.
- Treballs amb exposició a radiacions ionitzants per als quals la normativa específica obliga a la delimitació de zones controlades o vigilades.
- Treballs en la proximitat de línies elèctriques d'alta tensió.
- Treballs que exposin a risc d'ofegament per immersió.
- Obres d'excavació de túnels, pous i altres treballs que suposin moviments de terra subterranis.
- Treballs realitzats en immersió amb equip subaquàtic.
- Treballs realitzats en calaixos d'aire comprimit.
- Treballs que impliquin l'ús d'explosius.
- Treballs que requereixin muntar o desmuntar elements prefabricats pesats.

A continuació, es detallen de manera orientativa, les activitats de l'obra del present estudi de seguretat i salut, sobre la base de l'avaluació de riscos d'aquest, que requereixen la presència de recurs preventiu:

ESTRUCTURES

- ESTRUCTURES DE FORMIGÓ IN SITU (ENCOFRATS/ARMADURES/FORMIGONAT/ANCORATGES I TESAT)

IMPERMEABILITZACIONS - AÏLLAMENTS I JUNTES

- IMPERMEABILITZACIÓ DE MURS DE CONTENCIÓ O SUPERFÍCIES PLANES

REVESTIMENTS

- PINTATS – VERNISSATS

## 1.19 SENYALITZACIÓ I ABALISSAMENT

Quant a la senyalització de l'obra, cal distingir entre la que es refereix a la que demanda atenció per part dels treballadors i aquella que correspon al trànsit exterior afectat per l'obra. En el primer cas són aplicable les prescripcions establertes pel Reial decret 485/1997, de 14 d'abril, en tant que la senyalització i l'abalisament del trànsit venen regulats, entre una altra normativa, per la Norma 8.3-I.C. de la Direcció General de Carreteres i no és objecte de l'Estudi de Seguretat i Salut. Aquesta distinció no exclou la possible complementació de la senyalització de trànsit durant l'obra quan la mateixa es faci exigible per a la seguretat dels treballadors que treballin en la immediació d'aquest trànsit.

S'ha de tenir en compte que la senyalització per si mateixa no elimina els riscos, no obstant això, la seva observació quan és l'apropiada i està ben col·locada, fa que l'individu adopti conductes segures. No n'hi ha prou amb col·locar un panell en les entrades de les obres, si després en la pròpia obra no se senyalitza l'obligatorietat d'utilitzar cinturó de seguretat en col·locar les mires per a realitzar el tancament de façana. La senyalització abundant no garanteix una bona senyalització, ja que el treballador acaba per fer cas omís de qualsevol tipus de senyal.

El R.D.485/97 estableix que la senyalització de seguretat i salut en el treball haurà d'utilitzar-se sempre que l'anàlisi dels riscos existents, de les situacions d'emergència previsibles i de les mesures preventives adoptades, posi de manifest la necessitat de:

- Cridar l'atenció dels treballadors sobre l'existència de determinats riscos, prohibicions o obligacions.
- Alertar als treballadors quan es produeixi una determinada situació d'emergència que requereixi mesures urgents de protecció o evacuació.
- Facilitar als treballadors la localització i identificació de determinats mitjans o instal·lacions de protecció, evacuació, emergència o primers auxilis.
- Orientar o guiar als treballadors perquè realitzin determinades maniobres perilloses.

La senyalització no haurà de considerar-se una mesura substitutòria de les mesures tècniques i organitzatives de protecció col·lectiva i haurà d'utilitzar-se quan mitjançant aquestes últimes no hagi estat possible eliminar els riscos o reduir-los prou.

Tampoc haurà de considerar-se una mesura substitutòria de la formació i informació dels treballadors en matèria de seguretat i salut en el treball.

Així mateix, segons s'estableix en l'RD 1627/97, s'haurà de complir:

- Les vies i sortides específiques d'emergència hauran de senyalitzar-se conforme al RD 485/97, tenint en compte que aquesta senyalització haurà de fixar-se en els llocs adequats i tenir la resistència suficient.
- Els dispositius no automàtics de lluita contra incendis hauran d'estar senyalitzats conforme al RD 485/97, tenint en compte que aquesta senyalització haurà de fixar-se en els llocs adequats i tenir la resistència suficient.

- El color utilitzat per a la il·luminació artificial no podrà alterar o influir en la percepció dels senyals o panells de senyalització.
- Les portes transparents hauran de tenir una senyalització a l'altura de la vista.
- Quan existeixin línies de línia elèctrica aèries, en cas que vehicles de l'obra haguessin de circular sota l'estesa, s'utilitzarà una senyalització d'advertiment.

La implantació de la senyalització i abalisament s'ha de definir en els plans de l'Estudi de Seguretat i Salut i tenir en compte en les fitxes d'activitats, almenys respecte als riscos que no s'hagin pogut eliminar.

## 1.20 CONDICIONS D'ACCÈS I AFECTACIONS DE LA VIA PÚBLICA

Aquí, s'ha de descriure les condicions d'accés i afectacions de la via pública particulars de l'obra (amplària carrer, amplària vorera, ocupació de la vorera i via pública i com es resol, accessos a l'obra, etc.)

En el PLA DE SEGURETAT i SALUT el Contractista definirà: les desviacions i passos provisionals per a vehicles i vianants, els circuits i trams de senyalització, la senyalització, les mesures de protecció i detecció, els paviments provisionals, les modificacions que comporta la implantació de l'obra i la seva execució, diferenciant, si és oportú, les diferents fases d'execució. A aquest efecte, es tindrà en compte el que determina la Normativa per a la informació i senyalització d'obres en el municipi i la Instrucció Municipal sobre la instal·lació d'elements urbans en l'espai públic de la ciutat que correspongui.

Quan correspongui, d'acord amb les previsions d'execució de les obres, es diferenciarà amb claredat i per a cadascuna de les diferents fases de l'obra, els àmbits de treball i els àmbits destinats a la circulació de vehicles i vianants, d'accés a edificis i guals, etc…, i es definiran les mesures de senyalització i protecció que correspongui a cadascuna de les fases.

És obligatori comunicar a la Guàrdia Municipal i als Bombers o a la corresponent Autoritat: l'inici, l'extensió, la naturalesa dels treballs i les modificacions de la circulació de vehicles provocades per les obres.

Quan es necessiti prohibir l'estacionament en zones on habitualment està permès, es col·locarà el cartell de "SENYALITZACIÓ EXCEPCIONAL" (1050 X 600 mm) amb 10 dies d'antelació a l'inici dels treballs, i es comunicarà a la Guàrdia Municipal o l'Autoritat que correspongui.

En la desviació o estrenyiment de passos per a vianants es col·locarà la senyalització corresponent. No es podrà iniciar l'execució de les obres sense haver procedit a la implantació dels elements de senyalització i pertinent protecció, definits en el PLA DE SEGURETAT aprovat.

El contractista de l'obra serà responsable del manteniment de la senyalització i elements de protecció implantats.

Els accessos de vianants i vehicles estaran clarament definits, senyalitzats i separats

### 1.20.1 Normes de Policia

- Control d'accessos

Una vegada establerta la delimitació del perímetre de l'obra, conformats els tancaments i accessos per als vianants i de vehicles, el contractista definirà dins del Pla de Seguretat i Salut, amb la col·laboració del seu servei de prevenció, el procés per al control d'entrada i sortida de vehicles en general (inclosa la maquinària com a grues mòbils, retroexcavadores) i de personal de manera que garanteixi l'accés únicament a persones autoritzades.

Quan la delimitació de l'obra no es pugui dur a terme per les pròpies circumstàncies de l'obra, el contractista, deurà almenys garantir l'accés controlat a les instal·lacions d'ús comú de l'obra i haurà d'assegurar que les entrades a l'obra estiguin senyalitzades i que quedin tancades les zones que puguin presentar riscos.

- Coordinació d'interferències i seguretat a peu d'obra

El contractista, sempre que resulti necessari, donat el volum d'obra, el valor dels materials emmagatzemats i altres circumstàncies que així ho aconsellin, definirà un procés per a garantir l'accés controlat a instal·lacions que suposin risc personal i/o comú per a l'obra i evitar l'intrusisme interior de l'obra en tallers, magatzems, vestuaris i altres instal·lacions d'ús comú o particular.

### 1.20.2 Àmbit d'ocupació de la via pública

- Ocupació del tancament de l'obra

S'entén per àmbit d'ocupació, el realment ocupat incloent: tanques, elements de protecció, baranes, bastides, contenidors, casetes, etc.

En el PLA DE SEGURETAT i SALUT EN EL TREBALL s'especificarà la delimitació de l'àmbit d'ocupació de l'obra i es diferenciarà clarament si aquest canvia en les diferents fases de l'obra. El/els àmbits/s d'ocupació quedarà/àn clarament dibuixats en plans per fases i interrelacionats amb el procés constructiu.

L'ample màxim a ocupar serà proporcional a l'ample de la vorera. L'espai lliure per a pas de vianants no serà inferior a un terç (1/3) de l'ample de la vorera existent.

En cap cas es podrà ocupar un ample superior a tres metres (3m) mesurats des de la línia de façana, ni més de dos terços (2/3) de l'ample de la vorera si no queda almenys una franja d'amplària mínima d'un metre i quaranta centímetres (1,40 m) per a pas de vianants.

Quan, per l'amplària de la vorera, no sigui possible deixar un pas per a vianants d'un metre i quaranta centímetres (1,40 m) es permetrà durant l'execució dels treballs en planta baixa, la col·locació de tanques amb un sortint màxim de seixanta centímetres (60 cm) deixant un pas mínim per a vianants d'un metre (1 m). Per a l'enderrocament de les plantes superiors a la planta baixa, es col·locarà una tanca en la línia de façana i es farà una protecció en volada per a la retenció d'objectes despresos de les cotes superiors. Si la vorera és inferior a un metre seixanta centímetres (1,60 cm) durant els treballs en la planta baixa, el pas per a vianants d'un metre (1 m) d'ample podrà ocupar part de la calçada en la mesura en què es necessiti. En aquest cas, s'haurà de delimitar i protegir amb tanques l'àmbit del pas de vianants.

- Situació de casetes i contenidors

S'indicaran en el PLA DE SEGURETAT i SALUT les àrees previstes per a aquest fi.

- Les casetes, contenidors, tallers provisionals i aparcament de vehicles d'obra se situaran en una zona pròxima a l'obra que permeti aplicar els següents criteris:
- Preferentment en la vorera, deixant un pas mínim d'un metre i quaranta centímetres (1,40 m) per a pas de vianants per la vorera.
- En la vorera, deixant un pas mínim d'un metre i quaranta centímetres (1,40 m) per a pas de vianants per a la zona d'aparcament de la calçada sense envair cap carril de circulació.
- Si no hi ha prou espai en la vorera, es col·locaran en la zona d'aparcament de la calçada procurant no envair mai cap carril de circulació i deixant sempre com a mínim un metre (1m) per al pas de vianants en la vorera.
- Es protegirà el pas de vianants i es col·locarà la senyalització corresponent.

- Situació de grues-torre i muntacàrregues

Solament podran estar emplaçades en l'àmbit de l'obra.

- Canvis de la Zona Ocupada

Qualsevol canvi en la zona ocupada que afecti l'àmbit de domini públic es considerarà una modificació del PLA DE SEGURETAT i SALUT EN EL TREBALL i s'haurà de documentar i tramitar d'acord amb l'RD 1627/97.

### 1.20.3 Tancaments de l'obra que afecten l'àmbit públic

- Tanques
  - Situació

Delimitaran el perímetre de l'àmbit de l'obra o, en ordenació entre mitgeres, barraran el front de l'obra o solar i els laterals de la part de vorera ocupada.

- Tipus de tanques

Es formaran amb xapa metàl·lica opaca o amb plafons prefabricats o d'obra de fàbrica arrebossada i pintada. Les empreses promotores podran presentar a l'Ajuntament per a la seva homologació, si és el cas, el seu propi model de tanca per a emprar-lo en totes les obres que realitzin.

Les tanques metàl·liques de 200 x 100 cm solament s'admeten per a proteccions provisionals en operacions de càrrega, desviacions momentànies de trànsit o similars.

En cap cas s'admet com a tanca el simple abalisat amb cinta de PVC, malla electrosoldada d'acer, xarxa tipus tennis de polipropilè (habitualment de color taronja), o elements tradicionals de delimitacions provisionals de zones de risc.

- Complements

Totes les tanques tindran abalisament lluminós i elements reflectors en tot el seu perímetre.

- Manteniment

El Contractista cuidarà del correcte estat de la tanca, eliminant “grafitis”, publicitat il·legal i qualsevol altre element que deteriori el seu estat original.

- Accés a l'obra
  - Portes

Les tanques estaran dotades de portes d'accés independent per a vehicles i per al personal de l'obra.

No s'admet com a solució permanent d'accés, la retirada parcial de les tanques.

### 1.20.4 Operacions que afecten l'àmbit públic

- Entrades i sortides de vehicles i maquinària.
  - Vigilància

El personal responsable de l'obra s'encarregarà de dirigir les operacions d'entrada i sortida, avisant als vianants a fi d'evitar accidents.

- Aparcament

Fora de l'àmbit del tancament de l'obra no podran estacionar-se vehicles ni maquinària de l'obra, excepte en la reserva de càrrega i descàrrega de l'obra quan existeixi zona d'aparcament en la calçada.

- Camions en espera

Si no hi ha espai suficient dins de l'àmbit del tancament de l'obra per a acollir als camions en espera, s'haurà de preveure i habilitar un espai adequat a aquest efecte fora de l'obra.

El PLA DE SEGURETAT preveurà tal necessitat, d'acord amb la programació dels treballs i els mitjans de càrrega, descàrrega i transport interior de l'obra.

- Càrrega i descàrrega

Les operacions de càrrega i descàrrega s'executaran dins de l'àmbit del tancament de l'obra. Quan això no sigui possible, s'estacionarà el vehicle en el punt més pròxim a la tanca de l'obra, es desviaran els vianants fora de l'àmbit d'actuació, s'ampliarà el perímetre tancat de l'obra i es prendran les següents mesures:

  - S'habilitarà un pas per als vianants. Es deixarà un pas mínim d'un metre i quaranta centímetres (1,40 m) d'ample per a la vorera o per a la zona d'aparcament de la calçada, sense envair cap carril de circulació. Si no és suficient i/o es necessita envair el carril de circulació que correspongui, cal contactar prèviament amb la Guàrdia Urbana.
  - Es protegirà el pas de vianants amb tanques metàl·liques de 200 x 100 cm, delimitant el camí pels dos costats i es col·locarà la senyalització corresponent.
  - La separació entre les tanques metàl·liques i àmbit d'operacions o el vehicle, formarà una franja de protecció (que el seu ample dependrà del tipus de productes a carregar o descarregar) que establirà el cap d'Obra prèvia consulta al Coordinador de Seguretat de l'obra.
  - Acabades les operacions de càrrega i descàrrega, es retiraran les tanques metàl·liques i es netejarà el paviment.
  - Es controlarà la descàrrega dels camions formigonera a fi d'evitar abocaments sobre la calçada.

- Descàrrega, apilament i evacuació de terres i enderrocs
  - Descàrrega

    La descàrrega d'enderrocs dels diferents nivells de l'obra, aprofitant la força de la gravetat, serà per canonades (cotes superiors) o mecànicament (cotes sota rasant), fins als contenidors o tremuges, que hauran de ser coberts amb lones o plàstics opacs a fi d'evitar pols. Les canonades o cintes d'elevació i transport de material es col·locaran sempre per l'interior del recinte de l'obra.

  - Apilament.

    No es poden acumular terres, enderrocs i restes en l'àmbit de domini públic, excepte si és per un termini curt i si s'ha obtingut un permís especial de l'Ajuntament, i sempre s'ha de dipositar en tremuges o en contenidors homologats.

    Si no es disposa d'aquesta autorització ni d'espais adequats, les terres es carregaran directament sobre camions per a la seva evacuació immediata.

    Mancant espai per a col·locar els contenidors en l'àmbit del tancament de l'obra, es col·locaran sobre la vorera en el punt més pròxim a la tanca, deixant un pas per als vianants d'un metre i quaranta centímetres (1,40 m) d'ample com a mínim.

    S'evitarà que hi hagi productes que sobresurtin del contenidor.

    Es netejarà diàriament la zona afectada, després de retirar el contenidor.

    Els contenidors, quan no s'utilitzin, hauran de ser retirats.

  - Evacuació

    Si els enderrocs es carreguen sobre camions, aquests necessitaran portar la caixa tapada amb una lona o un plàstic opac a fi d'evitar la producció de pols, i es transportarà a un abocador autoritzat. D'igual mode, es farà en els transports dels contenidors.

  - Bastides:
    - Es col·locaran bastides perimetrals en tots els paraments exteriors en la construcció a realitzar.
    - Les bastides seran metàl·liques i modulars. Tindran una protecció de la caiguda de materials i elements formant un entarimat horitzontal a 2,80 m d'altura (preferentment de peces metàl·liques), fixat a l'estructura vertical i horitzontal de la bastida, així com una marquesina inclinada en volada que sobresurti 1,50 m, com a mínim, del pla de la bastida.
    - Les bastides estaran tapades perimetralment i en tota l'altura de l'obra, des de l'entarimat de visera, amb una xarxa o lones opaques que eviti la caiguda d'objectes i la propagació de pols.

- Grues torre:
    - En el PLA DE SEGURETAT s'indicarà l'àrea de funcionament del braç i les mesures que es prendran en el cas de superar els límits del solar o del tancament de l'obra.
    - El carro del qual penja el ganxo de la grua no podrà sobrepassar aquests límits. Si fos necessari fer-ho, en algun moment, es prendran les mesures indicades per a càrregues i descàrregues.

### 1.20.5 Neteja i incidència sobre l'ambient que afecten l'àmbit públic

- Neteja

  Els contractistes netejaran i regaran diàriament l'espai públic afectat per l'activitat de l'obra i especialment després d'haver efectuat càrregues i descàrregues o operacions productores de pols o restes.

  Es vigilarà especialment l'emissió de partícules sòlides (pols, ciment, etc.).

  S'hauran de prendre les mesures pertinents per a evitar les roderes de fang sobre la xarxa viària a la sortida dels camions de l'obra. Amb aquesta finalitat, es disposarà, abans de la sortida del tancament de l'obra, d'una solera de formigó o planxes de "relliga" de 2 x 1 m, com a mínim, sobre la qual es pararan els camions i es netejaran per reg amb mànega, cada parella de rodes.

  Està prohibit efectuar la neteja de formigoneres en el clavegueram públic.

- Sorolls. Horari de treball

  Les obres es realitzaran entre les 8,00 i les 20,00 hores dels dies laborables.

  Fora d'aquest horari, només es permet realitzar activitats que no produeixin sorolls més enllà d'aquells que estableixen les OCAF. Les obres realitzades fora d'aquest horari hauran de ser específicament autoritzades per l'Ajuntament.

  Excepcionalment, per motius de seguretat i a fi de minimitzar les molèsties que determinades operacions poden produir sobre l'àmbit públic i la circulació, l'Ajuntament podrà decidir que alguns treballs s'executin en dies no laborables o en un horari específic.

- Pols

  Es regaran les pistes de circulació de vehicles.

  Es regaran els elements a derrocar, els enderrocs i tots els materials que puguin produir pols.

  En el tall de peces amb disc s'afegirà aigua.

  Les sitges de ciment estaran dotats de filtre.

### 1.20.6 Residus que afecten l'àmbit públic

El contractista, dins del Pla de Seguretat i Salut, definirà amb la col·laboració del seu servei de prevenció, els procediments de treball per a l'emmagatzematge i retirada de cadascun dels diferents tipus de residus que es puguin generar en l'obra.

El contractista haurà de donar als treballadors i subcontractistes, les instruccions oportunes i comprovar que aquests les comprenen i compleixen.

### 1.20.7 Circulació de vehicles i vianants que afecten l'àmbit públic

- Senyalització i protecció

  Si el pla d'implantació de l'obra comporta la desviació del trànsit rodat o la reducció de vials de circulació, s'aplicaran les mesures definides en la Norma de Senyalització d'Obres 8.3.

  Està prohibida la col·locació de senyals no autoritzats pels Serveis Municipals.

- Dimensions mínimes d'itineraris i passos per a vianants

  Es respectaran les següents dimensions mínimes:

  - En cas de restricció de la vorera, l'ample de pas per a vianants no serà inferior a un terç (1/3) de l'ample de la vorera existent.
  - L'ample mínim d'itineraris o de passos per a vianants serà d'un metre i quaranta centímetres (1,40 m).

- Elements de protecció

  Pas vianants.

  Tots els passos de vianants que s'hagin d'habilitar es protegiran, pels dos costats, amb tanques o baranes resistents, ancorades o enganxades al sòl, d'una altura mínima d'un metre (1 m) amb travesser intermedi i zanquín de vint centímetres (0,20 m) en la base. L'altura de la passarel·la no sobrepassarà els quinze centímetres (0,15 m). Els elements que formen les tanques o baranes seran preferentment continus. Si són calats, les separacions mínimes no podran ser superiors a quinze centímetres (015 m).

  Pous i rases.

  Si els vianants necessiten passar per sobre dels pous o les rases, es col·locaran xapes metàl·liques fixades, de resistència suficient, totalment planes i sense regruixos.

  Si els pous o les rases han de ser evitats, les baranes o tancs de protecció del pas es col·locaran a 45è en el sentit de la marxa.

- Enllumenat i abalisament lluminós

  Els senyals i els elements d'abalisament aniran degudament il·luminats, encara que hagi il·luminat públic. S'utilitzarà pintura i material reflector o fotoluminiscent, tant per a la senyalització vertical i horitzontal, com per als elements d'abalisament.

  Els itineraris i passos de vianants estaran convenientment il·luminats al llarg de tot el tram (intensitat mínima 20 lux).

  Les bastides de paraments verticals que ocupin vorera o calçada tindran abalisament lluminós i elements reflectors en totes les potes, en tot el seu perímetre exterior.

  La delimitació d'itineraris o passos per a vianants formats per tanques metàl·liques de 200 x 100 cm, tindran abalisament lluminós en tot el seu perímetre.

- Abalisament i defensa

  Els elements d'abalisament i defensa que s'empraran per a passos de vehicles seran els designats com a tipus TB, TL i TD de la Norma de carreteres 8.3 – IC. amb el següent criteri d'ubicació d'elements d'abalisament i defensa:

  - En la delimitació de la vora del carril de circulació de vehicles contigu al tancament de l'obra.
  - En la delimitació de vores de passos provisionals de circulació de vehicles contigus a passos provisionals per a vianants.
  - Per a impedir la circulació de vehicles d'una banda d'un carril, per tot un carril o per diversos carrils, en estrenyiment de pas i/o disminució del nombre de carrils.
  - En la delimitació de vores en la desviació de carrils en el sentit de circulació, per a salvar l'obstacle de les obres.
  - En la delimitació de vores de nous carrils de circulació per a passos provisionals o per a establir una nova ordenació de la circulació, diferent de la que hi havia abans de les obres.

  Es col·locaran elements de defensa TD–1 quan: en vies d'alta densitat de circulació, en vies ràpides, en corbes pronunciades, etc., la possible desviació d'un vehicle de l'itinerari assenyalat pugui produir accidents a vianants o a treballadors (desplaçament o enderrocament del tancament de l'obra o de baranes de protecció de pas de vianants, xoc contra objectes rígids, bolcada del vehicle per l'existència de desnivells, etc.).

  Quan l'espai disponible sigui mínim, s'admetrà la col·locació d'elements de defensa TD–2.

- Accessibilitat de persones amb mobilitat reduïda

  Si la via o vies al voltant de l'obra estan adaptades d'acord amb el que disposa el Decret 135/1995 de 24 de març, i no hi ha itinerari alternatiu, els passos o itineraris provisionals compliran les següents condicions mínimes:

  - Altura lliure d'obstacles de dos metres i deu centímetres (2,10 m.)
  - En els canvis de direcció, l'amplària mínima de pas haurà de permetre inscriure un cercle d'un metre i mig (1,5 m) de diàmetre.
  - No podrà haver-hi escales ni graons aïllats.
  - El pendent longitudinal serà com a màxim del 8% i el pendent transversal del 2%.
  - El paviment serà dur, no relliscós i sense regruixos diferents als propis del gravat de peces. Si és de terres tindrà una compactació del 90% PM (Proctor Modificat).
  - Els guals tindran una amplària mínima d'un metre i vint centímetres (1,20 m) i una pendent màxima del 12%.

  Si hi ha itinerari alternatiu, s'indicarà, als punts de desviació cap a l'itinerari alternatiu, col·locant una senyal tipus D amb el símbol internacional d'accessibilitat i una fletxa de senyalització.

- Manteniment

  La senyalització i els elements d'abalisament es fixaran de tal manera que impedeixi el seu desplaçament i dificulti el seu sostracció.

  La senyalització, l'abalisament, els paviments, l'enllumenat i totes les proteccions dels itineraris, desviacions i passos per a vehicles i vianants es conservaran en perfecte estat durant la seva vigència, evitant la pèrdua de condicions perceptives o de seguretat.

  Els passos i itineraris es mantindran nets.

- Retirada de senyalització i abalisament

  Acabada l'obra es retiraran tots els senyals, elements, dispositius i abalisaments implantats.

  El termini màxim per a l'execució d'aquestes operacions serà d'una setmana, una vegada acabada l'obra o la part d'obra que exigeixi la seva implantació.

  Protecció i trasllat d'elements emplaçats en la via pública

- Arbres i jardins

  En el PLA DE SEGURETAT s'assenyalaran tots els elements vegetals i l'arbratge existent en la via pública que estigui en la zona de les obres i el seu llindar. L'Entitat Municipal responsable de Parcs i Jardins emetrà un informe previ preceptiu.

Mentre durin les obres es protegirà l'arbratge, els jardins i les espècies vegetals que puguin quedar afectades, deixant al seu voltant una franja d'un metre (1 m) de zona no ocupada. El contractista vigilarà que els escocells i les zones enjardinades estiguin sempre lliures d'elements estranys, restes, escombraries i enderrocs. S'haurà de regar periòdicament, sempre que això no es pugui fer normalment des de l'exterior de la zona d'obres.

Els escocells que quedin inclosos dins de l'àmbit d'estrenyiment de pas per a vianants s'hauran de tapar de manera que la superfície sigui contínua i sense regruixos.

- Parades d'autobús, quioscos, bústies

  A causa de la implantació del tancament de l'obra, ja sigui perquè quedin en el seu interior o per romandre en zona de pas restringit, haurà de preveure el trasllat provisional de parades d'autobús, quioscos, bústies de Correu o elements similars emplaçats en l'espai públic.

  En tal cas, haurà d'indicar-ho en el PLA DE SEGURETAT, preveure el seu emplaçament durant el temps que durin les obres i contactar amb els serveis corresponents per a coordinar les operacions.

## 1.21 RISCOS DE DANYS A TERCERS I MESURES DE PROTECCIÓ

Els riscos que durant les successives fases d'execució de l'obra podrien afectar persones o objectes annexos que es desprenguin són els següents:

- Caiguda al mateix nivell.
- Atropellaments.
- Col·lisions amb obstacles en la vorera.
- Caiguda d'objectes.

### 1.21.1 MESURES DE PROTECCIÓ A TERCERS

Es consideraran les següents mesures de protecció per a cobrir el risc de les persones que transitin pels voltants de l'obra:

- Muntatge de la tanca metàl·lica amb elements prefabricats de dos metres (2 m.) d'altura, separant el perímetre de l'obra de les zones de trànsit exterior.
- Per a la protecció de persones i vehicles que transitin pels carrers limítrofs, s'instal·larà un passadís d'estructura consistent quant a l'assenyalament, que haurà de ser òptic i lluminós en la nit, per a indicar el gàlib de les proteccions al trànsit rodat. Ocasionalment, es podrà instal·lar en el perímetre de la façana una marquesina en volada de material resistent.
- Si fos necessari ocupar la vorera durant l'apilament de materials en l'obra, mentre duri la maniobra de descàrrega es canalitzarà el trànsit de vianants per l'interior del passadís de vianants i el de vehicles fora de les zones d'afectació de la maniobra, amb protecció a base de reixes metàl·liques de separació d'àrees i col·locant llums de gàlib nocturnes i senyals de trànsit que avisin als vehicles de la situació de perill.
- En funció del nivell d'intromissió de tercers en l'obra, es pot considerar la conveniència de contractar un servei de control d'accessos a l'obra, a càrrec d'un Servei de Vigilància patrimonial, exclusivament per a aquesta funció.

## 1.22 PREVENCIÓ DE RISCOS CATASTRÒFICS

Els principals riscos catastròfics considerats com remotament previsibles per a aquesta obra són:

- Incendi, explosió i/o deflagració.
- Inundació.
- Col·lapse estructural per maniobres amb fallada.
- Atemptat patrimonial contra la Propietat i/o contractistes.
- Enfonsament de càrregues o aparells d'elevació.

Per a cobrir les eventualitats pertinents, el Contractista redactarà i inclourà com a annex al seu Pla de Seguretat i Salut un “Pla d'Emergència Interior”, en el qual explicitarà les següents mesures mínimes:

1. Ordre i neteja general.
2. Accessos i vies de circulació interna de l'obra.
3. Ubicació d'extintors i altres agents extintors.
4. Nomenament i formació de la Brigada de Primera Intervenció.
5. Punts de trobada.
6. Assistència Primers Auxilis.

## 1.23 PREVISIONS DE SEGURETAT PER ALS TREBALLS POSTERIORS

Previsions i informacions útils per a efectuar en el seu moment, en les degudes condicions de seguretat i salut, els previsibles treballs posteriors (manteniment) segons art. 5.6 RD. 1627/97.

## 1.24 FICHAS D'ACTIVITATS-RISCOS-EVALUACIÓ-MEDIDES

Avaluació de riscos

| Id | Risc | P | G | E |
|---|---|---|---|---|
| 2 | CAIGUDA DE PERSONES AL MATEIX NIVELL<br>Situació: ITINERARIS OBRA<br>ACOPIS DE MATERIAL<br>SUPERFÍCIES IRREGULARS DE TREBALL | 2 | 1 | 2 |
| 4 | CAIGUDA D'OBJECTES PER MANIPULACIÓ O DE MATERIALS TRANSPORTATS<br>Situació: MANIPULACIÓ I TRANSPORT DE MATERIALS DEMOLITS | 2 | 2 | 3 |
| 9 | COPS AMB OBJECTES O EINES (TALLS)<br>Situació: MANIPULACIÓ DE EINES | 3 | 1 | 3 |
| 10 | PROJECCIÓ DE FRAGMENTS O PARTÍCULES<br>Situació: INEXISTENCIA DE ZONES DE SEGURETAT<br>ÚS DEL MARTELL PNEUMÀTIC | 2 | 2 | 3 |
| 13 | SOBREESFORÇOS<br>Situació: ELEVACIÓ I CÀRREGA DE MATERIAL, I DEMOLICIONS | 2 | 2 | 3 |
| 14 | EXPOSICIÓ A CONDICIONS AMBIENTALS EXTREMES<br>Situació: TREBALLS EN EXTERIOR | 1 | 2 | 2 |
| 16 | EXPOSICIÓ A CONTACTES ELÈCTRICS<br>Situació: INSTAL·LACIONS ELÈCTRIQUES EXISTENTS | 1 | 3 | 3 |
| 17 | INHALACIÓ O INGESTIÒ DE SUBSTÀNCIES NOCIVES<br>Situació: POLS I PARTÍCULES GENERADES EN LA DEMOLICIÓ | 2 | 1 | 2 |
| 25 | ATROPELLAMENTS O COPS AMB VEHICLES<br>Situació: ITINERARIS DE VEHICLES PROPIS D'OBRA I TRANSPORT | 3 | 2 | 4 |
| 26 | EXPOSICIÓ A SOROLLS<br>Situació: MAQUINARIA DEMOLICIÓ: MARTELL, COMPRESSOR | 3 | 1 | 3 |
| 27 | EXPOSICIÓ A VIBRACIONS<br>Situació: CABINA MÀQUINES<br>MARTELL PNEUMÀTIC | 2 | 1 | 2 |

P: Probabilitat (1,2,3) / G: Gravetat (1,2,3) / E: Avaluació (1,2,3,4,5)

EQUIPS PROTECCIÓ INDIVIDUAL

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H1411111 | u | Casc de seguretat per ús normal, anticops, de polietilè amb un pes màxim de 400 g, homologat segons UNE-EN 812 | 2 /4 /9 /10 /14 /16 /17 /25 /26 |
| H1421110 | u | Ulleres de seguretat antiimpactes estàndard, amb muntura universal, amb visor transparent i tractament contra entelament, homologades segons UNE-EN 167 i UNE-EN 168 | 10 |
| H1431101 | u | Protector auditiu de tap d'escuma, homologat segons UNE-EN 352-2 i UNE-EN 458 | 26 |
| H1432012 | u | Protector auditiu d'auricular, acoblat al capdavant amb arnès i orelleres antisoroll, homologat segons UNE-EN 352-1 i UNE-EN 458 | 14 /26 |
| H1445003 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 140 | 17 |
| H145C002 | u | Parell de guants de protecció contra riscos mecànics comuns de construcció nivell 3, homologats segons UNE-EN 388 i UNE-EN 420 | 2 /4 /9 /10 /14 /25 |
| H145K153 | u | Parell de guants de material aïllant per a treballs elèctrics, classe 00, logotip color beix, tensió màxima 500 V, homologats segons UNE-EN 420 | 16 |
| H1463253 | u | Parell de botes dielèctriques resistents a la humitat, de pell rectificada, amb turmellera embuatada sola antilliscant i antiestàtica, tascó amortidor per al taló, llengüeta de manxa, de despreniment ràpid, sense ferratge metàl·lic, amb capdavantera reforçada, homologades segons DIN 4843 | 16 |
| H1465275 | u | Parell de botes baixes de seguretat industrial per a treballs de construcció en general, resistents a la humitat, de pell rectificada, amb turmellera embuatada, amb capdavantera metàl·lica, sola antilliscant, tascó amortidor d'impactes en el taló i sense plantilla metàl·lica, homologades segons UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 i UNE-EN ISO 20347 | 2 /4 /9 /10 /14 /17 /25 |
| H1474600 | u | Cinturó antivibratori, ajustable i de teixit transpirable | 27 |
| H147N000 | u | Faixa de protecció dorsolumbar | 13 |
| H1481343 | u | Mono de treball per a construcció d'obres lineals en servei, de polièster i cotó (65%-35%), color groc, trama 240, amb butxaques interiors i tires reflectores, homologada segons UNE-EN 340 | 2 /4 /9 /10 /14 /16 /25 |
| H1485800 | u | Armilla reflectora amb tires reflectores en la cintura, en el pit i a l'esquena, homologada segons UNE-EN 471 | 25 |
| H1486241 | u | Parka tipus enginyer, de polièster embuatat amb material aïllant, butxaques exteriors | 14 |
| H1487460 | u | Impermeable amb jaqueta, caputxa i pantalons, per a obres públiques, de PVC soldat de 0,4 mm de gruix, de color viu, homologat segons UNE-EN 340 | 14 |

SISTEMAS DE PROTECCIÓ COL·LECTIVA

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H152U000 | m | Tanca d'advertiment o abalisament d'1 m d'altura amb malla de polietilè taronja, fixada a 1 m del perímetre del forjat amb suports d'acer allotjats amb forats al forjat | 2 /4 |
| HBBAA005 | u | Senyal de prohibició, normalitzada amb pictograma negre sobre fons blanc, de forma circular amb vores i banda transversal descendent d'esquerra a dreta a 45°, en color vermell, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 2 /4 /9 /10 /14 /16 /17 /25 /26 /27 |
| HBBAB115 | u | Senyal d'obligació, normalitzada amb pictograma blanc sobre fons blau, de forma circular amb vores en color blanc, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 2 /4 /9 /10 /14 /16 /17 /25 /26 /27 |
| HBBAF004 | u | Senyal d'advertiment, normalitzada amb pictograma negre sobre fons groc, de forma triangular amb el cant negre, costat major 41 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m de distància, fixada i amb el desmuntatge inclòs | 2 /4 /9 /10 /14 /16 /17 /25 /26 /27 |

MEDIDES PREVENTIVES

| Codi | Descripció | Riscos |
|---|---|---|
| I0000002 | Planificar els treballs per a mantenir el màxim de temps possible les proteccions | 2 |
| I0000003 | Itineraris preestablerts i abalisats per al personal | 2 |
| I0000004 | Revisió i manteniment periòdic de SPC | 2 |
| I0000013 | Ordre i neteja | 17 |
| I0000026 | Planificació de recorreguts i maniobres per a màquines i camions | 4 |
| I0000027 | Elecció dels mitjans auxiliars de manteniment | 4 |
| I0000028 | Impedir l'accés de personal dins del radi d'acció de càrregues suspeses | 4 |
| I0000029 | No balancejar les càrregues suspeses | 4 |
| I0000031 | Per a la manipulació de materials voluminosos i/o pesats, sol·licitar un procediment de treball específic | 4 |
| I0000038 | Substituir el manual pel mecànic | 9 /10 |
| I0000039 | Planificació de compra i programa de manteniment d'eines | 9 |
| I0000040 | Formació de l'operari en l'ús i manteniment d'eines | 9 /13 |
| I0000044 | Evitar processos de tall de materials en l'obra | 10 |
| I0000055 | Elecció d'equips de manteniment | 13 |
| I0000056 | Paletització i equips ergonòmics | 13 |
| I0000058 | Adaptar el treball a les característiques individuals de la persona que la realitza | 13 |
| I0000060 | Suspensió dels treballs en condicions extremes | 14 |
| I0000061 | Rotació dels llocs de treball | 14 /27 |
| I0000062 | Planificar els treballs per a realitzar-los en zones protegides | 26 |
| I0000063 | En cas de vent, apuntalament i fixació de tots els elements inestables | 14 |
| I0000068 | Elecció i manteniment de les eines elèctriques | 16 |
| I0000070 | Compliment de la REBT referent a equips de protecció | 16 |
| I0000073 | Disposar de quadres elèctrics secundaris | 16 |
| I0000074 | Regar les zones de treball | 17 |
| I0000076 | Reconeixement dels materials a derrocar | 17 |
| I0000078 | Evitar processos de divisió de material en sec | 17 |
| I0000103 | Planificació de les àrees de treball | 25 |
| I0000104 | Accessos i circulació independents per a personal i maquinària | 25 |

| | | |
|---|---|---|
| I0000105 | Anivellar la maquinària per a la realització de l'activitat | 25 |
| I0000106 | El personal no ha de descansar al costat de màquines parades | 25 |
| I0000107 | Limitació de la velocitat dels vehicles | 25 |
| I0000108 | Eliminar el soroll en origen | 26 |
| I0000110 | Eliminar vibracions en origen | 27 |
| I0000154 | Verificar nivell lumínic mínim (250 lux) en itineraris i zones de treball | 2 |
| I0000155 | Controlar la temperatura i velocitat del vent en les zones de treball | 14 |
| I0000156 | Detecció xarxes instal·lacions encastades o enterrades | 16 /17 |
| I0000157 | Control del nivell sonor amb sonòmetre portàtil | 26 |
| I0000161 | Verificar que les connexions de les màquines es facin amb endolls reglamentaris | 16 |

## G04 ESTRUCTURES

## G04.G02 ESTRUCTURES DE FORMIGÓ IN SITU (ENCOFRATS/ARMADURES/FORMIGONAT/ANCORATGES I TESAT)

ESTRUCTURES DE FORMIGÓ ARMAT ELABORADES EN OBRA, ABOCAMENT AMB CUBILOT O BOMBA, ENCOFRAT METÀL·LIC O DE FUSTA

### Avaluació de riscos

| Id | Risc | P | G | E |
|---|---|---|---|---|
| 1 | CAIGUDA DE PERSONES A DIFERENT NIVELL<br>**Situació:** BUITS VERTICALS O HORITZONTALS | 2 | 3 | 4 |
| 2 | CAIGUDA DE PERSONES AL MATEIX NIVELL<br>**Situació:** MATERIAL ACOPIAT<br>MATERIAL D'ENDERROCS | 2 | 1 | 2 |
| 4 | CAIGUDA D'OBJECTES PER MANIPULACIÓ O DE MATERIALS TRANSPORTATS<br>**Situació:** DESCÀRREGA DE MATERIALS EN VORA DE FORJAT<br>CAIGUDA DE EINES MANUALS | 2 | 3 | 4 |
| 6 | TREPITJADES SOBRE OBJECTOS<br>**Situació:** ACOPIS DE MATERIAL<br>TREPITJADES SOBRE FORMIGÓ FRESC, CASETONS, ARMADURA | 3 | 1 | 3 |
| 9 | COPS AMB OBJECTOS O EINES (TALLS)<br>**Situació:** EINES MANUALS<br>MANIPULACIÓ DE MATERIALS<br>TALLS VARIS | 2 | 2 | 3 |
| 10 | PROJECCIÓ DE FRAGMENTS O PARTÍCULES<br>**Situació:** TREBALLS DE TALL DE MATERIALS<br>ABOCAMENT DE FORMIGÓ | 2 | 2 | 3 |
| 11 | ATRAPAT PER O ENTRE OBJECTES<br>**Situació:** PROCESSOS DE DESCÀRREGA DE MATERIALS | 2 | 2 | 3 |
| 13 | SOBREESFORÇOS<br>**Situació:** TREBALLS MANUALS | 2 | 2 | 3 |
| 14 | EXPOSICIÓ A CONDICIONS AMBIENTALS EXTREMES<br>**Situació:** TREBALLS EN EXTERIORS | 1 | 2 | 2 |
| 16 | EXPOSICIÓ A CONTACTES ELÈCTRICS<br>**Situació:** CONTACTES DIRECTES E INDIRECTES | 1 | 3 | 3 |
| 18 | CONTACTES AMB SUBSTÀNCIES NOCIVES (CÀUSTIQUES, CORROSIVAS, IRRITANTS O AL·LERGÒGENES)<br>**Situació:** CONTACTE AMB FORMIGÓ (CIMENT) | 2 | 1 | 2 |
| 25 | ATROPELLAMENTS O COPS AMB VEHICLES<br>**Situació:** CIRCULACIÓ DE VEHICLES EN OBRA | 2 | 3 | 4 |

**P: Probabilitat (1,2,3) / G: Gravetat (1,2,3) / E: Avaluació (1,2,3,4,5)**

### EQUIPS PROTECCIÓ INDIVIDUAL

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H1411111 | u | Casc de seguretat per a ús normal, anticops, de polietilè amb un pes màxim de 400 g, homologat segons UNE-EN 812 | 1 /2 /3 /4 /6 /9 /10 /11 /14 /16 /18 /25 |
| H1421110 | u | Ulleres de seguretat antiimpactes estàndard, amb muntura universal, amb visor transparent i tractament contra el entelament, homologades segons UNE-EN 167 i UNE-EN 168 | 10 /14 /18 |
| H142CD70 | u | Pantalla facial per a protecció de riscos mecànics, amb visor de malla de reixeta metàl·lica, per a acoblar al casc amb arnès abatible, homologada segons UNE-EN 1731 | 10 |
| H1432012 | u | Protector auditiu d'auricular, acoblat al capdavant amb arnès i orelleres antisoroll, homologat segons UNE-EN 352-1 i UNE-EN 458 | 14 |
| H1455710 | u | Parell de guants d'alta resistència al tall i a l'abrasió per a ferrallista, amb dits i palma de cautxú rugós sobre suport de cotó, i subjecció elàstica en la nina, homologats segons UNE-EN 388 i UNE-EN 420 | 9 /11 |
| H145C002 | u | Parell de guants de protecció contra riscos mecànics comuns de construcció nivell 3, homologats segons UNE-EN 388 i UNE-EN 420 | 1 /2 /3 /4 /6 /9 /10 /11 /14 /25 |
| H145K153 | u | Parell de guants de material aïllant per a treballs elèctrics, classe 00, logotip color beix, tensió màxima 500 V, homologats segons UNE-EN 420 | 16 |
| H1461164 | u | Parell de botes d'aigua de PVC de canya alta, per a posada en obra del formigó, amb plantilla metàl·lica, amb sola antilliscant i folrades de niló rentable, homologades segons UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 i UNE-EN ISO 20347 | 6 |
| H1463253 | u | Parell de botes dielèctriques resistents a la humitat, de pell rectificada, amb turmellera embuatada sola antilliscant i antiestàtica, tascó amortidor per al taló, llengüeta de manxa, de despreniment ràpid, sense ferratge metàl·lic, amb capdavantera reforçada, homologades segons DIN 4843 | 16 |
| H1465275 | u | Parell de botes baixes de seguretat industrial per a treballs de construcció en general, resistents a la humitat, de pell rectificada, amb turmellera embuatada, amb capdavantera metàl·lica, sola antilliscant, tascó amortidor d'impactes en el taló i sense plantilla metàl·lica, homologades segons UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 i UNE-EN ISO 20347 | 1 /2 /3 /4 /6 /9 /10 /11 /14 /18 /25 |
| H146J364 | u | Parell de plantilles anticlaus de fleix d'acer de 0,4 mm de gruix, de 120 kg de resistència a la perforació, pintades amb pintures epoxi i folrades, homologades segons UNE-EN ISO 20344 i UNE-EN 12568 | 6 |
| H147N000 | u | Faixa de protecció dorsolumbar | 13 |
| H1481242 | u | Mono de treball per a construcció, de polièster i cotó (65%-35%), color beix, trama 240, amb butxaques interiors, homologada segons UNE-EN 340 | 1 /2 /3 /4 /6 /9 /10 /11 /14 /16 /18 /25 |
| H1482222 | u | Camisa de treball per a construcció, de polièster i cotó (65%-35%), color beix amb butxaques interiors, trama 240, homologada segons UNE-EN 340 | 14 |
| H1485800 | u | Armilla reflectora amb tires reflectores en la cintura, en el pit i a l'esquena, homologada segons UNE-EN 471 | 25 |
| H1486241 | u | Parka tipus enginyer, de polièster embuatat amb material aïllant, butxaques exteriors | 14 |
| H1487460 | u | Impermeable amb jaqueta, caputxa i pantalons, per a obres públiques, de PVC soldat de 0,4 mm de gruix, de color viu, homologat segons UNE-EN 340 | 14 |

### SISTEMAS DE PROTECCIÓ COL·LECTIVA

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| HBBAA005 | u | Senyal de prohibició, normalitzada amb pictograma negre sobre fons blanc, de forma circular amb vores i banda transversal descendent d'esquerra a dreta a 45°, en color vermell, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /11 /13 /14 /16 /18 /25 |
| HBBAB115 | u | Senyal d'obligació, normalitzada amb pictograma blanc sobre fons blau, de forma circular amb vores en color blanc, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /11 /13 /14 /16 /18 /25 |
| HBBAF004 | u | Senyal d'advertiment, normalitzada amb pictograma negre sobre fons groc, de forma triangular amb el cant negre, costat major 41 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m de distància, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /11 /13 /14 /16 /18 /25 |

### MEDIDES PREVENTIVES

| Codi | Descripció | Riscos |
|---|---|---|

| | | |
|---|---|---|
| I0000002 | Planificar els treballs per a mantenir el màxim de temps possible les proteccions | 1 |
| I0000003 | Itineraris preestablerts i abalisats per al personal | 1 |
| I0000004 | Revisió i manteniment periòdic de SPC | 1 |
| I0000005 | Integrar la seguretat al disseny arquitectònic | 1 |
| I0000006 | Disseny i estudi de les mesures preventives en fase de projecte | 1 |
| I0000007 | Adoptar les mesures preventives necessàries per al correcte manteniment posterior | 1 |
| I0000008 | Personal qualificat per a treballs en altura | 1 |
| I0000013 | Ordre i neteja | 1 /2 /6 |
| I0000014 | Preparació i manteniment de les superfícies de treball | 2 /6 |
| I0000015 | Organització de les zones de pas i emmagatzematge | 2 /6 |
| I0000020 | No fer treballs en la mateixa vertical | 3 /4 |
| I0000022 | Condemna de la planta inferior en la qual es vagi a formigonar | 3 |
| I0000025 | Planificació d'àrees i llocs de treball | 3 /4 |
| I0000026 | Planificació de recorreguts i maniobres per a màquines i camions | 4 |
| I0000028 | Impedir l'accés de personal dins del radi d'acció de càrregues suspeses | 4 |
| I0000029 | No balancejar les càrregues suspeses | 4 |
| I0000030 | Suspendre i aixecar les càrregues dins de l'envolupant o fleixos originals | 4 |
| I0000038 | Substituir el manual pel mecànic | 9 |
| I0000039 | Planificació de compra i programa de manteniment d'eines | 9 |
| I0000040 | Formació de l'operari en l'ús i manteniment d'eines | 9 |
| I0000041 | Substituir la fabricació en obra per la prefabricació en taller | 9 |
| I0000042 | Evitar processos de manipulació de materials en l'obra | 9 |
| I0000044 | Evitar processos de tall de materials en l'obra | 10 |
| I0000045 | Formació | 9 /10 /11 /13 /18 |
| I0000046 | Evitar processos d'ajust en l'obra | 10 |
| I0000047 | Planificació i procediments per a la càrrega i descàrrega de materials | 11 |
| I0000048 | No treballar al costat de paraments acabats de fer ( <48h ) | 11 |
| I0000050 | No treballar ni estar en el radi d'acció de les càrregues suspeses | 11 |
| I0000060 | Suspensió dels treballs en condicions extremes | 14 |
| I0000061 | Rotació dels llocs de treball | 14 |
| I0000062 | Planificar els treballs per a realitzar-los en zones protegides | 14 |
| I0000068 | Elecció i manteniment de les eines elèctriques | 16 |
| I0000069 | Formació i habilitació específica per a cada eina | 16 |
| I0000070 | Compliment de la REBT referent a equips de protecció | 16 |
| I0000071 | Revisió de la connexió a terra | 16 |
| I0000072 | Fer els treballs sobre superfícies seques | 16 |
| I0000073 | Disposar de quadres elèctrics secundaris | 16 |
| I0000103 | Planificació de les àrees de treball | 25 |
| I0000104 | Accessos i circulació independents per a personal i maquinària | 25 |
| I0000106 | El personal no ha de descansar al costat de màquines parades | 25 |
| I0000107 | Limitació de la velocitat dels vehicles | 25 |
| I0000149 | Fer treballs formigonat pilars amb plataformes amb proteccions reglamentàries | 1 |
| I0000150 | No usar escales de mà per a formigonar pilars. Utilitzar plataformes de treball estables. | 1 |
| I0000152 | Utilitzar mitjans mecànics (grues, transpalés, plataformes elevadores) per a manipular càrregues | 4 |
| I0000154 | Verificar nivell lumínic mínim (250 lux) en itineraris i zones de treball | 1 /2 /6 /9 /25 |
| I0000155 | Controlar la temperatura i velocitat del vent en les zones de treball | 14 |
| I0000159 | Per a manipular càrregues llargues amb grua, utilitzar biga de repartiment | 4 /11 |
| I0000160 | Traslladar materials amb la grua dins d'una caixa o sarcòfag | 4 /11 |
| I0000161 | Verificar que les connexions de les màquines es facin amb endolls reglamentaris | 16 |

## G06 IMPERMEABILITZACIONS - AILLAMENTS I JUNTES

## G06.G01 IMPERMEABILITZACIÓ DE MURS DE CONTENCIÓ O SUPERFÍCIES PLANES

IMPERMEABILITZACIÓ DE MURS DE CONTENCIÓ O SUPERFÍCIES PLANES AMB LA APLICACIÓ DE EMULSIONS, PINTURES O MEMBRANES

**Avaluació de riscos**

| Id | Risc | P | G | E |
|---|---|---|---|---|
| 2 | CAIGUDA DE PERSONES AL MATEIX NIVELL<br>**Situació:** ITINERARIS OBRA<br>IRREGULARITAT DE LA SUPERFÍCIE DE TREBALL | 2 | 2 | 3 |
| 4 | CAIGUDA D'OBJECTES PER MANIPULACIÓ O DE MATERIALS TRANSPORTATS<br>**Situació:** SUMINISTRO DE MATERIALES A LA ZONA DE TRABAJO | 1 | 3 | 3 |
| 6 | TREPITJADES SOBRE OBJECTES<br>**Situació:** ITINERARIS D'OBRA<br>SUPERFÍCIE DE TREBALL | 2 | 2 | 3 |
| 9 | COPS AMB OBJECTES O EINES (TALLS)<br>**Situació:** EN PROCESSOS DE TROSSEJAMENT, COL·LOCACIÓ, MANIPULACIÓ EN OBRA | 2 | 2 | 3 |
| 10 | PROJECCIÓ DE FRAGMENTS O PARTÍCULES<br>**Situació:** TREBALLS DE NETEJA DEL SUPORT ABANS DE LA COL·LOCACIÓ | 2 | 1 | 2 |
| 13 | SOBREESFORÇOS<br>**Situació:** MANIPULACIÓ DE MATERIALS PESATS | 2 | 2 | 3 |
| 14 | EXPOSICIÓ A CONDICIONES AMBIENTALS EXTREMES<br>**Situació:** TREBALLS EN EXTERIORS | 2 | 2 | 3 |
| 16 | EXPOSICIÓ A CONTACTES ELÈCTRICS<br>**Situació:** CONTACTES DIRECTES E INDIRECTES | 1 | 3 | 3 |
| 17 | INHALACIÓ O INGESTIÒ DE SUBSTÀNCIES NOCIVES<br>**Situació:** DISOLVENTS, COLAS, MASSILLES | 1 | 2 | 2 |
| 18 | CONTACTES AMB SUBSTÀNCIES NOCIVES (CÀUSTIQUES, CORROSIVES, IRRITANTS O AL·LERGÒGENES)<br>**Situació:** DISOLVENTES, COLAS, MASILLAS | 1 | 2 | 2 |
| 21 | INCENDIS<br>**Situació:** DISOLVENTS, MATERIALS INFLAMABLES | 1 | 2 | 2 |

**P: Probabilitat (1,2,3) / G: Gravetat (1,2,3) / E: Avaluació (1,2,3,4,5)**

**EQUIPS PROTECCIÓ INDIVIDUAL**

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H1411111 | u | Casc de seguretat per a ús normal, anticops, de polietilè amb un pes màxim de 400 g, homologat segons UNE-EN 812 | 1 /2 /4 /6 /9 /10 /14 /16 /18 /21 |
| H1421110 | u | Ulleres de seguretat antiimpactes estàndard, amb muntura universal, amb visor transparent i tractament contra el empañamiento, homologades segons UNE-EN 167 i UNE-EN 168 | 14 /18 |
| H1432012 | u | Protector auditiu d'auricular, acoblat al capdavant amb arnès i orelleres antisoroll, homologat segons UNE-EN 352-1 i UNE-EN 458 | 14 |
| H1447005 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 136 | 17 |
| H145C002 | u | Parell de guants de protecció contra riscos mecànics comuns de construcció nivell 3, homologats segons UNE-EN 388 i UNE-EN 420 | 1 /2 /4 /6 /9 /10 /14 /18 /21 |
| H145K153 | u | Parell de guants de material aïllant per a treballs elèctrics, classe 00, logotip color beix, tensió màxima 500 V, homologats segons UNE-EN 420 | 16 |
| H1463253 | u | Parell de botes dielèctriques resistents a la humitat, de pell rectificada, amb turmellera embuatada sola antilliscant i antiestàtica, tascó amortidor per al taló, llengüeta de manxa, de despreniment ràpid, sense ferratge metàl·lic, amb capdavantera reforçada, homologades segons DIN 4843 | 16 |
| H1465275 | u | Parell de botes baixes de seguretat industrial per a treballs de construcció en general, resistents a la humitat, de pell rectificada, amb turmellera embuatada, amb capdavantera metàl·lica, sola antilliscant, tascó amortidor d'impactes en el taló i sense plantilla metàl·lica, homologades segons UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 i UNE-EN ISO 20347 | 1 /2 /4 /6 /9 /10 /14 /18 /21 |
| H147N000 | u | Faixa de protecció dorsolumbar | 13 |
| H1481242 | u | Mono de treball per a construcció, de polièster i cotó (65%-35%), color beix, trama 240, amb butxaques interiors, homologada segons UNE-EN 340 | 1 /2 /4 /6 /9 /10 /14 /16 /18 /21 |
| H1482222 | u | Camisa de treball per a construcció, de polièster i cotó (65%-35%), color beix amb butxaques interiors, trama 240, homologada segons UNE-EN 340 | 14 |
| H1485800 | u | Armilla reflectora amb tires reflectores en la cintura, en el pit i a l'esquena, homologada segons UNE-EN 471 | 4 |
| H1486241 | u | Parka tipus enginyer, de polièster embuatat amb material aïllant, butxaques exteriors | 14 |
| H1487460 | u | Impermeable amb jaqueta, caputxa i pantalons, per a obres públiques, de PVC soldat de 0,4 | 14 |

| | | | |
|---|---|---|---|
| | | mm de gruix, de color viu, homologat segons UNE-EN 340 | |

**SISTEMAS DE PROTECCIÓ COL·LECTIVA**

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| HBBAA005 | u | Senyal de prohibició, normalitzada amb pictograma negre sobre fons blanc, de forma circular amb vores i banda transversal descendent d'esquerra a dreta a 45°, en color vermell, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /13 /14 /16 /17 /18 /21 |
| HBBAB115 | u | Senyal d'obligació, normalitzada amb pictograma blanc sobre fons blau, de forma circular amb vores en color blanc, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /13 /14 /16 /17 /18 /21 |
| HBBAF004 | u | Senyal d'advertiment, normalitzada amb pictograma negre sobre fons groc, de forma triangular amb el cant negre, costat major 41 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m de distància, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /13 /14 /16 /17 /18 /21 |

**MEDIDES PREVENTIVES**

| Codi | Descripció | Riscos |
|---|---|---|
| I0000002 | Planificar els treballs per a mantenir el màxim de temps possible les proteccions | 1 |
| I0000004 | Revisió i manteniment periòdic de SPC | 1 |
| I0000008 | Personal qualificat per a treballs en altura | 1 |
| I0000013 | Ordre i neteja | 2 /6 |
| I0000014 | Preparació i manteniment de les superfícies de treball | 2 /6 |
| I0000015 | Organització de les zones de pas i emmagatzematge | 2 /6 |
| I0000017 | En els plans inclinats, treballar sobre superfícies rugoses i no relliscoses | 2 |
| I0000025 | Planificació d'àrees i llocs de treball | 4 |
| I0000026 | Planificació de recorreguts i maniobres per a màquines i camions | 4 |
| I0000027 | Elecció dels mitjans auxiliars de manteniment | 4 |
| I0000028 | Impedir l'accés de personal dins del radi d'acció de càrregues suspeses | 4 |
| I0000029 | No balancejar les càrregues suspeses | 4 |
| I0000030 | Suspendre i aixecar les càrregues dins de l'envolupant o fleixos originals | 4 |
| I0000031 | Per a la manipulació de materials voluminosos i/o pesats, sol·licitar un procediment de treball específic | 4 |
| I0000038 | Substituir el manual pel mecànic | 9 /10 |
| I0000039 | Planificació de compra i programa de manteniment d'eines | 9 |
| I0000040 | Formació de l'operari en l'ús i manteniment d'eines | 9 /21 |
| I0000041 | Substituir la fabricació en obra per la prefabricació en taller | 9 |
| I0000044 | Evitar processos de tall de materials en l'obra | 10 |
| I0000045 | Formació | 10 /13 /18 |
| I0000055 | Elecció d'equips de manteniment | 13 |
| I0000056 | Paletització i equips ergonòmics | 13 |
| I0000058 | Adaptar el treball a les característiques individuals de la persona que la realitza | 13 |
| I0000059 | Elecció dels materials alternatius poc pesats i més manejables | 13 |
| I0000060 | Suspensió dels treballs en condicions extremes | 14 |
| I0000061 | Rotació dels llocs de treball | 14 /17 |
| I0000062 | Planificar els treballs per a realitzar-los en zones protegides | 14 |
| I0000063 | En cas de vent, apuntalament i fixació de tots els elements inestables | 14 |
| I0000064 | Suspensió dels treballs en cobertes inclinades amb vent superior a 40 km/h | 14 |
| I0000068 | Elecció i manteniment de les eines elèctriques | 16 |
| I0000069 | Formació i habilitació específica per a cada eina | 16 |
| I0000070 | Compliment de la REBT referent a equips de protecció | 16 |
| I0000071 | Revisió de la connexió a terra | 16 |
| I0000072 | Fer els treballs sobre superfícies seques | 16 |
| I0000073 | Disposar de quadres elèctrics secundaris | 16 |
| I0000079 | Fer els treballs a l'aire lliure, sempre a sotavent | 17 |
| I0000080 | Elecció dels materials en el disseny del projecte | 17 |
| I0000081 | Canvi o modificació del procés de treball | 17 |
| I0000082 | Aïllament del procés | 17 |
| I0000085 | Ventilació de les zones de treball | 17 |
| I0000097 | Substituir l'inflamable pel no inflamable | 21 |
| I0000151 | Per a treballs en altura utilitzar plataformes elevadores mecàniques o hidràuliques | 2 |
| I0000154 | Verificar nivell lumínic mínim (250 lux) en itineraris i zones de treball | 2 /6 |
| I0000155 | Controlar la temperatura i velocitat del vent en les zones de treball | 14 |
| I0000161 | Verificar que les connexions de les màquines es facin amb endolls reglamentaris | 16 |

**G06.G04 JUNTES (FORMACIÓ - FARCIMENTS - SELLATS)**

FORMACIÓ, FARCIT I SELLAT DE JUNTES DE DILATACIÓ I ENTRE MATERIALS D'OBRA AMB PERFILS, CORDONS I MÀSTIQUES

**Avaluació de riscos**

| Id | Risc | P | G | E |
|---|---|---|---|---|
| 1 | CAIGUDA DE PERSONES A DIFERENT NIVELL<br>**Situació:** ITINERARIS EN OBRA<br>TREBALLS EN ALTURA | 1 | 3 | 3 |
| 2 | CAIGUDA DE PERSONES AL MATEIX NIVELL<br>**Situació:** ITINERARIS EN OBRA<br>ÀREA DE TREBALL<br>FALTA D'IL·LUMINACIÓ | 1 | 2 | 2 |
| 6 | TREPITJADES SOBRE OBJECTES<br>**Situació:** ITINERARIS EN OBRA<br>ÀREA DE TREBALL<br>FALTA D'IL·LUMINACIÓ | 1 | 2 | 2 |
| 9 | COPS AMB OBJECTES O EINES (TALLS)<br>**Situació:** EINES | 1 | 1 | 1 |
| 10 | PROJECCIÓ DE FRAGMENTS O PARTÍCULES<br>**Situació:** QUAN ES NETEJA EL SUPORT O JUNTA | 1 | 1 | 1 |
| 13 | SOBREESFORÇOS<br>**Situació:** MANIPULACIÓ MANUAL | 1 | 2 | 2 |
| 14 | EXPOSICIÓ A CONDICIONS AMBIENTALS EXTREMES<br>**Situació:** TREBALLS EN EL EXTERIOR | 2 | 2 | 3 |
| 17 | INHALACIÓ O INGESTIÒ DE SUBSTÀNCIES NOCIVES<br>**Situació:** DISOLVENTS, COLAS<br>POLS NETEJA DEL SUPORT O JUNTA | 1 | 2 | 2 |
| 18 | CONTACTES AMB SUBSTÀNCIES NOCIVES (CÀUSTIQUES, CORROSIVES, IRRITANTS O AL·LERGÒGENES)<br>**Situació:** DISOLVENTS, COLAS Y MÀSTIQUES | 1 | 2 | 2 |

**P: Probabilitat (1,2,3) / G: Gravetat (1,2,3) / E: Avaluació (1,2,3,4,5)**

**EQUIPS PROTECCIÓ INDIVIDUAL**

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H1411111 | u | Casc de seguretat per a ús normal, anticops, de polietilè amb un pes màxim de 400 g, homologat segons UNE-EN 812 | 1 /2 /6 /9 /10 /14 /18 |
| H1421110 | u | Ulleres de seguretat antiimpactes estàndard, amb muntura universal, amb visor transparent i tractament contra el empañamiento, homologades segons UNE-EN 167 i UNE-EN 168 | 10 /14 /18 |
| H1431101 | u | Protector auditiu de tap d'escuma, homologat segons UNE-EN 352-2 y UNE-EN 458 | 14 |
| H1447005 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 136 | 17 |
| H145C002 | u | Parell de guants de protecció contra riscos mecànics comuns de construcció nivell 3, homologats segons UNE-EN 388 i UNE-EN 420 | 9 /10 /14 |
| H1465275 | u | Parell de botes baixes de seguretat industrial per a treballs de construcció en general, resistents a la humitat, de pell rectificada, amb turmellera embuatada, amb capdavantera metàl·lica, sola antilliscant, tascó amortidor d'impactes en el taló i sense plantilla metàl·lica, homologades segons UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 i UNE-EN ISO 20347 | 1 /2 /6 /9 /10 /14 /18 |
| H147D102 | u | Sistema anticaiguda compost per un arnès anticaiguda amb tirants, bandes secundàries, bandes subglúteas, bandes de cuixa, suport dorsal per a subjecció, elements d'ajust, element dorsal d'enganxament d'arnès anticaiguda i sivella, incorporat a un element d'amarrament | 1 |

| | | | |
|---|---|---|---|
| | | compost per un terminal manufacturat, homologat segons UNE-EN 361, UNE-EN 362, UNE-EN 364, UNE-EN 365 i UNE-EN 354 | |
| H147L015 | u | Instrument d'ancoratge per a equip de protecció individual contra caiguda d'altura, homologat segons UNE-EN 795, amb fixació amb tac mecànic | 1 |
| H147N000 | u | Faixa de protecció dorsolumbar | 13 |
| H1481242 | u | Mono de treball per a construcció, de polièster i cotó (65%-35%), color beix, trama 240, amb butxaques interiors, homologada segons UNE-EN 340 | 1 /2 /6 /9 /10 /14 /18 |
| H1482222 | u | Camisa de treball per a construcció, de polièster i cotó (65%-35%), color beix amb butxaques interiors, trama 240, homologada segons UNE-EN 340 | 14 |
| H1486241 | u | Parka tipus enginyer, de polièster embuatat amb material aïllant, butxaques exteriors | 14 |
| H1487460 | u | Impermeable amb jaqueta, caputxa i pantalons, per a obres públiques, de PVC soldat de 0,4 mm de gruix, de color viu, homologat segons UNE-EN 340 | 14 |

**SISTEMAS DE PROTECCIÓ COL·LECTIVA**

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H152U000 | m | Tanca d'advertiment o abalisament d'1 m d'altura amb malla de polietilè taronja, fixada a 1 m del perímetre del forjat amb suports d'acer allotjats amb forats al forjat | 1 /2 /6 |
| HBBAA005 | u | Senyal de prohibició, normalitzada amb pictograma negre sobre fons blanc, de forma circular amb vores i banda transversal descendent d'esquerra a dreta a 45°, en color vermell, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /6 /9 /10 /13 /17 /18 |
| HBBAB115 | u | Senyal d'obligació, normalitzada amb pictograma blanc sobre fons blau, de forma circular amb vores en color blanc, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /6 /9 /10 /13 /17 /18 |
| HBBAF004 | u | Senyal d'advertiment, normalitzada amb pictograma negre sobre fons groc, de forma triangular amb el cant negre, costat major 41 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m de distància, fixada i amb el desmuntatge inclòs | 1 /2 /6 /9 /10 /13 /17 /18 |

**MEDIDAS PREVENTIVAS**

| Codi | Descripció | Riscos |
|---|---|---|
| I0000002 | Planificar els treballs per a mantenir el màxim de temps possible les proteccions | 1 |
| I0000004 | Revisió i manteniment periòdic de SPC | 1 |
| I0000005 | Integrar la seguretat al disseny arquitectònic | 1 |
| I0000006 | Disseny i estudi de les medides preventives en fase de projecte | 1 |
| I0000008 | Personal qualificat per a treballs en altura | 1 |
| I0000013 | Ordre i neteja | 2 /6 |
| I0000014 | Preparació i manteniment de les superfícies de treball | 2 /6 |
| I0000015 | Organització de les zones de pas i emmagatzematge | 2 /6 |
| I0000017 | En els plans inclinats, treballar sobre superfícies rugoses i no relliscoses | 2 |
| I0000038 | Substituir el manual pel mecànic | 9 |
| I0000039 | Planificació de compra i programa de manteniment d'eines | 9 |
| I0000040 | Formació de l'operari en l'ús i manteniment d'eines | 9 |
| I0000045 | Formació | 10 /13 /18 |
| I0000055 | Elecció d'equips de manteniment | 13 |
| I0000056 | Paletització i equips ergonòmics | 13 |
| I0000058 | Adaptar el treball a les característiques individuals de la persona que la realitza | 13 |
| I0000060 | Suspensió dels treballs en condicions extremes | 14 |
| I0000061 | Rotació dels llocs de treball | 14 /17 |
| I0000062 | Planificar els treballs per a realitzar-los en zones protegides | 14 |
| I0000079 | Fer els treballs a l'aire lliure, sempre a sotavent | 17 |
| I0000080 | Elecció dels materials en el disseny del projecte | 17 |
| I0000081 | Canvi o modificació del procés de treball | 17 |
| I0000082 | Aïllament del procés | 17 |
| I0000086 | Substituir els materials amb substàncies nocives | 18 |
| I0000151 | Per a treballs en altura utilitzar plataformes elevadores mecàniques o hidràuliques | 1 /13 |
| I0000152 | Utilitzar medis mecànics (grues, traspalés, plataformes elevadores) per manipular càrregues | 13 |
| I0000154 | Verificar nivell lumínic mínim (250 lux) en itineraris i zones de treball | 2 /6 /9 |
| I0000155 | Controlar la temperatura i velocitat del vent en les zones de treball | 14 |

**G07 REVESTIMENTS**

**G07.G01 PINTATS - VERNISSATS**

PROTECCIÓN DE ESTRUCTURAS, PARAMENTOS O SUPERFICIES CON PINTURA O BARNIZ

**Avaluació de riscos**

| Id | Risc | P | G | E |
|---|---|---|---|---|
| 1 | CAIGUDA DE PERSONAES A DIFERENT NIVELL<br>**Situació:** CAIGUDA DESDE ANDAMIS, BORRIQUETAS<br>CAIGUDA DESDE ANDAMIS PENJATS<br>CAIGUDA PER BUITS VERTICALS U HORITZONTALS | 2 | 3 | 4 |
| 2 | CAIGUDA DE PERSONES AL MATEIX NIVELL<br>**Situació:** SUPERFÍCIES IRREGULARS DE TREBALL | 1 | 1 | 1 |
| 4 | CAIGUDA D'OBJECTES PER MANIPULACIÓ O DE MATERIALS TRANSPORTATS<br>**Situació:** CAIGUDA DE EINES MANUALS<br>CAIGUDA DE MATERIALS TRANSPORTATS (MANUTENCIÓ) | 1 | 3 | 3 |
| 6 | TREPITJADES SOBRE OBJECTES<br>**Situació:** SOBRE TERRENYS IRREGULARS | 3 | 1 | 3 |
| 9 | COPS AMB OBJECTES O EINES (TALLS)<br>**Situació:** ÚS DE EINES MANUALS<br>TRANSPORT, MANIPULACIÓ I COL·LOCACIÓ DE MATERIALS | 2 | 1 | 2 |
| 10 | PROJECCIÓ DE FRAGMENTS O PARTÍCULES<br>**Situació:** PROJECCIÓ DEL MATERIAL EN APLICACIÓ | 3 | 1 | 3 |
| 13 | SOBREESFORÇOS<br>**Situació:** CÀRREGA DE MATERIALS PESATS | 2 | 2 | 3 |
| 14 | EXPOSICIÓ A CONDICIONS AMBIENTALS EXTREMES<br>**Situació:** TREBALLS EN EXTERIORS | 1 | 2 | 2 |
| 16 | EXPOSICIÓ A CONTACTES ELÈCTRICS<br>**Situació:** CONTACTES DIRECTES E INDIRECTES | 1 | 3 | 3 |
| 17 | INHALACIÓ O INGESTIÒ DE SUBSTÀNCIES NOCIVES<br>**Situació:** INHALACIÓ DE VARNISSOS, AIGUARRAS...<br>ESCATAT O PULIT DE SUPERFÍCIES<br>ACABATS | 3 | 2 | 4 |
| 18 | CONTACTES AMB SUBSTÀNCIES NOCIVES (CÀUSTIQUES, CORROSIVES, IRRITANTS O AL·LERGÒGENES)<br>**Situació:** CONTACTE AMB PINTURES ESPECIALS, VERNÍS | 2 | 2 | 3 |
| 25 | ATROPELLAMENTS O COPS AMB VEHICLES<br>**Situació:** VEHICLES PROPIS D'OBRA | 2 | 3 | 4 |

**P: Probabilitat (1,2,3) / G: Gravetat (1,2,3) / E: Avaluació (1,2,3,4,5)**

**EQUIPS PROTECCIÓ INDIVIDUAL**

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H1411111 | u | Casc de seguretat per a ús normal, anticops, de polietilè amb un pes màxim de 400 g, homologat segons UNE-EN 812 | 1 /2 /4 /6 /9 /10 /14 /16 /18 /25 |
| H1421110 | u | Ulleres de seguretat antiimpactes estàndard, amb muntura universal, amb visor transparent i tractament contra el empañamiento, homologades segons UNE-EN 167 i UNE-EN 168 | 10 /14 /18 |
| H1432012 | u | Protector auditiu de auricular, acoblat al cap amb arnés i orelleres antisoroll, homologat segons UNE-EN 352-1 y UNE-EN 458 | 14 |
| H1445003 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 136 | 17 |
| H144N030 | u | Equip de protecció respiratòria no autònom per línia d'aire comprimit amb màscara, homologat segons UNE-EN 14593-1 | 17 |
| H145B002 | u | Parell de guants de protecció contra riscos mecànics per manipulació de paqueteria i/o materials sense arestes vives, nivell 2, homologats segons UNE-EN 388 y UNE-EN 420 | 1 /2 /4 /6 /9 /10 /14 /18 /25 |

| | | | |
|---|---|---|---|
| H145K153 | u | Parell de guants de material aïllant per treballs elèctrics, classe 00, logotip color beige, tensió màxima 500 V, homologats segons UNE-EN 420 | 16 |
| H1463253 | u | Parell de botes dielèctriques resistents a la humitat, de pell rectificada, amb turmellera embuatada sola antilliscant i antiestàtica, tascó amortiguador pel taló, llengüeta de fuell, de despreniment ràpida, sense ferratge metàl·lic, amb puntera reforçada, homologades segons DIN 4843 | 16 |
| H1465275 | u | Parell de botes baixes de seguretat industrial per a treballs de construcció en general, resistents a la humitat, de pell rectificada, amb turmellera embuatada, amb capdavantera metàl·lica, sola antilliscant, tascó amortidor d'impactes en el taló i sense plantilla metàl·lica, homologades segons UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 i UNE-EN ISO 20347 | 1 /2 /4 /6 /9 /10 /14 /18 /25 |
| H147D501 | u | Sistema anticaiguda compost per un arnès anticaiguda amb tirants, bandes secundàries, bandes subglúteas, bandes de cuixa, suport dorsal per a subjecció, elements d'ajust, element dorsal d'enganxament d'arnès anticaiguda i sivella, incorporat a un element d'amarrament compost per un terminal manufacturat, homologat segons UNE-EN 361, UNE-EN 362, UNE-EN 364, UNE-EN 365 i UNE-EN 354 | 1 |
| H147N000 | u | Faixa de protecció dorsolumbar | 13 |
| H1481542 | u | Mono de treball per a construcció, de polièster i cotó (65%-35%), color beix, trama 240, amb butxaques interiors, homologada segons UNE-EN 340 | 1 /2 /4 /6 /9 /10 /14 /16 /18 /25 |
| H1484110 | u | Samarreta de treball, de cotó | 14 |
| H1485800 | u | Armilla reflectora amb tires reflectores en la cintura, en el pit i a l'esquena, homologada segons UNE-EN 471 | 4 /25 |
| H1486241 | u | Parka tipus enginyer, de polièster embuatat amb material aïllant, butxaques exteriors | 14 |
| H1487460 | u | Impermeable amb jaqueta, caputxa i pantalons, per a obres públiques, de PVC soldat de 0,4 mm de gruix, de color viu, homologat segons UNE-EN 340 | 14 |

**SISTEMAS DE PROTECCIÓ COL·LECTIVA**

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H152U000 | m | Tanca d'advertiment o abalisament d'1 m d'altura amb malla de polietilè taronja, fixada a 1 m del perímetre del forjat amb suports d'acer allotjats amb forats al forjat | 6 |
| HBBAA005 | u | Senyal de prohibició, normalitzada amb pictograma negre sobre fons blanc, de forma circular amb vores i banda transversal descendent d'esquerra a dreta a 45°, en color vermell, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /13 /14 /16 /17 /18 /25 |
| HBBAA007 | u | Senyal de prohibició, normalitzada amb pictograma negre sobre fons blanc, de forma circular amb vores i banda transversal descendent d'esquerra a dreta a 45°, en color vermell, diàmetre 10 cm, amb cartell explicatiu rectangular, per a ser vista fins a 3 m, fixada i amb el desmuntatge inclòs | 10 |
| HBBAB115 | u | Senyal d'obligació, normalitzada amb pictograma blanc sobre fons blau, de forma circular amb vores en color blanc, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /13 /14 /16 /17 /18 /25 |
| HBBAF004 | u | Senyal d'advertiment, normalitzada amb pictograma negre sobre fons groc, de forma triangular amb el cant negre, costat major 41 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m de distància, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /13 /14 /16 /17 /18 /25 |

**MEDIDES PREVENTIVES**

| Codi | Descripció | Riscos |
|---|---|---|
| I0000002 | Planificar els treballs per a mantenir el màxim de temps possible les proteccions | 1 |
| I0000003 | Itineraris preestablerts i abalisats per al personal | 1 |
| I0000004 | Revisió i manteniment periòdic de SPC | 1 |
| I0000006 | Disseny i estudi de les medides preventives en fase de projecte | 1 |
| I0000008 | Personal qualificat per a treballs en altura | 1 |
| I0000013 | Ordre i neteja | 2 /6 |
| I0000014 | Preparació i manteniment de les superfícies de treball | 2 /6 |
| I0000015 | Organització de les zones de pas i emmagatzematge | 2 /6 |
| I0000025 | Planificació de àrees i llocs de treball | 4 |
| I0000026 | Planificació de recorreguts i maniobres per màquines i camions | 4 |
| I0000027 | Elecció dels medis auxiliars de manteniment | 4 |
| I0000028 | Impedir l'accés de personal dins del radi d'acció de càrregues suspeses | 4 |
| I0000029 | No balancejar les càrregues suspeses | 4 |
| I0000030 | Suspendre i aixecar les càrregues dins de l'envolvent o fleixos originals | 4 |
| I0000031 | Per la manipulació de materials voluminosos i/o pesats, sol·licitar un procediment de treball especifico | 4 |
| I0000038 | Substituir el manual pel mecànic | 9 /10 |
| I0000039 | Planificació de compra i programa de manteniment d'eines | 9 |
| I0000040 | Formació de l'operari en l'ús i manteniment d'eines | 9 |
| I0000045 | Formació | 9 /10 /13 /17 /18 |
| I0000056 | Paletització i equips ergonòmics | 13 |
| I0000060 | Suspensió dels treballs en condicions extremes | 14 |
| I0000061 | Rotació dels llocs de treball | 14 |
| I0000062 | Planificar els treballs per a realitzar-los en zones protegides | 14 |
| I0000067 | No treballar prop de línies elèctriques amb cables nus | 16 |
| I0000068 | Elecció i manteniment de les eines elèctriques | 16 |
| I0000069 | Formació i habilitació específica para cada eina | 16 |
| I0000070 | Compliment de la REBT en lo referent a equips de protecció | 16 |
| I0000071 | Revisió de la connexió a terra | 16 |
| I0000072 | Fer els treballs sobre superfícies seques | 16 |
| I0000073 | Disposar de quadres elèctrics secundaris | 16 |
| I0000078 | Evitar processos de divisió de material en sec | 17 |
| I0000080 | Elecció dels materials en el disseny del projecte | 17 |
| I0000085 | Ventilació de les zones de treball | 17 |
| I0000086 | Substituir els materials amb substàncies nocives | 17 /18 |
| I0000103 | Planificació de las àrees de treball | 25 |
| I0000104 | Accessos i circulació independents per personal i maquinaria | 25 |
| I0000105 | Anivellar la maquinaria per la realització de la activitat | 25 |
| I0000106 | El personal no ha de descansar al costat de màquines parades | 25 |
| I0000107 | Limitació de la velocitat dels vehicles | 25 |
| I0000151 | Per a treballs en altura utilitzar plataformes elevadores mecàniques o hidràuliques | 1 /13 |
| I0000152 | Utilitzar medis mecànics (grues, traspalés, plataformes elevadores) per manipular càrregues | 4 /13 |
| I0000154 | Verificar nivell lumínic mínim (250 lux) en itineraris i zones de treball | 2 /6 /9 /25 |
| I0000155 | Controlar la temperatura i velocitat del vent en les zones de treball | 14 |
| I0000161 | Verificar que las connexions de les màquines es facin amb endolls reglamentaris | 16 |

**G08 PAVIMENTS**

**G08.G01 PAVIMENTS AMORFS (FORMIGÓ, SUBBASES, TERRA, SABLÓN, BITUMINOSOS I RISCOS)**

EXECUCIÓ I MANTENIMENT DE PAVIMENTS CONTINUS

**Avaluació de riscos**

| Id | Risc | P | G | E |
|---|---|---|---|---|
| 1 | CAIGUDA DE PERSONES A DIFERENT NIVELL<br>**Situació:** TREBALLS EN VORES DE TALUD | 1 | 3 | 3 |
| 2 | CAIGUDA DE PERSONES AL MATEIX NIVELL<br>**Situació:** ITINERARI OBRA<br>ACOPIS DE MATERIAL | 2 | 2 | 3 |
| 4 | CAIGUDA D'OBJECTES PER MANIPULACIÓ O DE MATERIALS TRANSPORTATS<br>**Situació:** TRANSPORTS DE BETUMS, TERRES, QUITRANS | 1 | 2 | 2 |
| 6 | TREPITJADES SOBRE OBJECTES<br>**Situació:** TREPITJADES SOBRE ELEMENTS CALENTS. BETUMS, QUITRANS... | 2 | 1 | 2 |
| 9 | COPS AMB OBJCETES O EINES (TALLS)<br>**Situació:** ÚS D'EINES MANUALS | 1 | 2 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| | COPS AMB MAQUINARIA | | | | |
| 10 | PROJECCIÓ DE FRAGMENTS O PARTÍCULES<br>**Situació:** TREBALLS DE COL·LOCACIÓ I EXTENSIÓ DE BETUMS, QUITRANS... | 2 | 1 | 2 |
| 11 | ATRAPAT PER O ENTRE OBJECTES<br>**Situació:** MAQUINARIA PROPIA DE L'OBRA | 1 | 2 | 2 |
| 12 | ATRAPAT PER BOLCADA DE MÀQUINES, TRACTORS O VEHICLES<br>**Situació:** MAQUINARIA DE COMPACTACIÓ EN LA PROXIMITAT DE LA VORA DE TALUD | 1 | 3 | 3 |
| 13 | SOBREESFORÇOS<br>**Situació:** ÚS D'EINES MANUALS | 2 | 2 | 3 |
| 14 | EXPOSICIÓ A CONDICIONS AMBIENTALS EXTREMES<br>**Situació:** TREBALLS EN EXTERIORS | 1 | 2 | 2 |
| 15 | CONTACTES TÉRMICS<br>**Situació:** COL·LOCACIÓ DE BETUMS | 2 | 2 | 3 |
| 16 | EXPOSICIÓ A CONTACTES ELÈCTRICS<br>**Situació:** CONTACTES DIRECTES E INDIRECTES<br>CONTACTES AMB INSTAL·LACIONS EXISTENTS | 1 | 2 | 2 |
| 17 | INHALACIÓ O INGESTIÓ DE SUBSTÀNCIES NOCIVES<br>**Situació:** POLS DE LA CIRCULACIÓ DE VEHICLES<br>POLS DE SILOS DE CIMENT | 2 | 1 | 2 |
| 25 | ATROPELLAMENTS O COPS AMB VEHICLES<br>**Situació:** CIRCULACIÓ ALIENA I PRÒPIA DE L'OBRA | 1 | 3 | 3 |
| 27 | EXPOSICIÓ A VIBRACIONS<br>**Situació:** MAQUINARIA | 1 | 2 | 2 |

**P: Probabilitat (1,2,3) / G: Gravetat (1,2,3) / E: Avaluació (1,2,3,4,5)**

## EQUIPS PROTECCIÓ INDIVIDUAL

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H1411111 | u | Casc de seguretat per a ús normal, anticops, de polietilè amb un pes màxim de 400 g, homologat segons UNE-EN 812 | 1 /2 /4 /6 /9 /10 /11 /12 /14 /15 /16 /25 |
| H1421110 | u | Ulleres de seguretat antiimpactes estàndard, amb muntura universal, amb visor transparent i tractament contra el entelament, homologades segons UNE-EN 167 i UNE-EN 168 | 10 /14 |
| H1432012 | u | Protector auditiu de auricular, acoblat al cap amb arnés i orelleres antisoroll, homologat segons UNE-EN 352-1 i UNE-EN 458 | 14 |
| H1445003 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 136 | 17 |
| H1459630 | u | Parell de guants per a soldador, amb palmell de pell, folre interior de cotó, i mànega llarga de serratge folrada de dril fort, homologats segons UNE-EN 407 i UNE-EN 420 | 15 |
| H145C002 | u | Parell de guants de protecció contra riscos mecànics comuns de construcció nivell 3, homologats segons UNE-EN 388 i UNE-EN 420 | 1 /2 /4 /6 /9 /10 /11 /12 /14 /25 |
| H145K153 | u | Parell de guants de material aïllant per treballs elèctrics, classe 00, logotip color beige, tensió màxima 500 V, homologats segons UNE-EN 420 | 16 |
| H1463253 | u | Parell de botes dielèctriques resistents a la humitat, de pell rectificada, amb turmellera embuatada sola antilliscant i antiestàtica, tascó amortiguador pel taló, llengüeta de fuell, de despreniment ràpida, sense ferratge metàl·lic, amb puntera reforçada, homologades segons DIN 4843 | 16 |
| H1465275 | u | Parell de botes baixes de seguretat industrial per a treballs de construcció en general, resistents a la humitat, de pell rectificada, amb turmellera embuatada, amb capdavantera metàl·lica, sola antilliscant, tascó amortidor d'impactes en el taló i sense plantilla metàl·lica, homologades segons UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 i UNE-EN ISO 20347 | 1 /2 /4 /6 /9 /10 /11 /12 /14 /15 /25 |
| H1474600 | u | Cinturó antivibratori, ajustable i de teixit transpirable | 27 |
| H147D102 | u | Sistema anticaiguda compost per un arnès anticaiguda amb tirants, bandes secundàries, bandes subglúteas, bandes de cuixa, suport dorsal per a subjecció, elements d'ajust, element dorsal d'enganxament d'arnès anticaiguda i sivella, incorporat a un element d'amarrament compost per un terminal manufacturat, homologat segons UNE-EN 361, UNE-EN 362, UNE-EN 364, UNE-EN 365 i UNE-EN 354 | 1 |
| H147L015 | u | Instrument d'ancoratge per a equip de protecció individual contra caiguda d'altura, homologat segons UNE-EN 795, amb fixació amb tac mecànic | 1 |
| H147N000 | u | Faixa de protecció dorsolumbar | 13 |
| H1481343 | u | Mono de treball per a construcció, de polièster i cotó (65%-35%), color beix, trama 240, amb butxaques interiors, homologada segons UNE-EN 340 | 1 /2 /4 /6 /9 /10 /11 /12 /14 /15 /16 /25 |
| H1482320 | u | Camisa de treball per a construcció, de polièster i cotó (65%-35%), color beix amb butxaques interiors, trama 240, homologada segons UNE-EN 340 | 14 |
| H1485800 | u | Armilla reflectora amb tires reflectores en la cintura, en el pit i a l'esquena, homologada segons UNE-EN 471 | 12 /25 |
| H1486241 | u | Parka tipus enginyer, de polièster embuatat amb material aïllant, butxaques exteriors | 14 |
| H1487460 | u | Impermeable amb jaqueta, caputxa i pantalons, per a obres públiques, de PVC soldat de 0,4 mm de gruix, de color viu, homologat segons UNE-EN 340 | 14 |
| H1489790 | u | Jaqueta de treball per a construcció d'obres lineals en servei, de polièster i cotó (65%-35%), color groc, trama 240, amb butxaques interiors i tires reflectores, homologada segons UNE-EN 340 | 14 |

## SISTEMAS DE PROTECCIÓ COL·LECTIVA

| Codi | UM | Descripció | Riscos |
|---|---|---|---|
| H152U000 | m | Tanca d'advertiment o abalisament d'1 m d'altura amb malla de polietilè taronja, fixada a 1 m del perímetre del forjat amb suports d'acer allotjats amb forats al forjat | 1 /2 /4 /6 /11 /15 |
| H153A9F1 | u | Topall per a descàrrega de camions en excavacions, de 4 m d'amplària amb tauló de fusta i perfils IPN 100 clavat al terreny i amb el desmuntatge inclòs | 12 /25 |
| HBBAA005 | u | Senyal de prohibició, normalitzada amb pictograma negre sobre fons blanc, de forma circular amb vores i banda transversal descendent d'esquerra a dreta a 45°, en color vermell, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /11 /12 /13 /14 /15 /16 /17 /27 |
| HBBAB115 | u | Senyal d'obligació, normalitzada amb pictograma blanc sobre fons blau, de forma circular amb vores en color blanc, diàmetre 29 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /11 /12 /13 /14 /15 /16 /17 /27 |
| HBBAF004 | u | Senyal d'advertiment, normalitzada amb pictograma negre sobre fons groc, de forma triangular amb el cant negre, costat major 41 cm, amb cartell explicatiu rectangular, per a ser vista fins a 12 m de distància, fixada i amb el desmuntatge inclòs | 1 /2 /4 /6 /9 /10 /11 /12 /13 /14 /15 /16 /17 /27 |

## MEDIDES PREVENTIVES

| Codi | Descripció | Riscos |
|---|---|---|
| I0000002 | Planificar els treballs per a mantenir el màxim de temps possible les proteccions | 1 |
| I0000003 | Itineraris preestablerts i abalisats per al personal | 1 |
| I0000004 | Revisió i manteniment periòdic de SPC | 1 |
| I0000013 | Ordre i neteja | 2 /6 /17 |
| I0000014 | Preparació i manteniment de les superfícies de treball | 2 /6 |
| I0000015 | Organització de les zones de pas i emmagatzematge | 2 /6 |
| I0000026 | Planificació de recorreguts i maniobres per màquines i camions | 4 |
| I0000027 | Elecció dels medis auxiliars de manteniment | 4 |
| I0000028 | Impedir l'accés de personal dins del radi d'acció de càrregues suspeses | 4 |
| I0000031 | Per la manipulació de materials voluminosos i/o pesats, sol·licitar un procediment de treball especifico | 4 |
| I0000038 | Substituir el manual pel mecànic | 9 /10 /15 |
| I0000039 | Planificació de compra i programa de manteniment d'eines | 9 |
| I0000040 | Formació de l'operari en l'ús i manteniment d'eines | 9 /11 /12 |
| I0000042 | Evitar processos de manipulació de materials en l'obra | 9 |
| I0000045 | Formació | 10 /13 |
| I0000051 | Adequació dels recorreguts de la maquinaria | 12 |
| I0000053 | Procediment d'utilització de la maquinaria | 12 /15 |
| I0000055 | Elecció d'equips de manteniment | 13 |
| I0000060 | Suspensió dels treballs en condicions extremes | 14 |
| I0000061 | Rotació dels llocs de treball | 27 |
| I0000067 | No treballar prop de línies elèctriques amb cables nus | 16 |

| | | |
|---|---|---|
| I0000068 | Elecció i manteniment de les eines elèctriques | 16 |
| I0000069 | Formació i habilitació específica para cada eina | 16 |
| I0000070 | Compliment de la REBT en lo referent a equips de protecció | 16 |
| I0000071 | Revisió de la connexió a terra | 16 |
| I0000073 | Disposar de quadres elèctrics secundaris | 16 |
| I0000074 | Regar les zones de treball | 17 |
| I0000084 | Tall amb serra per via humida, amb proteccions integrades | 10 |
| I0000086 | Substituir els materials amb substàncies nocives | 17 |
| I0000103 | Planificació de las àrees de treball | 25 |
| I0000104 | Accessos i circulació independents per personal i maquinaria | 25 |
| I0000105 | Anivellar la maquinaria per la realització de la activitat | 25 |
| I0000106 | El personal no ha de descansar al costat de màquines parades | 25 |
| I0000107 | Limitació de la velocitat dels vehicles | 25 |
| I0000110 | Eliminar vibracions en origen | 27 |
| I0000152 | Utilitzar medis mecànics (grues, traspalés, plataformes elevadores) per manipular càrregues | 13 |
| I0000154 | Verificar nivell lumínic mínim (250 lux) en itineraris i zones de treball | 2 /6 /9 /25 |
| I0000155 | Controlar la temperatura i velocitat del vent en les zones de treball | 14 |
| I0000161 | Verificar que las connexions de les màquines es facin amb endolls reglamentaris | 16 |

## 1.25 RECOMENDACIONS COVID-19

Orientacions preventives enfront del COVID-19 en les obres de construcció (Font Ministeri de Treball i Economia Social i Institut Nacional de Seguretat i Salut en el Treball)

En aquest document es recull una selecció no exhaustiva de recomanacions i mesures, fonamentalment de caràcter organitzatiu, per a garantir la protecció de la salut dels treballadors enfront de l'exposició a COVID-19 en les obres de construcció.

Prèviament, s'exposen algunes qüestions relacionades amb la gestió de la seguretat i salut laboral en les obres de construcció que s'han de tenir en compte a l'hora de valorar l'adopció de les mesures previstes en aquest document.

Consideracions essencials

- A causa de la pandèmia originada pel coronavirus SARS-CoV-2, l'activitat en les obres de construcció es va suspendre temporalment. Abans del reinici del treball en aquestes, han d'adoptar-se mesures per a protegir els treballadors enfront del contagi tenint en compte que aquestes afectaran, molt probablement, a les condicions tècniques i organitzatives del treball, als terminis d'execució i als costos de l'obra. No obstant això, és essencial assumir aquests canvis extra- ordinaris, així com integrar les recomanacions i instruccions que a cada moment dictin les autoritats sanitàries..
- Una de les característiques de les obres de construcció és la intervenció de nombroses figures en la gestió de la seguretat i salut laboral de les mateixes (promotor, coordinador en matèria de seguretat i salut, direcció facultativa, contractistes, subcontractistes, treballadors autònoms, etc.). És especialment rellevant, en la situació actual, la coordinació i cooperació entre totes elles, cadascuna des del paper que li correspongui exercir, per a promoure, valorar, acordar, planificar, implantar i controlar les mesures extraordinàries que siguin necessàries per a evitar el contagi per SARS-CoV-2.
- Com ja s'ha dit anteriorment, l'organització que s'havia previst en l'obra (prèviament a la pandèmia) haurà de ser modificada per a adaptar-la a les noves circumstàncies. Aquestes modificacions, com qualsevol canvi que afecti l'organització de l'obra, hauran de quedar reflectides en el pla de seguretat i salut en el treball. D'aquesta manera, tots els intervinents en l'obra tindran constància i coneixeran les noves mesures que s'implantaran. No obstant això, s'ha de buscar la fórmula que permeti dur a terme l'anterior amb la major celeritat possible. Així, es podrà recordar entre les diferents figures (per exemple: mitjançant reunions telemàtiques) les accions més adequades per a evitar el contagi en l'obra i recollir aquests acords en actes, protocols, etc. que poden ser incorporats al pla de seguretat i salut en el treball. S'ha de remarcar, que el llibre d'incidències hauria de ser utilitzat, en aquests casos, per a deixar constància de les modificacions del citat pla.
- L'anterior, amb les particularitats que correspongui, serà aplicable igualment en les obres que no requereixin la redacció d'un projecte.

  Una vegada s'hagin realitzat els ajustos necessaris en l'organització de l'obra i, abans d'iniciar els treballs, s'haurà de garantir que es disposa dels mitjans materials (per exemple: senyalització, mampares de material transparent, etc.) que s'ha previst utilitzar i que tots els intervinents en l'obra estan correctament informats sobre les noves mesures que hagi estat necessari adoptar.

Mesures prèvies a l'inici de l'activitat

- El desplaçament a l'obra es realitzarà preferentment de manera individual.
- El servei sanitari del servei de prevenció de riscos laborals (SPRL) de cada empresa intervinent en l'obra haurà d'avaluar l'existència de treballadors especialment sensibles a la infecció per SARS-CoV-2 i, en conseqüències, es determinaran les mesures de prevenció, adaptació i protecció addicionals necessàries.
- Es conscienciarà als treballadors sobre la importància de comunicar, al més aviat possible, si presenten símptomes compatibles amb la malaltia o, si és el cas, si han estat en contacte estret amb persones que els presentin. A aquest efecte, en l'obra s'informarà els treballadors sobre quins són els símptomes de COVID-19.
- S'informarà i formarà als treballadors sobre els riscos derivats de SARS-CoV-2, amb especial atenció a les vies de transmissió, i les mesures de prevenció i protecció adoptades.
- Es consultarà als treballadors i es consideraran les seves propostes.

Mesures tècniques i organitzatives

- La transmissió del coronavirus SARS-CoV-2 pot produir-se bé per entrar en contacte directe amb una persona contagiada, bé per entrar en contacte amb superfícies o objectes contaminades. Per tant, s'han d'adoptar mesures per a evitar totes dues vies de transmissió. En aquest document s'exposen algunes possibles actuacions que podrien dur-se a terme per a evitar el contagi perquè, en cada obra en concret, es determini quines són les més adequades i viables. El que s'ha dit anteriorment ha d'entendre's sense perjudici de qualsevol altra mesura que, en funció de les característiques dels treballs i/o emplaçament de l'obra, es consideri oportú adoptar, encara que no es trobi entre les opcions proposades en el present document.
- S'identificaran aquelles actuacions en l'obra que puguin realitzar-se sense necessitat de presència física en aquesta, promovent altres maneres de dur-les a terme (per exemple: les reunions de coordinació poden realitzar-se de manera telemàtica, el coordinador en matèria de seguretat i salut en el treball i/o la direcció facultativa poden donar algunes de les instruccions per telèfon/correu electrònic, fins i tot utilitzar eines audiovisuals per a comprovar que les instruccions s'han dut a terme). Quan hagin de visitar l'obra, es planificarà de tal manera que es minimitzi el contacte amb altres persones.
- En cas de ser necessaris desplaçaments en vehicle per l'obra, es limitarà el nombre de persones que ocupen aquest vehicle simultàniament tractant de mantenir la distància social recomanada, augmentant la freqüència dels desplaçaments si fos necessari.
- En la mesura en què es pugui, es minimitzarà la concurrència en l'obra a fi de reduir el nombre de persones afectades en cas de contagi (per exemple: espaiant els treballs en el temps de manera que es redueixi la coincidència de treballadors, encara que això impliqui ampliar els terminis d'execució).
- S'organitzaran els treballs de manera que es mantingui una distància de seguretat de 2 metres entre treballadors. Alguns dels ajustos que podrien valorar-se són: reubicació els llocs de treball dins l'obra, posposar alguns treballs per a evitar la coincidència en el mateix espai i al mateix temps, assignar horaris específics per a cada activitat i treballador per àrees de l'obra, etc.
- Això implica haver de revisar la programació de l'obra i analitzar quines activitats de les quals estava previst realitzar simultàniament podran continuar duent-se a terme conforme al planificat o, en cas contrari, haurà d'adaptar-se la programació inicial de l'obra perquè les mateixes puguin executar-se mantenint la distància social recomanada.
- Quan l'anterior no resulti factible, es valorarà la instal·lació de barreres físiques com a mampares de materials transparents (plàstic dur rígid, metacrilat, cristall o, a falta dels anteriors, plàstic dur flexible –generalment subministrat en rotllos-) per a no obstaculitzar la visibilitat dels treballadors resistents a trencament per impacte i fàcils de netejar i desinfectar. Disposaran, si fos necessari, d'elements que les facin fàcilment identificables per a evitar risc de cops o xocs.
- Quan estigués prevista l'execució d'una determinada tasca per part de diversos treballadors i no resulti viable mantenir la separació de 2 m entre ells ni la instal·lació de barreres físiques per a separar-los, s'estudiaran altres opcions per a dur-la a terme (per exemple: de forma mecanitzada o utilitzant equips de treball que permetin que els treballadors estiguin prou allunyats). Quan no sigui possible aplicar cap de les opcions assenyalades anteriorment, d'acord amb la informació recaptada mitjançant l'avaluació de riscos laborals, s'estudiaran altres alternatives de protecció adequades (com pot ser el cas de l'ús d'equips de protecció personal). Si cap de les mesures indicades resultés factible, es valorarà l'ajornament de l'execució de la tasca fins que la situació de crisi originada pel SARS-CoV-2 remeti i així ho determinin les autoritats sanitàries.
- De la mateixa manera s'organitzarà l'ús de les zones comunes (menjador, lavabos, vestuaris, etc.) per a garantir que puguin respectar-se les distàncies de seguretat en tot moment. Si fos necessari, s'habilitaran més zones comunes o s'instal·laran barreres de separació físiques, com a mampares de materials transparents (plàstic dur rígid, metacrilat, cristall o, a falta dels anteriors, plàstic dur flexible –generalment subministrat en rotllos-) per a no obstaculitzar la visibilitat dels treballadors. Els materials seran resistents al trencament per impacte i fàcils de netejar i desinfectar. Disposaran, si fos necessari, d'elements que les facin fàcilment identificables per a evitar risc de cops o xocs. Les zones comunes hauran de desinfectar-se periòdicament, preferiblement entre usos.
- Es recomana l'ús individualitzat d'eines i altres equips de treball havent de desinfectar-se després de la seva utilització. Quan l'ús d'eines o altres equips no sigui exclusiu d'un solo treballador, es desinfectaran entre usos. En aquells casos en què s'hagin llogat equips de treball (per exemple: PEMP, bastides, maquinària per a moviment de terres, etc.), serà imprescindible la desinfecció d'aquests abans de la seva utilització en l'obra i després del mateix per a evitar la propagació del virus entre diferents obres. S'acordarà amb les empreses de lloguer d'equips de treball qui es responsabilitza d'aquesta desinfecció i amb quins productes ha de dur-se a terme.
- En aquelles obres que es realitzin en un recinte tancat, aquest es ventilarà periòdicament. • S'adoptaran mesures perquè únicament accedeixi a l'obra personal autoritzat i s'establiran els mitjans d'informació necessaris (per exemple, cartells, notes informatives, megafonia, etc.) per a garantir que totes les persones que accedeixin coneixen i assumeixen les mesures adopta- dones per a evitar contagis.
- S'adoptaran mesures per a evitar el contagi en aquelles situacions en què personal aliè a l'obra hagi d'accedir necessàriament a aquesta, bé mantenint la distància recomanada, bé mitjançant separacions físiques. Concretament, per al cas de la recepció de materials en l'obra podran adoptar-se, entre altres, les següents mesures:
    - S'informarà, amb antelació suficient, als subministradors de material sobre aquelles mesures que s'hagin adoptat excepcionalment en l'obra en relació amb la recepció de mercaderia i altres generals que hagin de conèixer.
    - S'organitzarà la recepció dels materials perquè no coincideixin diferents subministrat- cap de bestiar en l'obra.

- Es realitzarà la descàrrega de material en zones específiques de l'obra evitant la concurrència amb els treballadors de la mateixa (excepte amb els quals sigui imprescindible).
- Quan sigui personal de l'obra qui descarregui el material, el conductor haurà de romandre en la cabina del vehicle.
- Quan sigui el transportista el que realitzi la càrrega/descarrega de la mercaderia, aquesta es disposarà en llocs específics perquè dur a terme aquesta operació sense entrar en contacte amb cap persona de l'obra o mantenint una distància de 2 metres.
- Es fomentarà, en tot cas, la descàrrega mecanitzada del material havent d'evitar l'ús dels equips destinats a tal fi per part de diversos treballadors o havent de netejar-se i desinfectar-se aquests adequadament després de cada ús. Això s'aplicarà, igualment, en aquells casos en què se cedeixin els equips al transportista perquè sigui el mateix qui els utilitzi.
- S'acordaran amb el subministrador de material, prèviament, formes alternatives per al lliurament i recepció dels albarans que evitin el contacte amb personal de l'obra (per exemple: correu electrònic, telèfon, etc.).

- Per a la desinfecció de les superfícies i equips, s'utilitzaran dilucions de lleixiu comercial (20-30 ml aprox. en 1 litre d'aigua), d'alcohol (almenys 70è) o altres viricides autoritzats.
- Els treballadors cooperaran en les mesures preventives adoptades.

Amb caràcter general, no serà necessari l'ús de EPI addicionals als requerits per l'activitat laboral.

<u>Higiene personal</u>

Es reforçaran les següents mesures:

- Rentada freqüent de mans amb aigua i sabó o solució hidroalcohòlica.
- Cobrir-se el nas i la boca en tossir i esternudar amb un mocador d'un sol ús.
- Evitar tocar-se ulls, nas i boca.
- S'evitarà fumar, beure o menjar sense rentar-se prèviament les mans.
- Es facilitarà el material necessari perquè els treballadors reforcin les mesures d'higiene personal al llarg de la jornada podent lliurar-los, a aquest efecte, un kit personal (aigua i sabó o gel hidroalcohòlic, mocadors d'un sol ús, etc.).
- D'igual manera, es col·locaran en les zones comunes gels hidroalcohòlics i mocadors d'un sol ús, així com contenidors amb tapa i obertura de pedal per als mocadors usats.

Aquest document té en compte tota la informació publicada per les autoritats competents fins a la data de la seva elaboració.

Es destaquen els següents documents de referència:

- Procediment d'actuació per als serveis de prevenció de riscos laborals enfront de l'exposició al nou coronavirus (SARS -COV-2). Ministeri de Sanitat (https://www.mscbs.gob.es/en/profesionales/saludpublica/ccayes/alertasactual/ncov-china/home.htm)
- Procediment d'actuació enfront de casos d'infecció pel nou coronavirus (SARS -COV-2). Ministeri de Sanitat. (https://www.mscbs.gob.es/en/profesionales/saludpublica/ccayes/alertasactual/ncov-china/home.htm)
- Maneig domiciliari del COVID -19. Ministeri de Sanitat. (https://www.mscbs.gob.es/en/profesionales/saludpublica/ccayes/alertasactual/ncov-china/home.htm)
- Mesures higièniques per a la prevenció de contagis del COVID -19. Ministeri de Sanitat. (https://www.mscbs.gob.es/en/profesionales/saludpublica/ccayes/alertasactual/ncov-china/home.htm)
- Prevenció de riscos laborals vs. COVID -19 - Compendi no exhaustiu de fonts d'informació -. Institut Nacional de Seguretat i Salut en el Treball (INSST). (https://www.insst.es/)

Barcelona, Març 2024

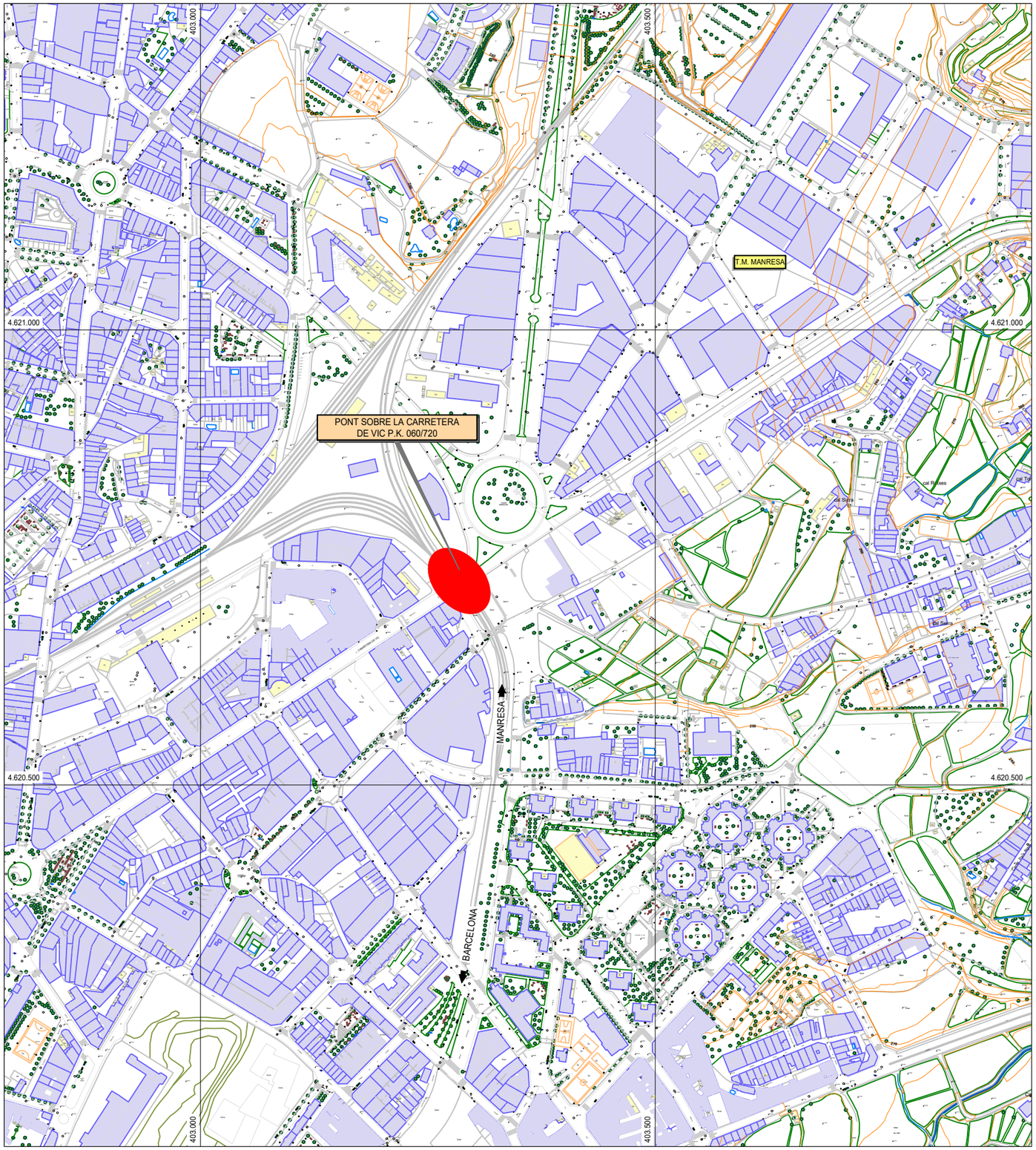
L'enginyer Autor del Projecte

Fco. Javier Jordán García

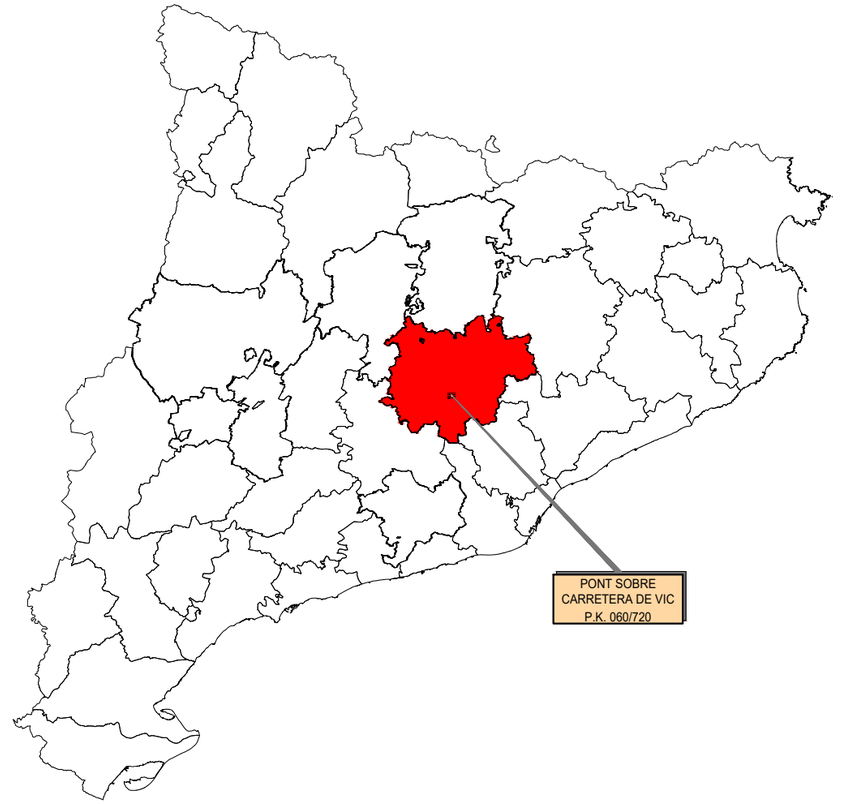
PEDELTA, S.L

# DOCUMENT NÚM. 2: PLÀNOLS

## CARTOGRAFIA
ESCALA 1/5000




## SITUACIÓ DEL PONT METÀLIC - MANRESA
ESCALA S/E




| CAPÍTOL | FULL | TÍTOL | NOM FITXER |
|---|---|---|---|
| A7 | | SEGURETAT I SALUT | |
| | 01 | INDEX I SITUACIÓ | A7F01 |
| | 02 | ITINERARI D´EVACUACIÓ | A7F02 |
| | 03 | IMPLANTACIÓ I SERVEIS | A7F03 |
| | 04 | PLATAFORMES I ESCALES | A7F04 |
| | 05 | EQUIPS DE PROTECCIÓ INDIVIDUAL (I) | A7F05 |
| | 06 | EQUIPS DE PROTECCIÓ INDIVIDUAL (II) | A7F06 |
| | 07 | EQUIPS DE PROTECCIÓNS COL.LECTIVA. BASTDES | A7F07 |
| | 08 | EQUIPS DE PROTECCIÓ COL.LECTIVA DISTÀNCIES DE SEGURETAT | A7F08 |
| | 09 | EQUIPS DE PROTECCIÓ COL.LECTIVA. MEDIS AUXILIARS | A7F09 |
| | 10 | EQIPS DE PROTECCIÓ COL.LECTIVA.BALISSAMENT I BARANES | A7F10 |
| | 11 | EQUIPS DE PROTECCIÓ COL.LECTIVA . TOPALLS | A7F11 |
| | 12 | EQIPS DE PROTECCIÓ COL.LECTIVA. XARXES | A7F12 |
| | 13 | SOLDADURA | A7F13 |
| | 14 | SENYALITZACIÓ D´OBRA | A7F14 |
| | 15 | MÒDULS D´OBRA I SERVEIS | A7F15 |

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR
PEDELTA

AUTOR DEL PROJECTE
JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE
INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES
1/500
0 125 250 m
ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL
PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
INDEX I SITUACIÓ

DATA
GENER 2024

PLÀNOL NÚM.
A7

NOM FITXER
A7F01.dwg

FULL 01 DE 15

## CARTOGRAFIA
ESCALA 1/10000




| NÚM. | DADES | DISTÀNCIA DESDE ZONA D'ACTUACIÓ | TEMPS APROXIMAT |
|---|---|---|---|
| **HOSPITALS** | | | |
| 1 | Centre Hospitalari de Manresa - Fundació Althaia (Carrer del Flor de Lis, 33, 08242 Manresa, Barcelona) | 1,7Km | 5 min |
| 2 | Hospital Sant Andreu (Carrer del Remei de Dalt, 3, 08241 Manresa, Barcelona) | | |
| 3 | Urgencias Centre Hospitalari Althaia (Av. de les Bases de Manresa, 6, 08242 Manresa, Barcelona) | 1,3 Km | 4min |
| **Centre d'atenció primària (CAP)** | | | |
| 4 | CAP Centre d'Atenció Primària les Bases (Carrer de la Creu Guixera, 51, 08243 Manresa, Barcelona) | 1,1 Km | 3min |
| 5 | CAP Sant Andreu (Carrer del Remei de Dalt, 8, 08241 Manresa, Barcelona) | 1,3 Km | 5min |
| 6 | Centre d'Atenció Primària Bages (Carrer de Soler i March, 6, 08242 Manresa, Barcelona) | 1,2 Km | 4 min |
| 7 | CAP Sagrada Família (Carrer de Sant Cristòfol, 34, 08243 Manresa, Barcelona) | 1,3 Km | 3min |
| **AMBULÀNCIES** | | | |
| 8 | Ambulancias Servimedic (Ctra. de Vic, 08241 Manresa, Barcelona) | 800 m | 3 min |
| **BOMBERS** | | | |
| 9 | Parc de Bombers de Manresa (Ctra. de Vic, 0, Km 3 1, 08241 Manresa, Barcelona) | 3,5 Km | 5 min |
| **POLICIA I MOSSOS D'ESQUADRA** | | | |
| 10 | Policia Local de Manresa (Carrer del Bruc, 33, 08241 Manresa, Barcelona) | 3,1 Km | 8 min |
| 11 | Comissaria de la Policia Nacional – Manresa (Carrer de Soler i March, 5, 08242 Manresa, Barcelona) | 1,2 Km | 4 min |
| 12 | Mossos d'Esquadra Manresa (Avinguda dels Països Catalans, 169, 171, 08243 Manresa, Barcelona) | 1,7 Km | 3 min |

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR
PEDELTA

AUTOR DEL PROJECTE
JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE
INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES
1/10000
ORIGINALS
0 1250 2500
GRÀFIQUES

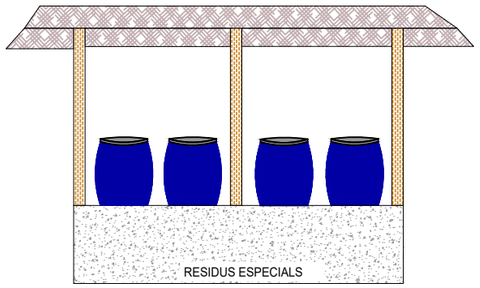
NOM DEL PLÀNOL
PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
ITINERARI D'EVACUACIÓ

DATA
GENER 2024

PLÀNOL NÚM.
A7

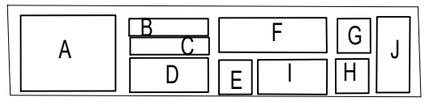
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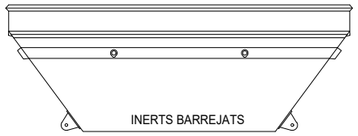
FULL 02 DE 15



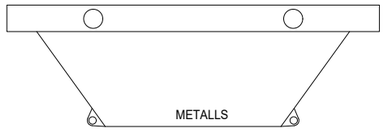

D

UBICACIÓ CONTENIDORS

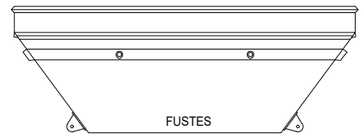


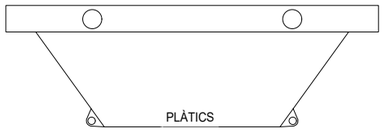

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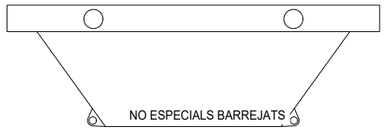

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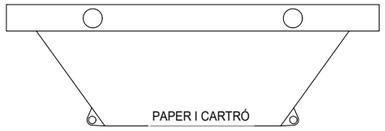

F




G




I




J

PLANTA ACTUAL

ESCALA S/E




ZONA D'ACOPI

A. ZONA D'ACOPI DE MATERIAL PETRIS
B. ZONA D'ACOPI DE METALLS A REUTILITZAR
C. ZONA D'ACOPI DE FUSTES A REUTILITZAR
D. ZONA HABILITADA DE RESIDUS ESPECIALS
E. CONTENIDOR D'INERTS BARREJATS
F. CONTENIDOR DE FUSTA
G. CONTENIDOR DE PLÀSTICS
H. CONTENIDOR DE METALLS
I. CONTENIDOR DE NO ESPECIALS BARREJATS
J. CONTENIDOR DE PAPER I CARTRÓ

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\A7F03.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

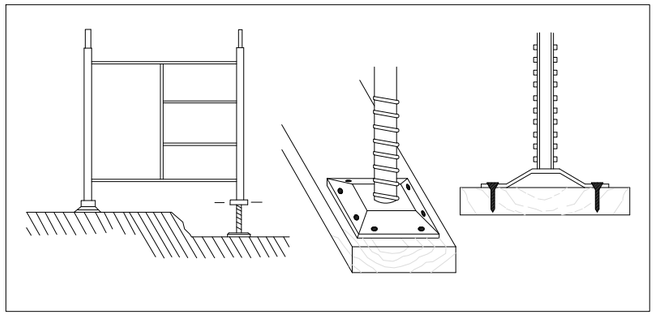
NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
IMPLANTACIÓ I SERVEIS

DATA: GENER 2024

PLÀNOL NÚM.: A7

NOM FITXER: A7F03.dwg

FULL 03 DE 15



BE

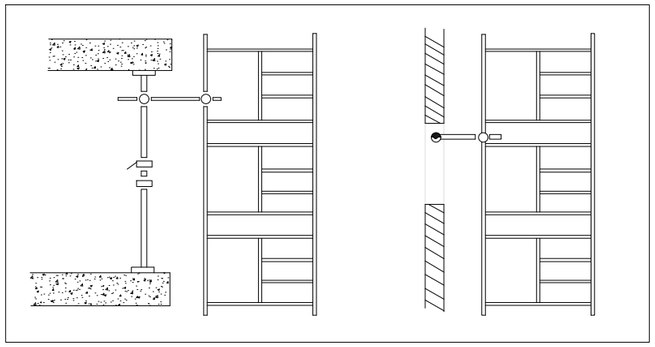
-ELS MÒDULS DE BASE RECOLZARAN SOBRE RECOLZAMENTS AUXILIARS A BASE DE TAULONS.

-COL.LOCAR PARAMENTS DE NIVELLACIÓ.

-CLAVAR LES PLAQUES DE RECOLZAMENT DELS USILLOS ALS RECOLZAMENTS AUXILIARS.

-NO SE COMENÇARÀ EL NIVELL SUPERIOR SENSE QUE L'INFERIOR ESTIGUI DOTAT DE TOTS ELS ELEMENTS D'ESTABILITAT.

-NO QUEDAR-SE SOTA LA BASTIDA MENTRE DURI EL MUNTATGE.

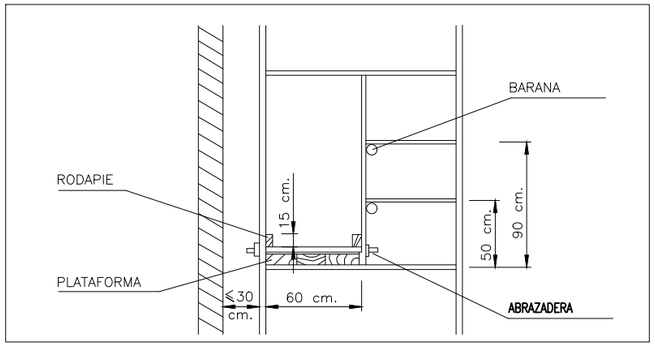


BE

-LES BASTIDES S'ARRIOSTRARAN AL PARAMENT ADJUNT AL QUE S'ESTIGUIN EXECUTANT

-TOTES LES UNIONS ENTRE PECES ES REALITZARAN COMPLINT LES NORMES DE MUNTATGE DEL MODEL TRIAT.

-ES REVISARAN TOTS ELS CARGOLS DEL TRAM EXECUTAT OBSERVANT QUE QUEDEN BEN APRETATS ABANS DE CONTINUAR AMB ELS SUPERIORS.

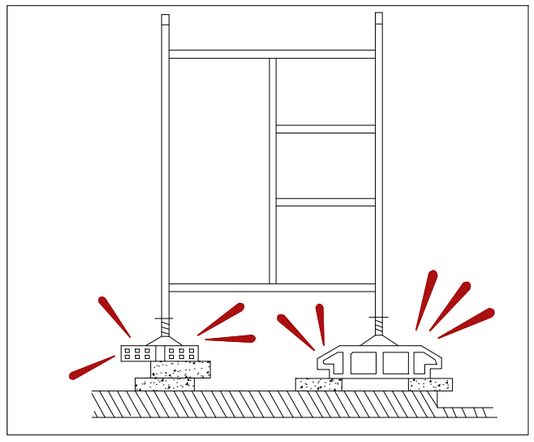



BE

-PLATAFORMA: AMPLE MÍNIM 60 cm.
-RODAPEU: ALTURA MÍNIMA 15 cm.
-BARANA:

PASAMANS: ALÇADA MÍNIMA 90 cm.
LLISTÓ INTERMIG: 50 cm.

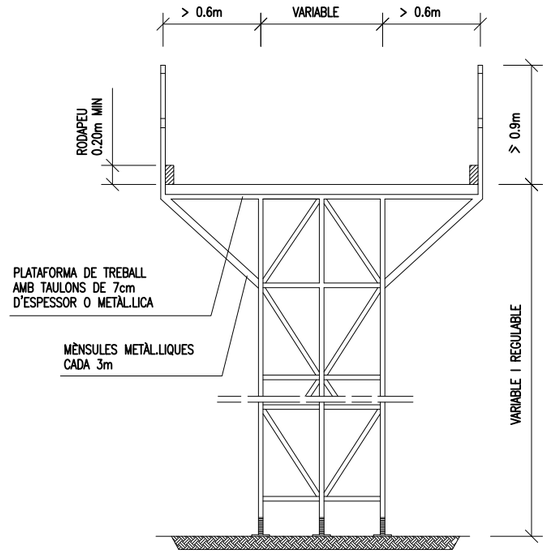
-DISTÀNCIA AL PARAMENT IGUAL O MENOR A 30 cm. MUNTAR BARANA EN EL COSTAT DE LA FAÇANA SI LA DISTÀNCIA ÉS MAJOR.



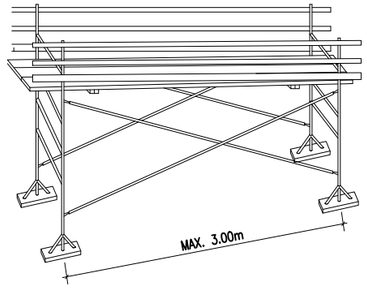
¡INCORRECTE!

PROHIBICIONS:

-NO RECOLZAR LA BASTIDA EN SUPLEMENTS COM MAHONS, BIDONS, ETC.
-NO FORMAR PLATAFORMES DE TREBALL EN CORONACIONS DE BASTIDES SENSE BARANES NI RODAPEU.
-DURANT RATXES DE FORTS VENTS NO QUEDAR-SE A LA BASTIDA.




BASTIDA METÀL.LICA

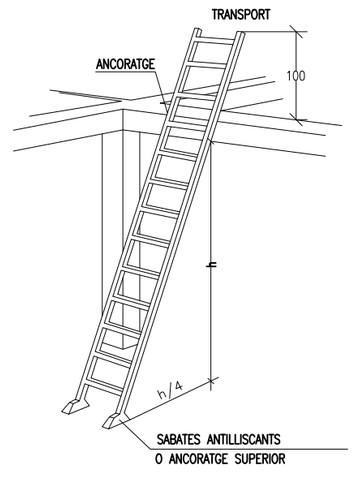



PLATAFORMES DE TREBALL METÀL.LIQUES

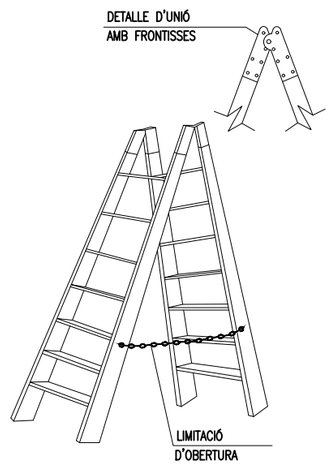
PLATAFORMA ELEVADORA

## ESCALES DE MA

-ESTARAN PROVISTES DE SABATES O ALTRES SISTEMES PER A EVITAR LLISCAMENTS.
-NOMÉS SUPERARAN ALÇADES DE FINS A 5 m. (FINS A 7 m. AMB REFORÇOS ESPECIALS EN LA SEVA ZONA CENTRAL).
-PUJAR I BAIXAR DE FRONT A L'ESCALA.
-NO PORTAR CÀRREGUES SUPERIORS A 25 Kg.
-COL.LOCAR L'ESCALA AMB LA INCLINACIÓ ADEQUADA.
-SUPERARÀ EN 1 m. ELS PUNTS SUPERIORS DE RECOLZAMENT.




ESCALA METÀL.LICA



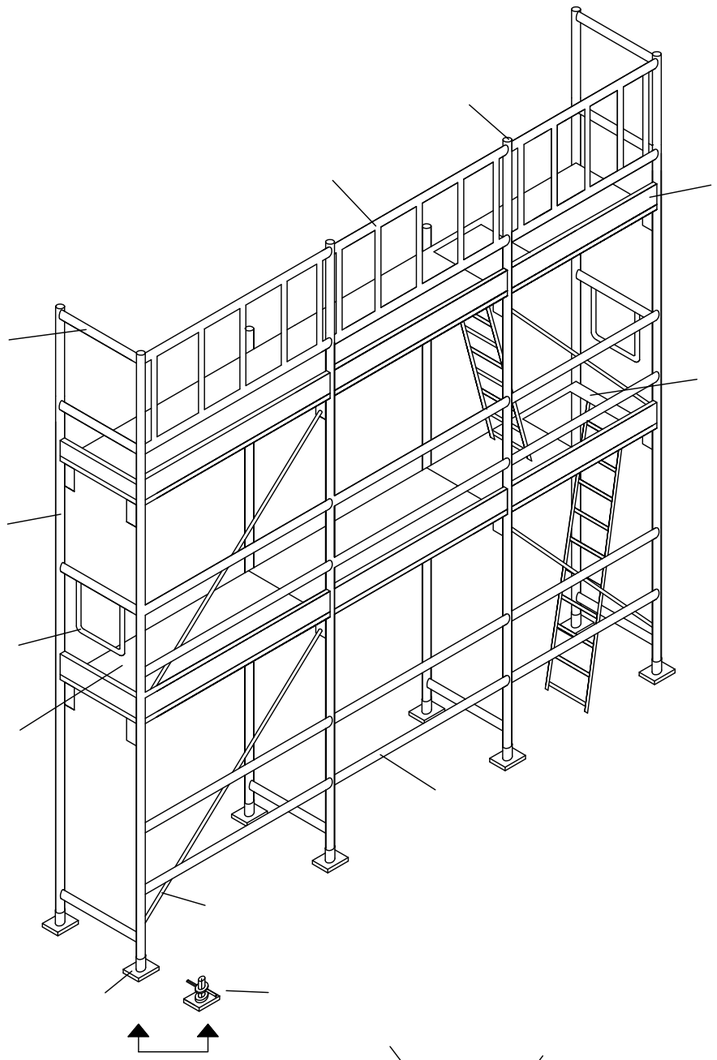

ESCALA DE TISORA

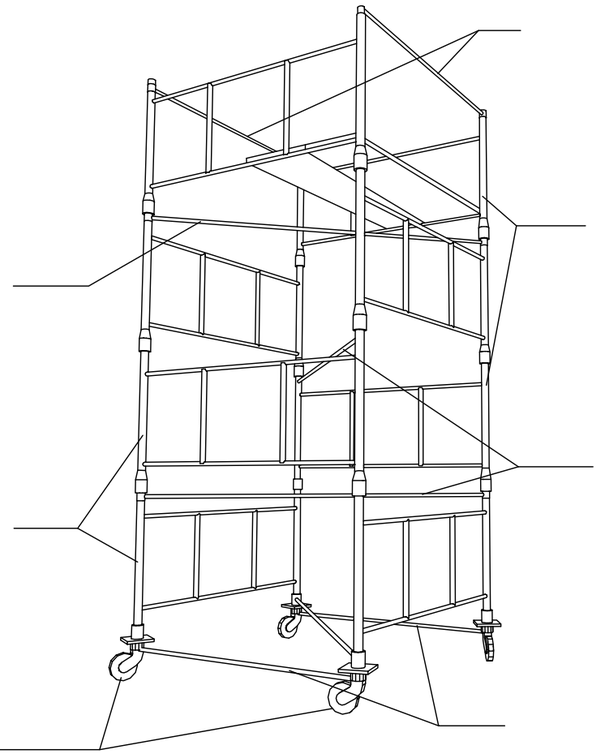
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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

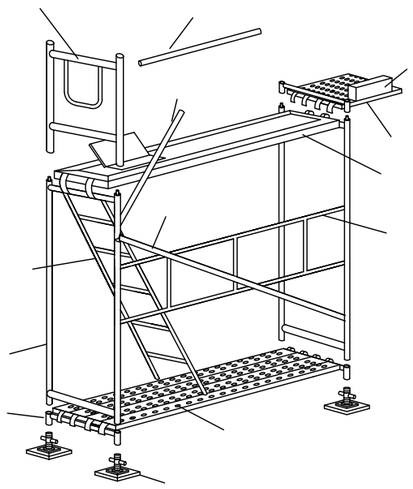
FGC
CONSULTOR PEDELTA
AUTOR DEL PROJECTE JAVIER JORDÁN GARCÍA
TÍTOL DEL PROJECTE INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA
CLAU PROJECTE
ESCALES ORIGINALS GRÀFIQUES
NOM DEL PLÀNOL PONT SOBRE LA CARRETERA DE VIC P.K. 060/720 SEGURETAT I SALUT IMPLANTACIÓ I SERVEIS
DATA GENER 2024
PLÀNOL NÚM. A7
NOM FITXER A7F04.dwg
FULL 04 DE 15

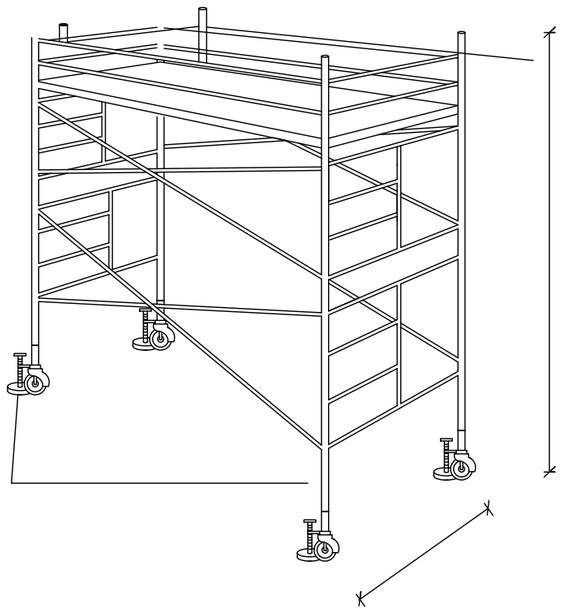
# ALÇADES MÀXIMES I CRREGUES' ADMISIBLES EN TORRES O CASTELLETS





| | |
|---|---|
| 2400 Kg. | Per a castellets o torres fixes (inclòs el seu pes propi). |
| 2000 Kg. | Per a castellets o torres mòbils sobre rodes de ferro (inclòs el seu pes propi). |
| 1000 Kg. | Per a castellets o torres mòbils sobre rodes de goma (inclòs el seu pes propi). |
| ALÇADES MÀXIMES DE TREBALL | |
| 4 Veces | Per a castellets o torres fixes (inclòs el seu pes propi). |
| 3 Veces | Per a castellets o torres mòbils sobre rodes de ferro (inclòs el seu pes propi). |





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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
EQUIPS DE PROTECCIÓ COL.LECTIVA
BASTIDA

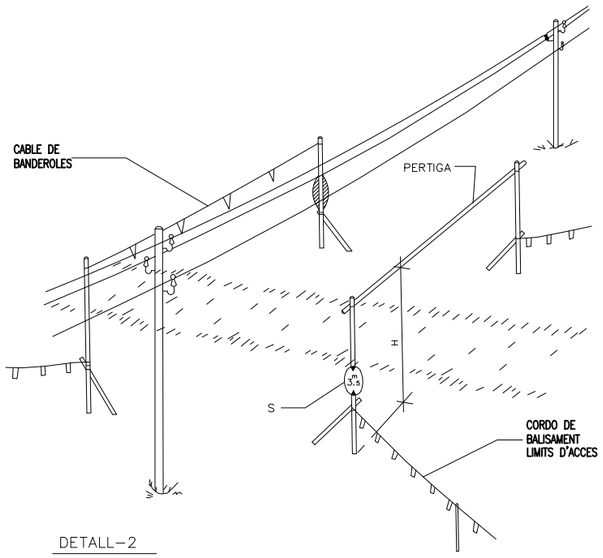
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PLÀNOL NÚM.: A707

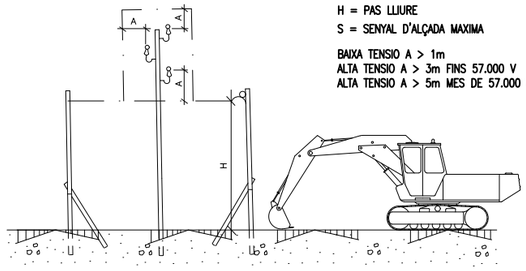
NOM FITXER: A7F07.dwg

FULL 07 DE 15

## BANDES DE BALISAMENT DE LINIES ELECTRIQUES AEREAS



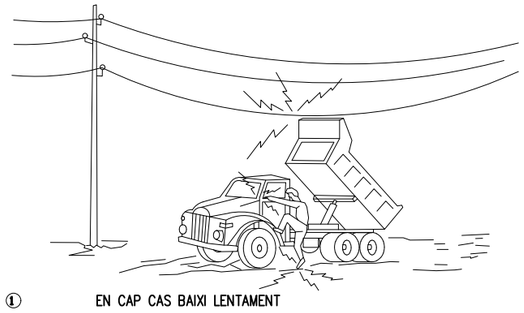

DETALL-2



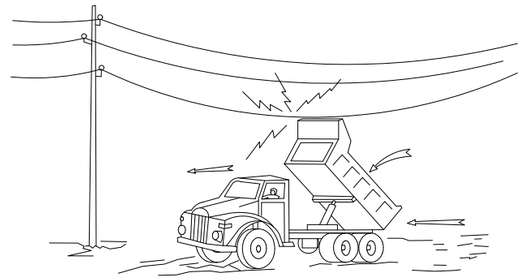

A = DISTANCIA MAXIMA DE SEGURETAT
H = PAS LLIURE
S = SENYAL D'ALÇADA MAXIMA

BAIXA TENSIO A > 1m
ALTA TENSIO A > 3m FINS 57.000 V
ALTA TENSIO A > 5m MES DE 57.000 V

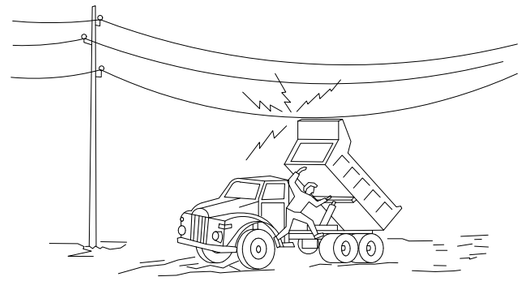
PROTECCIONS COL.LECTIVES
BANDES DE BALISAMENT I PROTECCIÓ EN RASES



① EN CAP CAS BAIXI LENTAMENT

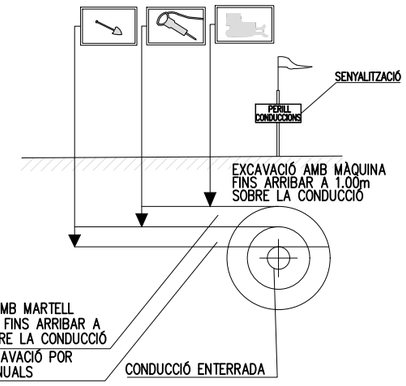


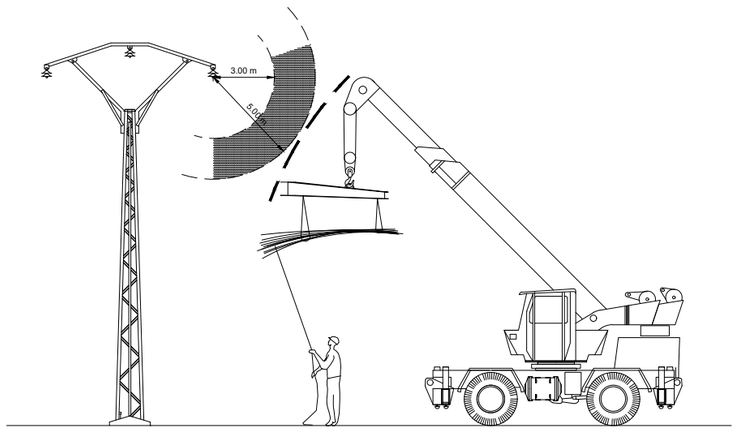
② SI CONTACTA, NO ABANDONI LA CABINA, INTENTI EN PRIMER LLOC BAIXAR-HO I allunyar-se

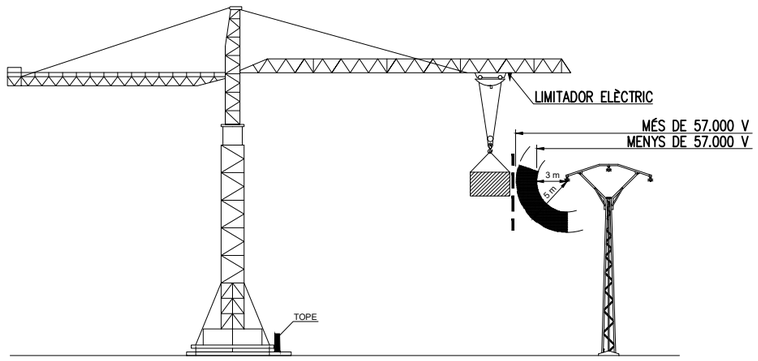


③ SI NO CONSIGUEIX QUE BAIXI, SALTI DEL CAMIÓ EL MÉS LLUNY POSSIBLE

## DISTÀNCIES DE SEGURETAT EN TREBALLS SOBRE INSTAL.LACIONS SUBTERRÀNIES




02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJA\ESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\A7F08.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
EQUIPS DE PROTECCIÓ COL.LECTIVA
DISTÀNCIES DE SEGURETAT

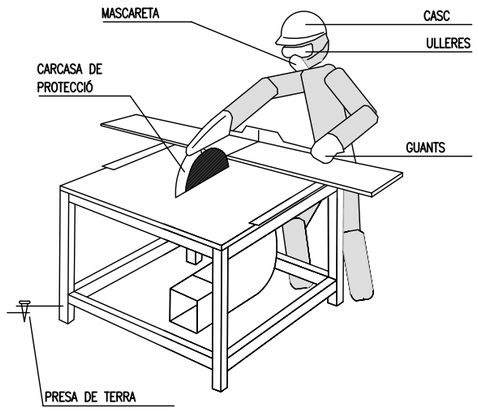
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PLÀNOL NÚM.: A708

NOM FITXER: A7F08.dwg

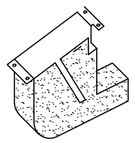
FULL 08 DE 15

## SERRA CIRCULAR

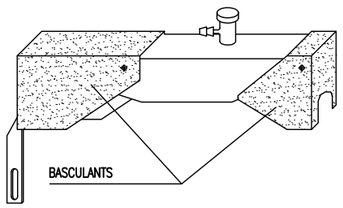


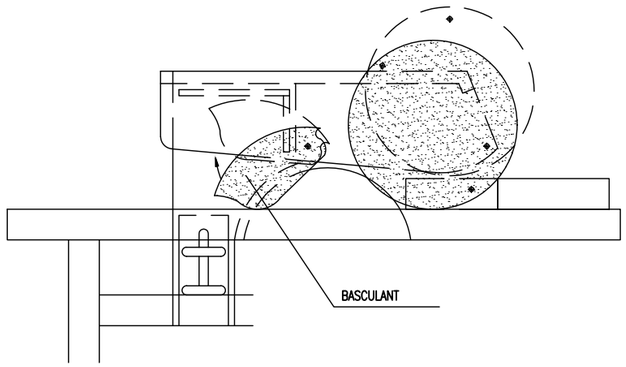

- HAURAN D'UTILITZAR-SE EMPENYEDORS ADEQUATS EN ELS TREBALLS EN QUE LA MIDA DE LES PECES A TALLAR COMPROMETI LA SEGURETAT DE LES MANS DE L'OPERARI.
- AMB ELS DISCS DE CARBURUM O WIDIA HAURAN D'EXTREMAR-SE LES PRECAUCIONS EN QUANT A L'EQUILIBRAT I PRESIÓ DE LA PEÇA, JA QUE SÓN FRÀGILS I TENEN GRAN FACILITAT PER A LA ROTURA.
- LA SERRA CIRCULAR ESTARÀ PROTEGIDA EN FRONT A RISCOS ELÈCTRICS AMB INTERRUPTOR DIFERENCIAL ASSOCIAT A PRESA DE TERRA.
- L'UTILIZACIÓ DE LA SERRA ES FARÀ NOMÉS PER EL PERSONAL AUTORITZAT.
- S'UTILITZARAN ELS SEGÜENTS EQUIPS DE PROTECCIÓ INDIVIDUAL: CASC, ULLERES DE SEGURETAT, MASCARETA I GUANTS.
- EL DISC PER LA SEVA PART POSTERIOR HAURÀ D'ESTAR TOTALMENT PROTEGIT.

## RESGUARD INFERIOR

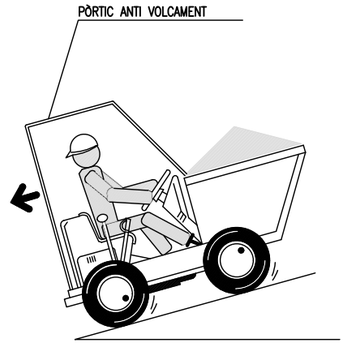


## CARCASES PROTECTORAS



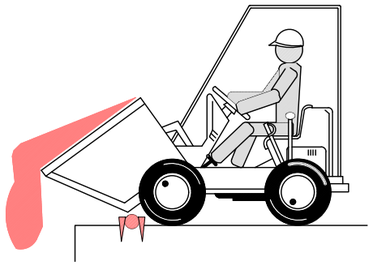

## DUMPER



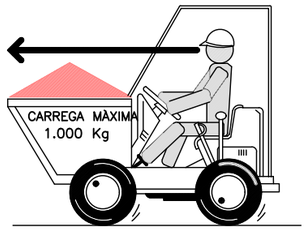

- AMB EL VEHICLE CARREGAT LES RAMPES HAURAN DE BAIXAR-SE MARXA ENRRERA.




- NO S'HA DE CIRCULAR A MÉS DE 20 Km/h. LA CONDUCCIÓ ES FARÀ DE FORMA PRUDENT.



- COL.LOCAR TOPE DE FI DE RECORREGUT PER A ABOCAR MATERIALS.




- EN CAP CAS ES SUPERARÀ LA CÀRREGA MÀXIMA. ES DISPOSARÀ LA CÀRREGA DE MANERA QUE GARANTITZI L'ESTABILITAT DEL DUMPER.
- LA CÀRREGA MAI DIFICULTARÀ LA VISIBILITAT DEL CONDUCTOR.

- LA MANIPULACIÓ DEL DUMPER NOMÉS LA REALITZARÀ PERSONAL AUTORITZAT.
- EL CONDUCTOR HAURÀ D'UTILITZAR CINTURÓ ANTIVIBRATORI.
- PER A CIRCULAR PER VIES PÚBLIQUES ESTARAN PROVISTOS DE LLUMS I DISPOSITIUS D'AVÍS ACÚSTIC.
- ESTÀ ABSOLUTAMENT PROHIBIT EL TRANSPORT DE PERSONAL.

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AESP23B117PMAN-FGC\07BIM\01PH1\04DRW\A7F09.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

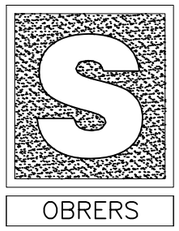
NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
EQUIPS DE PROTECCIÓ COL.LECTIVA
MEDIS AUXILIARS

DATA: GENER 2024

PLÀNOL NÚM.: A709

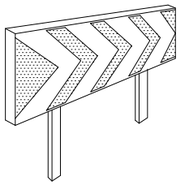
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FULL 09 DE 15

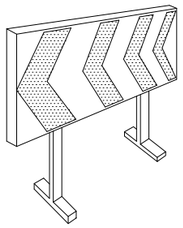



– PORTARAN LA LLEGENDA INDICADORA DE:

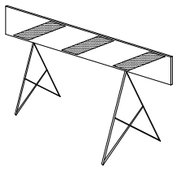
*OBRERS EN VIA*



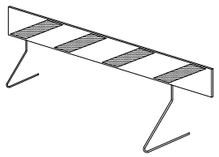
PANELLES DIRECCIONALS
PER A REVOLT



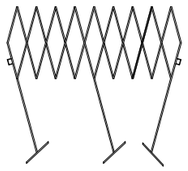
PANELLES DIRECCIONALS
PER A OBRES



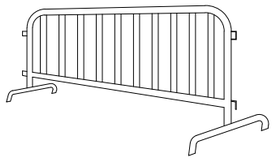
TANCA D'OBRES MODEL 2



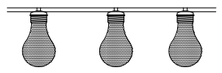
TANCA D'OBRES MODEL 1



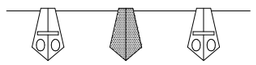
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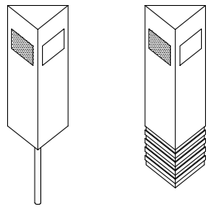
TANCA DE CONTENCIÓ DE VIANANTS



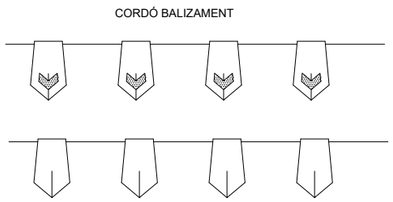
PORTABOMBETES DE PLÀSTIC



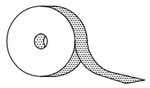
CORDÓ DE BALISA
NORMAL I REFLECTANT



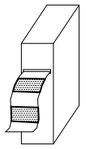
FIX CAPTADOR DE FOCUS PER A SENYALITZACIÓ
LATERAL D'AUTOPISTA EN POLIETILÈ

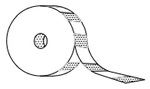


CORDÓ BALIZAMENT



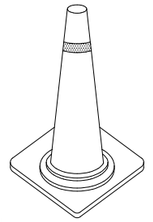
CINTA BALIZAMENT REFLECTOR





CINTA BALIZAMENT PLÀSTC

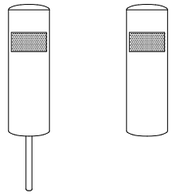




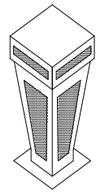
CON



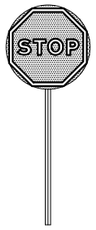
LLANTIA AUTONOMA FIXA
INTERMITENT

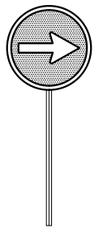


FIX DE PVC

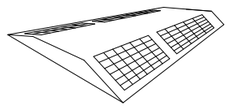


FIX LUMINOS



PALETES MANUALS
DE SENYALITZACIÓ



CAPTADOR DE FOCUS HORIZONTAL
"ULLS DE GAT"

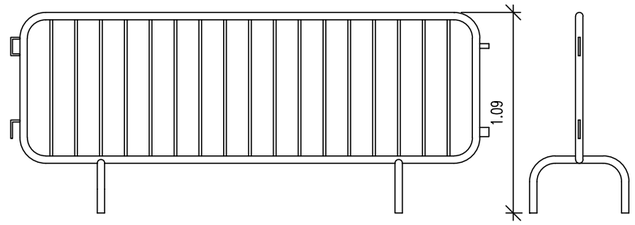




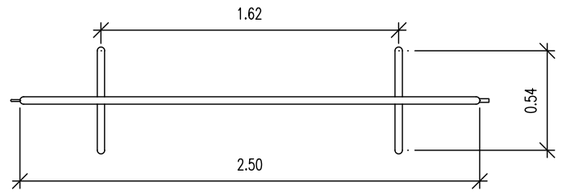
CLAUS DE DESACCELERACIÓ

PROTECCIONES COLECTIVAS
BALIZAMIENTO

VALLA MÓVIL ENCADENADA
TIPO AYUNTAMIENTO

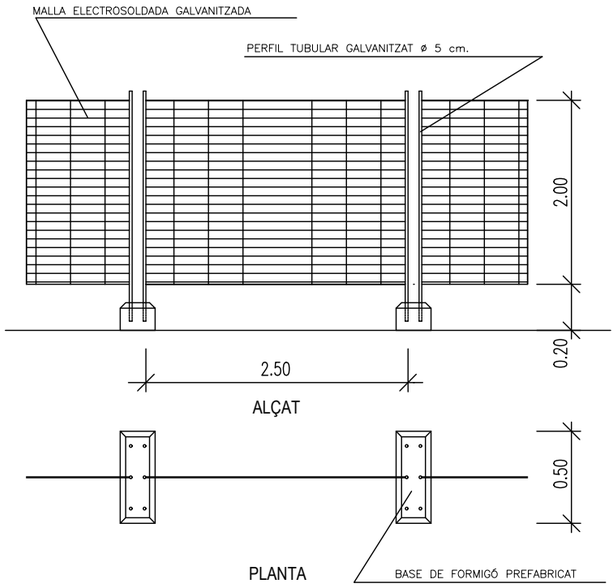



ALZADO PERFIL




PLANTA

TANCAT D' OBRA:
AMB MALLA ELECTROSOLDADA GALVANITZADA

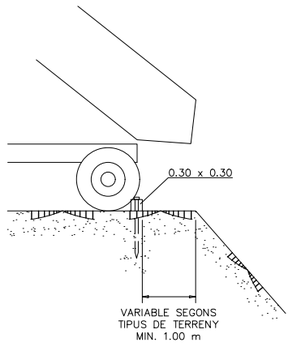


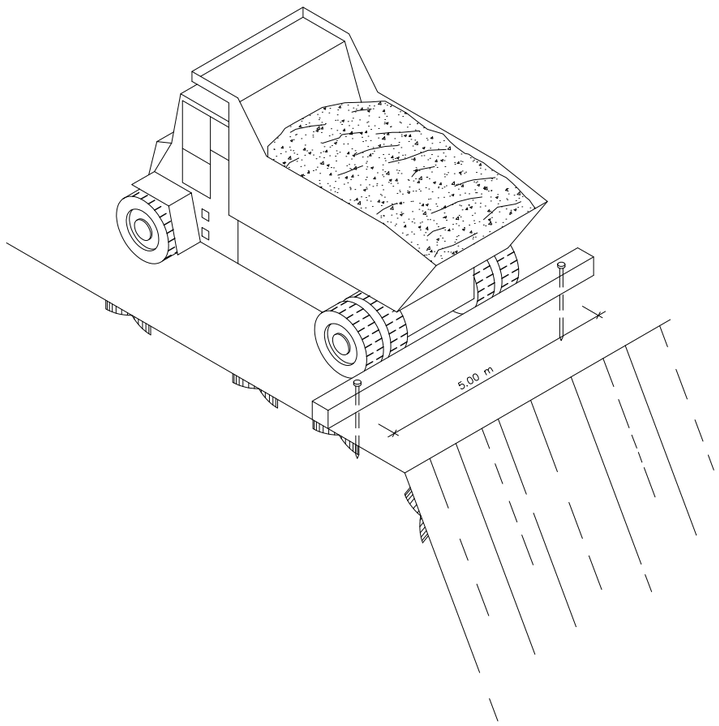

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

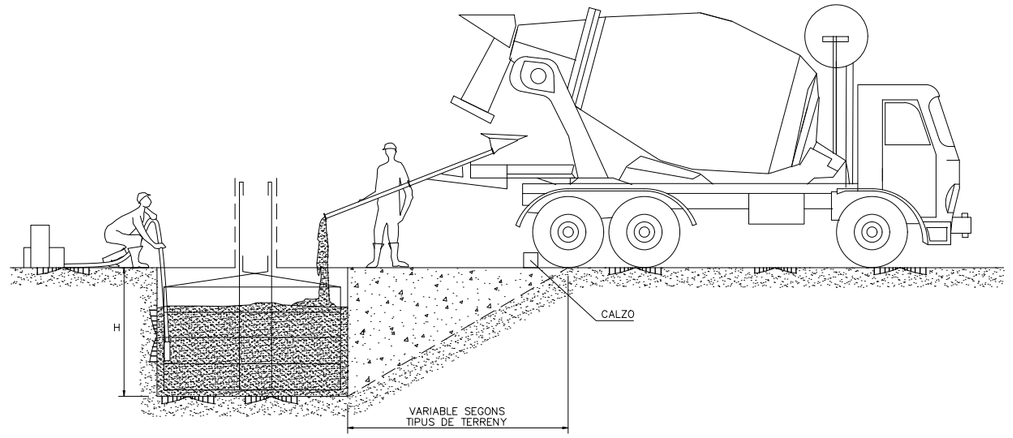
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FGC | CONSULTOR<br>EPEDELTA | AUTOR DEL PROJECTE<br>JAVIER JORDÁN GARCÍA | TÍTOL DEL PROJECTE<br>INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA | CLAU PROJECTE | ESCALES<br>S/E<br>ORIGINALS GRÀFIQUES | NOM DEL PLÀNOL<br>PONT SOBRE LA CARRETERA DE VIC P.K. 060/720<br>SEGURETAT I SALUT<br>EQUIPS DE PROTECCIÓ COL.LECTIVA<br>BALISSAMENT I BARANES | DATA<br>GENER 2024<br>NOM FITXER<br>A7F10.dwg | PLÀNOL NÚM.<br>A710<br>FULL 10 DE 15 |

## TOPALL PER A VEHICLES AUTOMOVILS

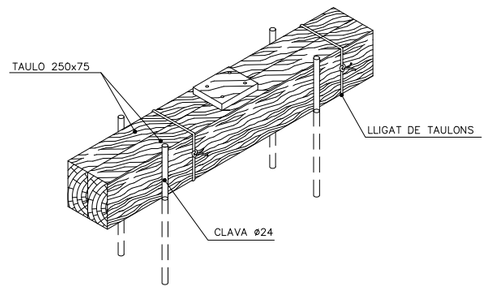



## HORMIGONAT PER ABOCAMENT DIRECTE EN RASES O FONAMENTS




## DETALL DE LA FALCA




02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH\104DRW\A7F11.DWG

| ELAB. | REV. | APR. |
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| AVB | IV | JJG |

FGC

CONSULTOR: EPEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
EQUIPS DE PROTECCIÓ COL.LECTIVA
TOPALLS

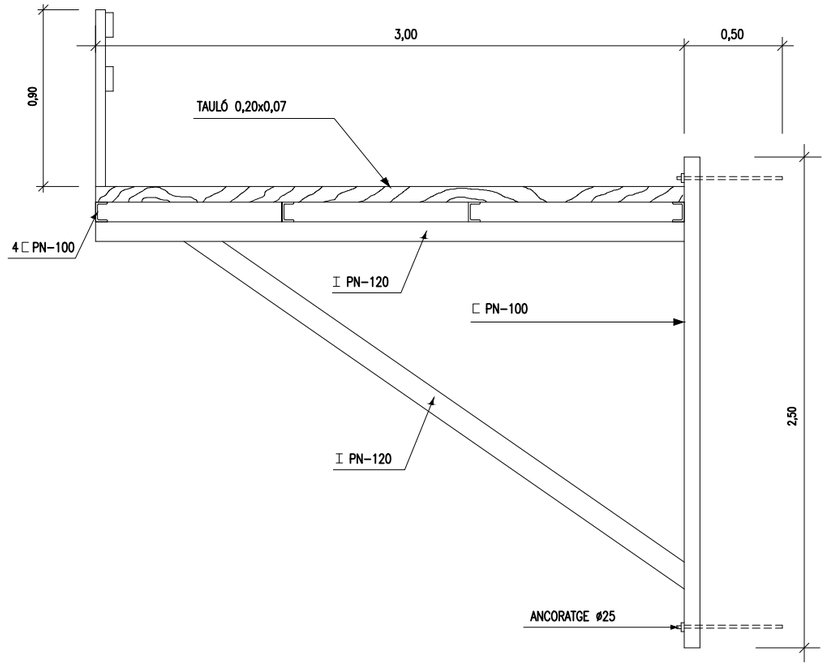
DATA: GENER 2024

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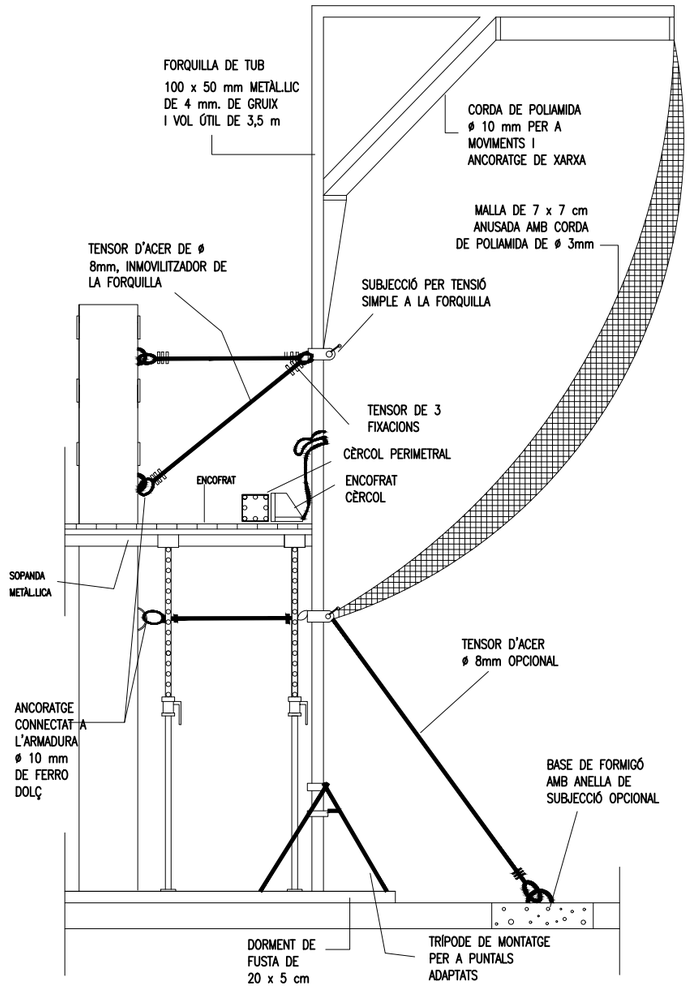
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FULL 11 DE 15

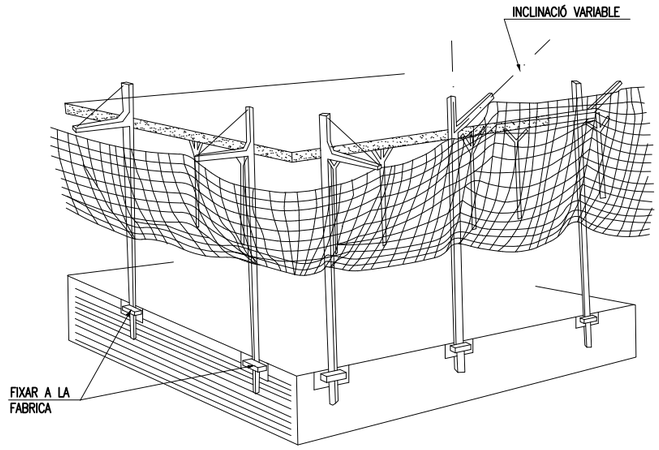
## PLATAFORMA DE TREBALL




## DETALL 3



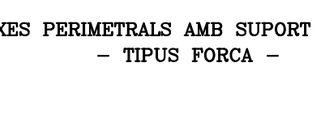

## XARXES PERIMETRALS AMB SUPORT METÀL-LIC
## – TIPUS FORCA –



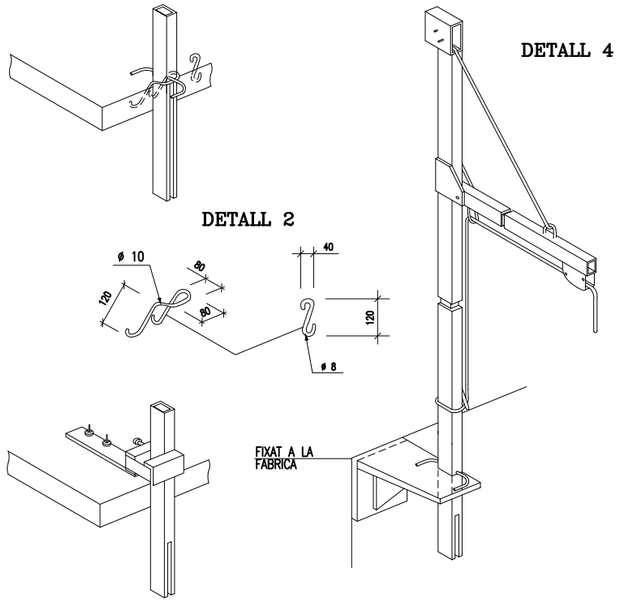

## DETALL 1



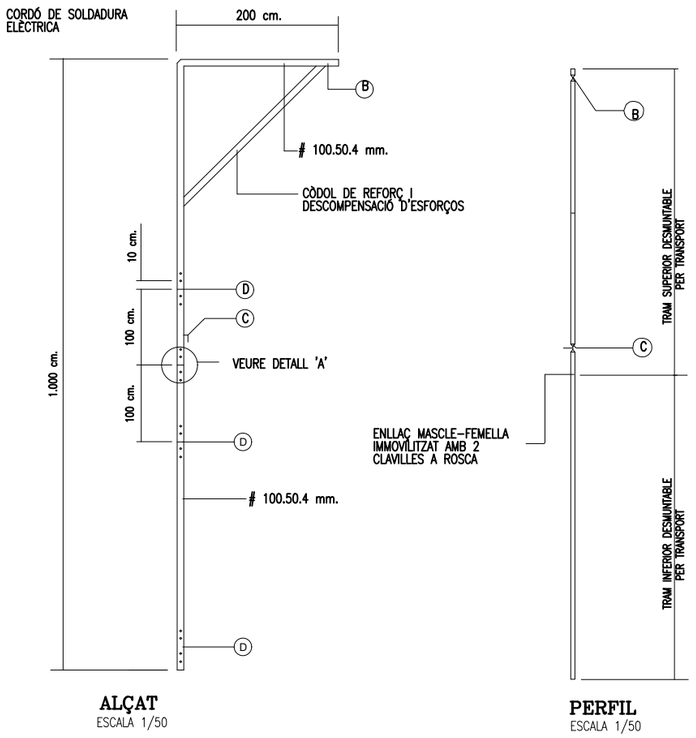
## DETALL 2




## DETALL 4




## PROTECCIONS COL–LECTIVES
## XARXES PERIMETRALS TIPUS FORCA




**ALÇAT**
ESCALA 1/50

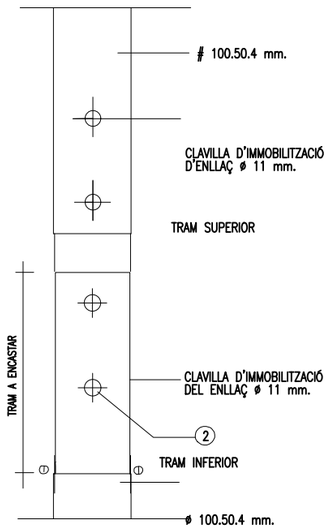
**PERFIL**
ESCALA 1/50

## DETALL DE SOPORT TIPUS FORCA
ESCALA 1/50 – 1/5

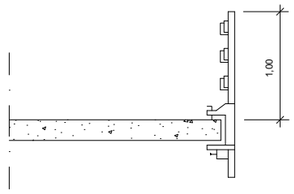
NOTES.–

- LA FORCA ES FABRICARÀ EN TUB RECTANGULAR DE 100.50.4 mm. HAN DE TAPAR–SE AMB XAPA SOLDADA EN AMBDUES EXTREMS PER EVITAR LA CORROSIÓ INTERNA.
- 5 ORIFICIS DE ø 11 mm PER A ENHEBRAR EL PASADOR D'INMOVILITZACIÓ DE LA FORCA EN LA OMEGA DEL CANTELL DEL FORJAT. ELS ORIFICIS PERMETEN L'ADEQUACIÓ FORCA–ALÇADA APROXIMADA ENTRE FORJATS; DISTEN A EIXOS ENTRE ORIFICIS CONTIGUS 10 cm.
- LA FORCA S'HA DE PINTAR AMB ANTICORROSSIU I REMATAR EN COLOR VIU (groc, taronja o bermel)
- B GANXO FABRICAT EN RODÓ DE FERRO DOLÇ DE ø mm. PER ENHEBRAR EN ELL LA CORDA DE SUBSTENTACIÓ DE LES XARXES.
- C GANXO FABRICAT EN RODÓ DE FERRO DOLÇ DE ø 10 mm. PER EFECTUAR EL ENNIUSSAT DE LA CORDA DE SUBSTENTACIÓ DE LA XARXA.
- 1 LLOCS A SOLDAR
- 2 NO OBLIDAR PROTEGIR AMB ANTICORROSSIÓ ELS TREPANTS.

## DETALL D'ENLLAÇ "A"
ESCALA 1/5




## BARANA PER LLOSES Y TAULONS




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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

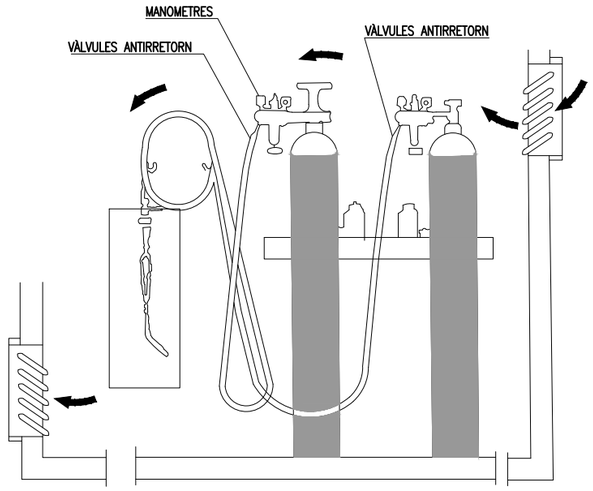
NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
EQUIPS DE PROTECCIÓ COL.LECTIVA
XARXES

DATA: GENER 2024

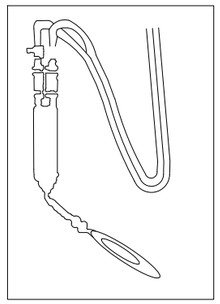
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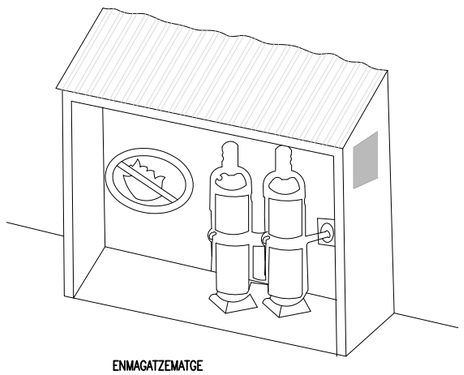



INSTAL.LACIÓ DE BOMBONES DE OXÍGEN I ACETILÉ



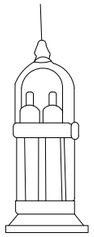
DETALL "A"

DOBLE VÀLVULA ANTIRRETORN

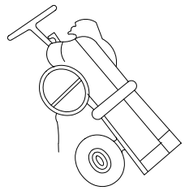


ENMAGATZEMATGE

VERTICAL



HORITZONTAL



TRANSPORT

OBSERVACIONS

- NO S'EMPRARAN GRASSES EN LA MANIPULACIÓ DE LES AMPOLLES D'OXÍGEN.
- S'EMPRARAN SEMPRE EN POSICIÓ VERTICAL I SOLTES.
- ES REVISARÀ PERIODICAMENT L'ESTAT DELS EQUIPS, COMPROVANT LA POSSIBLE EXISTÈNCIA DE FUITES EN EL GRUP D'OXITALL I EL ESTAT DEL CABLE D'ALIMENTACIÓ EN LA SOLDADURA ELÈCTRICA.

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: EPEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720 — SEGURETAT I SALUT — SOLDADURA

DATA: GENER 2024

PLÀNOL NÚM.: A713

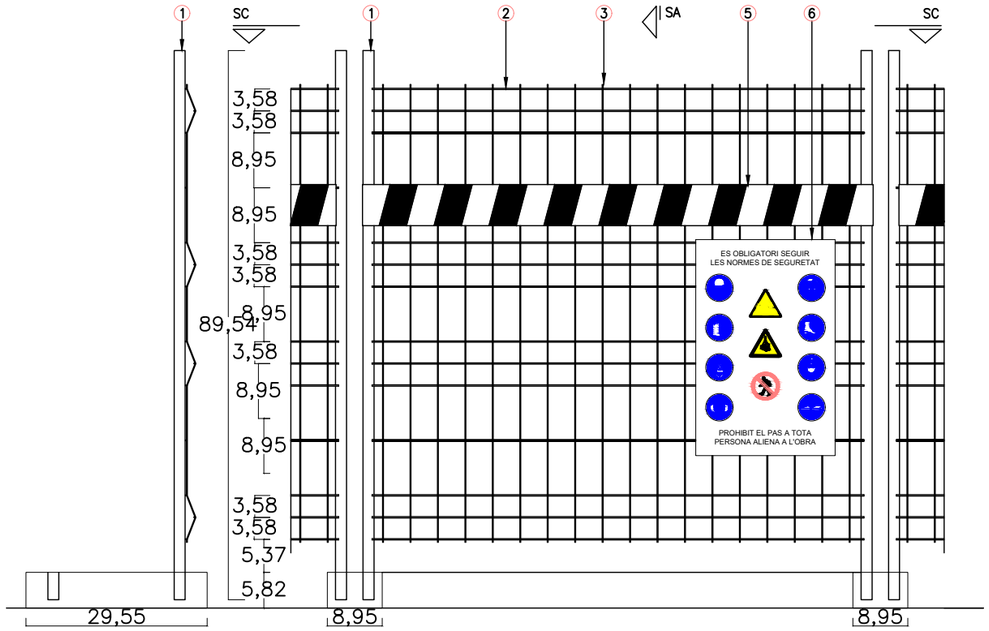
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FULL 13 DE 15

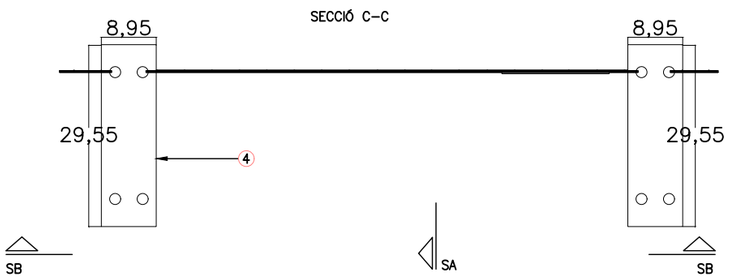
# TANCA PERIMETRAL
# REIXA METÀL.LICA, SENYALITZACIÓ D'ENTRADA A L'OBRA

SECCIÓ A–A

SECCIÓ B–B



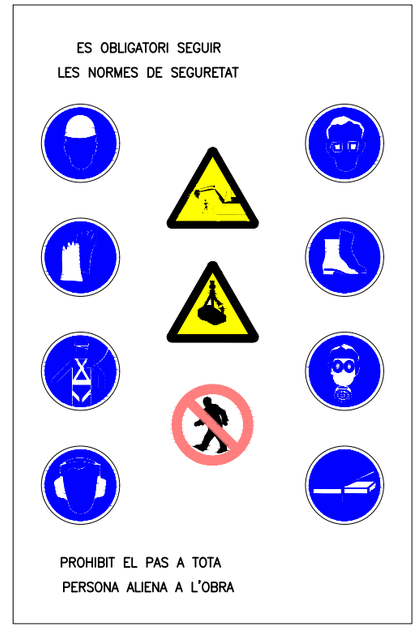

SECCIÓ C–C




| | |
|---|---|
| ① | ø70.4 GALVANITZAT EN CALENT |
| ② | ø12 GALVANITZAT EN CALENT SOLDAT AL TUB |
| ③ | ø6 GALVANITZAT EN CALENT |
| ④ | BASE DE FORMIGÓ |
| ⑤ | CINTA A FRANGES VERMELLES I BLANQUES |
| ⑥ | PANELL DE SENYALITZACIÓ D'ENTRADA A L'OBRA |

# SEÑALITZACIÓ EN OBRES

| DISTÀNCIA MÀXIMA DE SEGURETAT MM<br>DIÀMETRE O COSTAT MAJOR | DISTÀNCIA MÀXIMA SEGONS LA FORMA M | | |
|---|---|---|---|
| | △ | ○ | □ |
| 1189 | 34.98 | 49.73 | 53.17 |
| 841 | 24.74 | 35.18 | 37.61 |
| 594 | 17.48 | 24.85 | 26.56 |
| 420 | 12.36 | 17.57 | 18.78 |
| 297 | 8.74 | 12.42 | 13.28 |
| 210 | 6.18 | 8.78 | 9.39 |
| 148 | 4.36 | 6.19 | 6.62 |
| 105 | 3.09 | 4.39 | 4.70 |




| DISTÀNCIA MÀXIMA DE SEGURETAT MM<br>DIÀMETRE O COSTAT MAJOR | DISTÀNCIA MÀXIMA SEGONS LA FORMA M | | |
|---|---|---|---|
| | △ | ○ | □ |
| 1189 | 34.98 | 49.73 | 53.17 |
| 841 | 24.74 | 35.18 | 37.61 |
| 594 | 17.48 | 24.85 | 26.56 |
| 420 | 12.36 | 17.57 | 18.78 |
| 297 | 8.74 | 12.42 | 13.28 |
| 210 | 6.18 | 8.78 | 9.39 |
| 148 | 4.36 | 6.19 | 6.62 |
| 105 | 3.09 | 4.39 | 4.70 |




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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
SENYALITZACIÓ D'OBRA

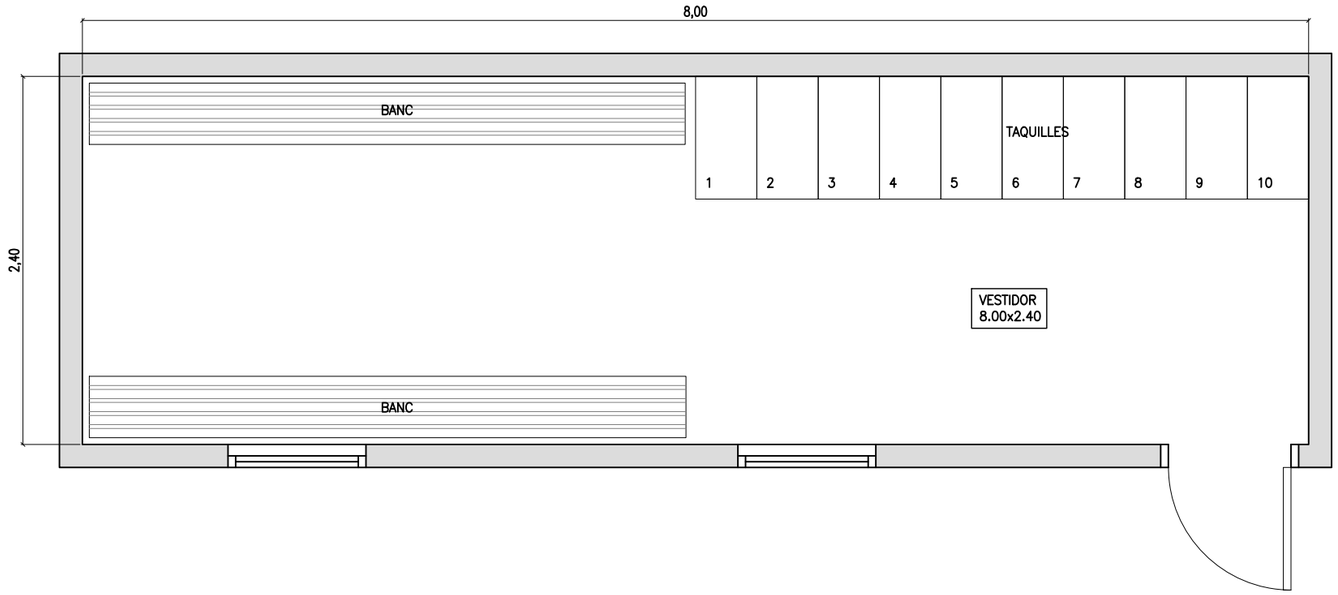
DATA: GENER 2024

NOM FITXER: A7F14.dwg

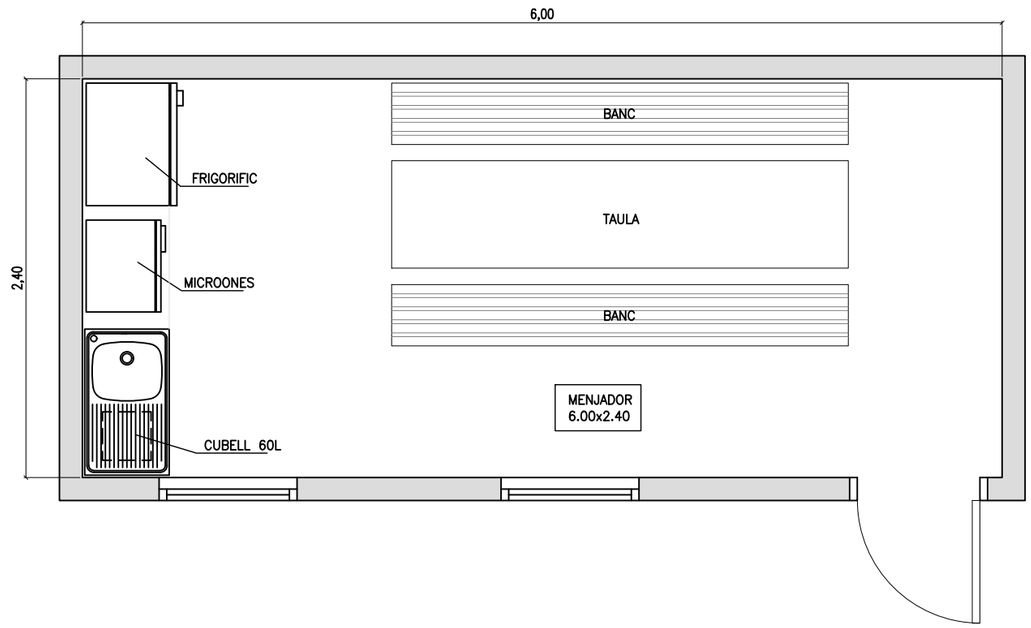
PLÀNOL NÚM.: A714

FULL 14 DE 15

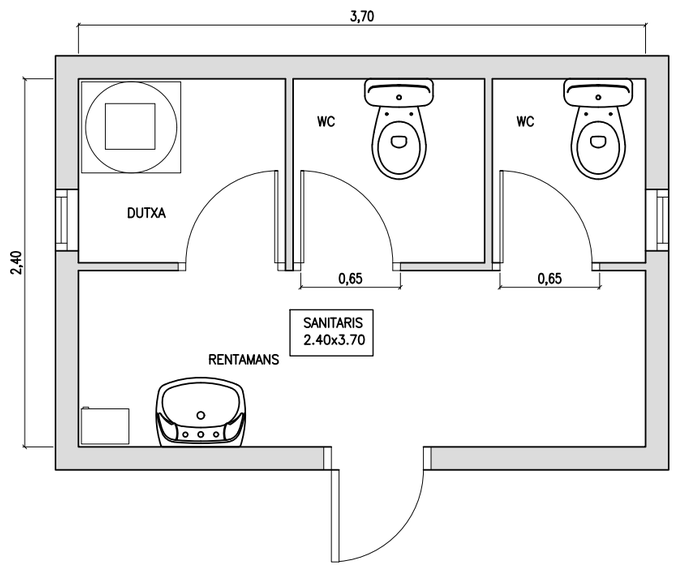
## PLANTA VESTIDOR (x1)
ESCALA 1/20




## PLANTA MENJADOR (x1)
ESCALA 1/20




## PLANTA SANITARIS (x1)
ESCALA 1/20




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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SEGURETAT I SALUT
MÒDULS D'OBRA I SERVEI

DATA: GENER 2024

PLÀNOL NÚM.: A715

NOM FITXER: A7F15.dwg

FULL 15 DE 15

# DOCUMENT NÚM. 3: PLEC DE CONDICIONS

**PLEC**

## 1. DEFINICIÓ I ABAST DEL PLEC

### 1.1. Identificació de les obres

L'objecte del present projecte constructiu és la definició i valoració de totes les obres necessàries per a l'execució de les obres del "Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya".

### 1.2. Objecte

Aquest plec de condicions de l'Estudi de Seguretat i Salut comprèn: el conjunt d'especificacions que hauran de complir tant el Pla de Seguretat i Salut del contractista com el document de gestió preventiva (planificació, organització, execució i control) de l'obra, les diferents proteccions a utilitzar per a la reducció dels riscos (mitjans auxiliars d'utilitat preventiva, sistemes de protecció col·lectiva, equips de protecció individual), implantacions provisionals per a la salubritat i confort dels treballadors, així com les tècniques de la seva implementació en l'obra i les que hauran de manar l'execució de qualsevol tipus d'instal·lacions i d'obres accessòries. Per a qualsevol tipus d'especificació no inclosa en aquest plec, es tindran en compte les condicions tècniques que es deriven d'entendre com a normes d'aplicació:

- Totes aquelles contingudes en el:
  - Plec General de Condicions Tècniques de l'Edificació, confeccionat pel Centre Experimental d'Arquitectura, aprovat pel Consell Superior de Col·legis d'Arquitectes i adaptat a les seves obres per la Direcció General d'Arquitectura (en el cas d'Edificació).
  - Plec de Clàusules Administratives Generals per a la Contractació d'Obres de l'Estat i adaptat a les seves obres per la Direcció de Política Territorial i Obres Públiques (en el cas d'Obra Pública).
- Reglament General de Contractació de l'Estat, Normes Tecnològiques de l'Edificació publicades pel Ministeri d'Habitatge i posteriorment pel Ministeri d'Obres Públiques i Urbanisme.
- La normativa legislativa vigent d'obligat compliment i les condicionades per les companyies subministradores de serveis públics, totes elles en el moment de l'oferta.

### 1.3. Documents que defineixen l'Estudi de Seguretat i Salut

Segons la normativa legal vigent, Art. 5, 2 del RD 1627/1997, de 24 d'octubre sobre ''Disposicions mínimes de seguretat i de salut en les obres de construcció'', l'Estudi de Seguretat haurà de formar part del projecte d'execució d'obra o, en defecte d'això, del projecte d'obra, havent de ser coherent amb el contingut del mateix i recollir les mesures preventives adequades als riscos que comporta la realització de l'obra, contenint com a mínim els següents documents:

Memòria: Descriptiva dels procediments, equips tècnics i mitjans auxiliars que hagin de ser utilitzats o la utilització dels quals es pugui preveure; identificació dels Riscos Laborals que puguin ser evitats, indicant a aquest efecte les mesures tècniques necessàries per a fer-ho; relació dels riscos laborals que no es puguin eliminar conforme als senyalitzats anteriorment, especificant les mesures preventives i proteccions tècniques tendents a controlar i reduir els citats riscos i valorant l'eficàcia, especialment quan es proposin mesures alternatives.

Plec: De condicions particulars en el qual es tindran en compte les normes legals i reglamentàries aplicables a les especificacions tècniques pròpies de l'obra que es tracti, així com les prescripcions que s'hauran de complir en relació amb: les característiques, l'ús i la conservació de les màquines, utensilis, eines, sistemes i equips preventius.

Plànols: on es desenvolupen els gràfics i esquemes necessaris per a la millor definició i comprensió de les mesures preventives definides en la memòria, amb expressió de les especificacions tècniques necessàries.

Amidaments: De totes les unitats o elements de seguretat i salut en el treball que hagin estat definides o projectades.

Pressupost: Quantificació del conjunt de costos previstos per a l'aplicació i execució de l'Estudi de Seguretat i Salut.

### 1.4. Compatibilitat i relació entre aquests documents

L'Estudi de Seguretat i Salut forma part del projecte d'execució d'obra, o si és el cas, del projecte d'obra, havent de ser cadascun dels documents que l'integren, coherent amb el contingut del projecte i recollir les mesures preventives, de caràcter pal·liatiu, adequades als riscos, no eliminats o reduïts en la fase de disseny, que comporti la realització de l'obra, en els terminis i circumstàncies sociotècniques on la mateixa s'hagi de materialitzar.

El plec de condicions particulars, els plans i pressupost de l'Estudi de Seguretat i Salut són documents contractuals que quedaran incorporats al Contracte i, per consegüent, són d'obligat compliment excepte modificacions degudament autoritzades.

La resta de documents o dades de l'Estudi de Seguretat i Salut són informatius i estan constituïts per la memòria descriptiva, amb tots els seus annexos, els detalls gràfics d'interpretació, les mesures i els pressupostos parcials.

Els citats documents informatius representen només una opinió fonamentada de l'autor de l'Estudi de Seguretat i Salut, sense que això suposi que es responsabilitzi de la veracitat de les dades que se subministrin. Aquestes dades s'han de considerar únicament com a complement d'informació que el contractista ha d'adquirir directament i amb els seus propis mitjans.

Només els documents contractuals constitueixen la base del contracte; per tant, el contractista no podrà al·legar ni introduir en el seu Pla de Seguretat i Salut cap modificació de les condicions del contracte basant-se en les dades contingudes en els documents informatius, tret que aquestes dades apareguin en algun document contractual.

El contractista serà, doncs, responsable dels errors que puguin derivar-se de no obtenir la suficient informació directa que rectifiqui o ratifiqui la continguda en els documents informatius de l'Estudi de Seguretat i Salut.

Si hi hagués contradicció entre els plans i les prescripcions tècniques particulars, en cas d'incloure's aquestes com a document que complementi el plec de condicions generals del projecte, prevaldria el que s'ha prescrit en les prescripcions tècniques particulars. En qualsevol cas, tots dos documents prevaldrien sobre les prescripcions tècniques generals.

En el cas que en el plec de condicions figurin aspectes que no contemplin els plans, o viceversa, hauran de ser executats com si hagués estat exposat en tots dos documents sempre que, a criteri de l'autor de l'Estudi de Seguretat i Salut, quedin prou definides les unitats de seguretat i salut corresponents, i aquestes tinguin preu en el contracte.

## 2. DEFINICIONS I COMPETÈNCIES DELS AGENTS QUE INTERVENEN EN EL PROCÉS CONSTRUCTIU

Dins de l'àmbit de la respectiva capacitat de decisió, cadascun dels actors del fet constructiu estarà obligat a prendre decisions ajustant-se als principis generals de l'acció preventiva (art. 15 a la L. 31/1995):

- Evitar els riscos.
- Avaluar els riscos inevitables.
- Combatre els riscos a l'origen.
- Adaptar la tasca a la persona, en particular pel que fa a la concepció dels llocs de treball, així com també referent a l'elecció dels equips i els mètodes de treball i de producció, amb l'objectiu específic d'atenuar la labor monòtona i repetitiva i de reduir els efectes en la salut.
- Tenir en compte l'evolució de la tècnica.
- Substituir el que sigui perillós pel que comporti poc o cap perill.
- Planificar la prevenció, amb la recerca d'un conjunt coherent que integri les tècniques, l'organització de les tasques, les condicions de treball, les relacions socials i la influència dels factors ambientals en el treball.
- Adoptar mesures que prioritzin la protecció col·lectiva per sobre de la individual.
- Facilitar les corresponents instruccions als treballadors.

**2.1. Promotor**

A l'efecte del present Estudi de Seguretat i Salut, serà considerat promotor qualsevol persona física o jurídica, pública o privada, que, individual o col·lectivament, decideixi, impulsi, programi i financi, amb recursos propis o aliens, les obres de construcció o per al seu posterior lliurament o cessió a tercers sota qualsevol títol.

Competències en matèria de seguretat i salut del promotor:

- Designar al tècnic competent per a la coordinació de seguretat i salut en fase de projecte quan sigui necessari o es cregui convenient.
- Designar en fase de projecte, la redacció de l'Estudi de Seguretat, facilitant, al projectista i al coordinador respectivament, la documentació i informació prèvia necessària per a l'elaboració del projecte i redacció de l'Estudi de Seguretat i Salut, així com autoritzar als mateixos les modificacions pertinents.
- Facilitar la intervenció en la fase de projecte i preparació de l'obra del coordinador de seguretat i salut.
- Designar al coordinador de seguretat i salut en la fase d'obra per a l'aprovació del Pla de Seguretat i Salut (aportat pel contractista amb antelació a l'inici de les obres) qui coordinarà la seguretat i salut en fase d'execució material d'aquestes.
- La designació dels coordinadors en matèria de seguretat i salut no eximeix al promotor de les seves responsabilitats.
- El promotor és el responsable que tots els agents que participen en l'obra tinguin en compte les observacions del coordinador de seguretat i salut degudament justificades o bé proposin unes mesures similars quant a la seva eficàcia

**2.2. Coordinador de Seguretat i Salut**

El coordinador de seguretat i salut serà, a l'efecte del present Estudi de Seguretat i Salut, qualsevol persona física legalment habilitada pels seus coneixements específics i que compti amb una titulació acadèmica en construcció.

És designat pel promotor en qualitat de coordinador de seguretat: a) en fase de concepció, estudi i elaboració del projecte o b) durant l'execució de l'obra.

El coordinador de seguretat i salut forma part de la direcció d'obra o direcció facultativa / direcció d'execució.

Competències en matèria de seguretat i salut del coordinador de seguretat del projecte:

El coordinador de seguretat i salut en fase de projecte, és designat pel promotor quan en l'elaboració del projecte d'obra intervinguin diversos projectistes.

Les funcions del coordinador en matèria de seguretat i salut durant l'elaboració del projecte, segons l'RD 1627/1997, són les següents:

- Vetllar perquè en fase de concepció, estudi i elaboració del projecte, el projectista tingui en consideració els ‘‘Principis generals de la prevenció en matèria de seguretat i salut’‘ (art. 15 a la L.31/1995) i en particular:
- Prendre les decisions constructives, tècniques i d'organització amb la finalitat de planificar les diferents tasques o fases de treball que es desenvolupin simultània o successivament.
- Estimar la durada requerida per l'execució de les diferents tasques o fases de treball.
- Traslladar al projectista tota la informació preventiva necessària que necessita per a integrar la seguretat i salut en les diferents fases de concepció, estudi i elaboració del projecte d'obra.
- Tenir en compte, cada vegada que es requereixi, qualsevol estudi de seguretat i salut o estudi bàsic, així com les previsions i informacions útils per a efectuar en el seu moment, amb les degudes condicions de seguretat i salut, els previsibles treballs posteriors (manteniment).
- Coordinar l'aplicació del que es disposa en els punts anteriors i redactar o fer redactar l'Estudi de Seguretat i Salut.

Competències en matèria de seguretat i salut del coordinador de seguretat i salut d'obra:

El Coordinador de Seguretat i Salut en fase d'execució d'obra, és designat pel Promotor en tots aquells casos en què intervingui més d'una empresa i treballadors autònoms o diversos treballadors autònoms.

Les funcions del coordinador en matèria de seguretat i salut durant l'execució de l'obra, segons l'RD 1627/1997, són les següents:

- Coordinar l'aplicació dels principis generals de l'acció preventiva (art. 15 L. 31/1995):
  - En el moment de prendre les decisions tècniques i d'organització amb la finalitat de planificar les diferents tasques o fases de treball que s'hagin de desenvolupar simultània o successivament.
  - En l'estimació de la durada requerida per a l'execució d'aquests treballs o fases de treball.

- Coordinar les activitats de l'obra per a garantir que els contractistes, i si és necessari els subcontractistes i els treballadors autònoms, apliquin de manera coherent i responsable els principis de l'acció preventiva que recull l'article 15 de la Llei de prevenció de riscos laborals (L.31/1995 de 8 de novembre) durant l'execució de l'obra i, en particular, en les tasques o activitats a les quals es refereix l'article 10 del RD 1627/1997 de 24 d'octubre sobre Disposicions mínimes de seguretat i salut en les obres de construcció:
- El manteniment de l'obra en bon estat d'ordre i neteja.
- L'elecció de la ubicació dels llocs i àrees de treball, tenint en compte les seves condicions d'accés i la determinació de les vies o zones de desplaçament o circulació.
- La manipulació dels diferents materials i la utilització dels mitjans auxiliars.
- El manteniment, el control previ a la posada en servei i el control periòdic de les instal·lacions i dispositius necessaris per a l'execució de l'obra, a fi de corregir els defectes que puguin afectar la seguretat i a la salut dels treballadors.
- La delimitació i el condicionament de les zones de magatzematge i dipòsit dels diferents materials, en particular si es tracta de matèries o substàncies perilloses.
- La recollida dels materials perillosos utilitzats.

- El magatzematge i l'eliminació o evacuació dels residus i sobres.
- L'adaptació, d'acord amb l'evolució de l'obra, del període de temps efectiu que haurà de dedicar-se als diferents treballs o fases de treball.
- La informació i coordinació entre els contractistes, subcontractistes i treballadors autònoms.
- Les interaccions i incompatibilitats amb qualsevol tipus de treball o activitat que es realitzi en l'obra o prop del lloc de l'obra.
- Aprovar el Pla de Seguretat i Salut (PSS) elaborat pel contractista i, si esdevé, les modificacions que s'haguessin introduït. La direcció facultativa prendrà aquesta funció quan no sigui necessari la designació de coordinador.
- Organitzar la coordinació d'activitats empresarials previstes en l'article 24 de la Llei de prevenció de riscos laborals.
- Coordinar les accions i funcions de control de l'aplicació correcta dels mètodes de treball.
- Adoptar les mesures necessàries perquè només puguin accedir a l'obra les persones autoritzades.

El coordinador de seguretat i salut en la fase d'execució de l'obra respondrà davant el promotor, del compliment de la seva funció com staff' assessor especialitzat en prevenció de la sinistralitat laboral, en col·laboració estricta amb els diferents agents que intervinguin en l'execució material de l'obra. Qualsevol divergència serà presentada al promotor com a màxim responsable de la gestió constructiva de la promoció de l'obra, a fi que aquest prengui, en funció de la seva autoritat, la decisió executiva necessària.

Les responsabilitats del coordinador no eximiran de les seves responsabilitats al promotor, fabricadors i subministradors d'equips, eines i mitjans auxiliars, direcció d'obra o direcció facultativa, contractistes, subcontractistes, treballadors autònoms i treballadors.

**2.3. Projectista**

És el tècnic habilitat professionalment qui, per encàrrec del promotor i amb subjecció a la normativa tècnica i urbanística corresponent, redacta el projecte.

Podran redactar projectes parcials del projecte, o parts que el complementin, altres tècnics, de manera coordinada amb l'autor d'aquest, comptant en aquest cas, amb la col·laboració del coordinador de seguretat i salut designat pel promotor.

Quan el Projecte es desenvolupa o completa mitjançant projectes parcials o d'altres documents tècnics, cada projectista assumeix la titularitat del seu projecte.

Competències en matèria de seguretat i salut del projectista

- Considerar els suggeriments del coordinador de seguretat i salut en fase de projecte per a integrar els principis de l'acció preventiva (Art.15 L. 31/1995), prendre les decisions constructives, tècniques i d'organització que puguin afectar la planificació dels treballs o fases de treball durant l'execució de les obres.
- Acordar, si és el cas, amb el promotor, la contractació de col·laboracions parcials.

**2.4. Director d'Obra**

És el tècnic habilitat professionalment qui, formant part de la direcció d'obra o direcció facultativa, dirigeix el desenvolupament de l'obra en els aspectes tècnics, estètics, urbanístics i mediambientals, de conformitat amb el projecte que el defineix, la llicència constructiva i altres autoritzacions preceptives i les condicions del contracte, a fi d'assegurar l'adequació a la fi proposat. En el supòsit que el director d'obra dirigeixi a més l'execució material d'aquesta, assumirà la funció tècnica de la seva realització i del control qualitatiu i quantitatiu de l'obra executada i de la seva qualitat.

Podran dirigir les obres dels projectes parcials altres tècnics, sota la coordinació del director d'obra, comptant amb la col·laboració del coordinador de seguretat i salut en fase d'obra, nomenat pel promotor.

Competències en matèria de seguretat i salut del director d'obra:

- Verificar el replanteig, l'adequació dels fonaments, estabilitat dels terrenys i de l'estructura projectada a les característiques geotècniques del terreny.
- Si dirigeix l'execució material de l'obra, verificar la recepció d'obra dels productes de construcció, ordenant la realització dels assajos i proves precises; comprovar els nivells, enfonsaments, influència de les condicions ambientals en la realització dels treballs, els materials, la correcta execució i disposició dels elements constructius de les instal·lacions i dels mitjans auxiliars d'utilitat preventiva i la senyalització, d'acord amb el projecte i l'estudi de seguretat i salut.
- Resoldre les contingències que es produeixin en l'obra i consignar en el llibre d'ordres i assistència les instruccions necessàries per a la correcta interpretació del projecte i dels mitjans auxiliars d'utilitat preventiva i solucions de seguretat i salut integrada, previstes en aquest.
- Elaborar a requeriment del coordinador de seguretat i salut o amb la seva conformitat, eventuals modificacions del projecte, que vinguin exigides per la marxa de l'obra i que puguin afectar la seguretat i salut dels treballs, sempre que les mateixes s'adeqüin a les disposicions normatives contemplades en la redacció del projecte i del seu estudi de seguretat i salut.
- Subscriure l'acta de replanteig o principi de l'obra, confrontant prèviament amb el coordinador de seguretat i salut l'existència prèvia de l'acta d'aprovació del Pla de Seguretat i Salut del contractista.
- Certificar el final d'obra, simultàniament amb el coordinador de seguretat, amb els visats que siguin preceptius.
- Conformar les certificacions parcials i la liquidació final de les unitats d'obra i de seguretat i salut executades, simultàniament amb el coordinador de seguretat.
- Les instruccions i ordres que donin la direcció d'obra o direcció facultativa seran normalment verbals, tenint força per a obligar en tots els efectes. Els desviaments respecte al compliment del Pla de Seguretat i Salut, s'anotaran pel coordinador en el llibre d'incidències.
- Elaborar i subscriure conjuntament amb el coordinador de seguretat, la memòria de seguretat i salut de l'obra finalitzada, per a lliurar-la al promotor amb els visats que fossin perceptius.

**2.5. Contractista o constructor (empresari principal) i Subcontractistes**

Definició de contractista:

És qualsevol persona física o jurídica que, individual o col·lectivament, assumeix contractualment davant el promotor, el compromís d'executar, en condicions de solvència i seguretat, amb mitjans humans i materials, propis o aliens, les obres o part de les mateixes amb subjecció al contracte, el projecte i el seu estudi de seguretat i salut.

Definició de subcontractista:

És qualsevol persona física o jurídica que assumeix, contractualment davant el contractista o empresari principal, el compromís de realitzar determinades parts o instal·lacions de l'obra, amb subjecció al contracte, al projecte i al pla de seguretat del contractista, pel qual es regeix la seva execució.

Competències en matèria de seguretat i salut del contractista i/o subcontractista:

- El contractista haurà d'executar l'obra amb subjecció al projecte, a les directrius de l'estudi i a compromisos del pla de seguretat i salut, a la legislació aplicable i a les instruccions del director d'obra i del coordinador de seguretat i salut, amb la finalitat de dur a terme les condicions preventives de la sinistralitat laboral i la seguretat de la qualitat, compromeses en el pla de seguretat i salut i exigides en el projecte.
- Tenir acreditació empresarial i la solvència i capacitació tècnica, professional i econòmica, que ho habiliti per al compliment de les condicions exigibles per a actuar com a constructor (i/o subcontractista, si és el cas), en condicions de seguretat i salut.
- Designar al cap d'obra que assumirà la representació tècnica del constructor (i/o subcontractista, si és el cas) en l'obra i que, per la seva titulació o experiència, haurà de tenir la capacitat adequada d'acord amb les característiques i complexitat de l'obra.
- Assignar en l'obra els mitjans humans i materials que per la seva importància requereixi.
- Formalitzar les subcontractacions de determinades parts o instal·lacions de l'obra dins dels límits establerts en el contracte i conforme amb la llei de la subcontractació 32/2006 i el Reial decret 1109/2007.
- Redactar i signar el Pla de Seguretat i Salut que desenvolupi l'Estudi de Seguretat i Salut del projecte. El subcontractista podrà incorporar els suggeriments de millora corresponents a la seva especialització en el Pla de Seguretat i Salut del contractista i presentar-los en l'aprovació del coordinador de seguretat.
- El representant legal del contractista signarà l'acta d'aprovació del Pla de Seguretat i Salut conjuntament amb el coordinador de seguretat.
- Signar l'acta de replanteig o principi i l'acta de recepció de l'obra.
- Aplicarà els principis de l'acció preventiva que recull l'article 15 de la Llei de prevenció de riscos laborals, en particular, a desenvolupar les tasques o activitats indicades en el citat article 10 del RD 1627/1997:
- Complir i fer complir al seu personal tot el que s'estableix en el Pla de Seguretat i Salut (PSS).
- Complir la normativa en matèria de prevenció de riscos laborals, tenint en compte, si esdevé, les obligacions referents a la coordinació d'activitats empresarials previstes en l'article 24 de la Llei de prevenció de riscos laborals i en conseqüència complir l'RD 171/2004, així com les disposicions mínimes establertes en l'annex IV del RD 1627/1997, durant l'execució de l'obra.
- Informar i facilitar les instruccions adequades als treballadors autònoms sobre totes les mesures que s'hagin d'adoptar quant a seguretat i salut en l'obra.
- Atendre les indicacions i complir les instruccions del coordinador en matèria de seguretat i salut durant l'execució de l'obra, i si és el cas, de la direcció facultativa.
- Els contractistes i subcontractistes seran responsables de l'execució correcta de les mesures preventives fixades en el Pla de Seguretat i Salut (PSS) en relació amb les obligacions que corresponen directament a elles o, si esdevé, als treballadors autònoms que hagin contractat.
- A més, els contractistes i subcontractistes es responsabilitzaran solidàriament de les conseqüències que es derivin de l'incompliment de les mesures previstes en el Pla, en els termes de l'apartat 2 de l'article 42 de la Llei de prevenció de riscos laborals.
- El contractista principal haurà de vigilar el compliment de la normativa de prevenció de riscos laborals per part de les empreses subcontractistes.
- Abans de l'inici de l'activitat en l'obra, el contractista principal exigirà als subcontractistes que acreditin per escrit que han efectuat, per als treballs a realitzar, l'avaluació de riscos i la planificació de la seva activitat preventiva. Així mateix, el contractista principal exigirà als subcontractistes que acreditin per escrit que han complert les seves obligacions en matèria d'informació i formació respecte als treballadors que hagin de prestar servei en l'obra.
- El contractista principal haurà de comprovar que els subcontractistes que concorren en l'obra han establert entre ells els mitjans necessaris de coordinació.
- Les responsabilitats del coordinador, de la direcció facultativa i del promotor no eximiran de les seves obligacions als contractistes ni als subcontractistes.
- El constructor serà responsable de la correcta execució dels treballs mitjançant l'aplicació de procediments i mètodes de treball intrínsecament segurs (SEGURETAT INTEGRADA), per a assegurar la integritat de les persones, els materials i els mitjans auxiliars utilitzats en l'obra.
- El contractista principal facilitarà per escrit a l'inici de l'obra, el nom del director tècnic, que serà creditor de la conformitat del coordinador i de la direcció facultativa. El director tècnic podrà exercir simultàniament el càrrec de cap d'obra o bé delegarà la citada funció a un altre tècnic, cap d'obra amb contrastats i suficients coneixements de construcció a peu d'obra. El director tècnic, o en la seva absència, el cap d'obra o l'encarregat general, ostentaran successivament la prelació de representació del contractista en l'obra.
- El representant del contractista en l'obra assumirà la responsabilitat de l'execució de les activitats preventives incloses en el present plec i el seu nom figurarà en el llibre d'incidències.
- Serà responsabilitat del contractista i del director tècnic, o del cap d'obra i/o encarregat si és el cas, l'incompliment de les mesures preventives en l'obra i entorn material de conformitat a la normativa legal vigent.
- El contractista també serà responsable de la realització del Pla de Seguretat i Salut (PSS), així com de l'específica vigilància i supervisió de Seguretat, tant del personal propi com subcontractat, i de facilitar les mesures sanitàries de caràcter preventiu laboral, formació, informació i capacitació del personal, conservació i reposició dels elements de protecció personal dels treballadors, càlcul i dimensions dels sistemes de proteccions col·lectius i especialment, les baranes i passarel·les, condemna de forats verticals i horitzontals susceptibles de permetre la caiguda de persones o objectes, característiques de les escales i estabilitat dels graons i suports, ordre i neteja de les zones de treball, il·luminació i ventilació dels llocs de treball, bastides, encofrats i apuntalaments, apilaments i emmagatzematges de materials, ordres d'execució dels treballs constructius, seguretat de les màquines, grues, aparells d'elevació, mesures auxiliars i equips de treball en general, distància i localització d'estès i canalitzacions de les companyies subministradores, així com qualsevol altra mesura de caràcter general i d'obligat compliment, segons la normativa legal vigent i els costums del sector, i que pugui afectar aquest centre de treball.
- El contractista haurà de designar la presència de recursos preventius i es determinarà la manera de dur-los a terme en el pla de seguretat i salut, segons la disposició addicional catorzena de la Llei 31/1995, de 8 de novembre, de Prevenció de Riscos Laborals i desenvolupada pel Reial decret 604/2006.
- El director tècnic (o el cap d'obra) visitarà l'obra com a mínim amb una cadència diària i haurà de donar les instruccions pertinents a l'encarregat general, qui haurà de ser una persona de provada capacitat per al càrrec i haurà de ser present en l'obra durant la realització de tot el treball que s'executi. sempre que sigui preceptiu i no existeixi una altra persona designada a aquest efecte, s'entendrà que l'encarregat general és al mateix temps el supervisor general de seguretat i salut del centre de treball per part del contractista, amb independència de qualsevol altre requisit formal.
- L'acceptació expressa o tàcita del contractista pressuposa que aquest ha reconegut: la ubicació del terreny, les comunicacions, accessos, afectació de serveis, característiques del terreny, mesures de seguretat necessàries, etc. i no podrà al·legar en el futur ignorància de tals circumstàncies.
- El contractista haurà de disposar de les pòlisses d'assegurança necessàries per a cobrir les responsabilitats que puguin esdevenir per motius de l'obra i el seu entorn, i serà responsable dels danys i prejudicis directes o indirectes que pugui ocasionar a tercers, tant per omissió com per negligència, imprudència o imperícia professional del personal al seu càrrec, així com dels subcontractistes, industrials i/o treballadors autònoms que intervinguin en l'obra.
- Les instruccions i ordres que doni la direcció d'obra o direcció facultativa seran normalment verbals, tenint força per a obligar amb caràcter general. Les desviacions respecte al compliment del Pla de Seguretat i Salut, seran anotades pel coordinador en el llibre d'incidències.
  En cas d'incompliment reiterat dels compromisos del Pla de Seguretat i Salut (PSS), el coordinador i tècnics de la direcció d'obra o direcció facultativa, constructor, director tècnic, cap d'obra, encarregat, supervisor de seguretat, delegat sindical de prevenció o els representants del servei de prevenció (propi o concertat) del contractista i/o subcontractistes tenen el dret a fer constar en el llibre d'incidències tot allò que considerin

d'interès per a reconduir la situació als àmbits previstos en el Pla de Seguretat i Salut de l'obra.

- Les condicions de seguretat i salut del personal dins de l'obra i els seus desplaçaments cap a o des del seu domicili particular, seran responsabilitat dels contractistes i/o subcontractistes així com dels propis treballadors autònoms.
- També serà responsabilitat del contractista: el tancament perimetral del recinte de l'obra i protecció d'aquesta, el control i reglament intern de policia en l'entrada per a evitar la intromissió incontrolada de tercers aliens i curiosos, la protecció d'accessos i l'organització de zones de pas amb destinació als visitants de les oficines d'obra.
- El contractista haurà de disposar d'un senzill però efectiu pla d'emergència per a l'obra, en previsió d'incendis, pluges, gelades, vent, etc. que pugui posar en situació de risc el personal d'obra, a tercers o als mitjans i instal·lacions de la pròpia obra o limítrofes.
- El contractista i/o subcontractistes tenen absolutament prohibit l'ús d'explosius sense autorització per escrit de la direcció d'obra o direcció facultativa.
- La utilització de grues, elevadors o altres màquines especials, es realitzarà per operaris especialitzats, posseïdors del carnet de grua torre, del títol d'operador de grua mòbil i en altres casos l'acreditació que correspongui sota la supervisió d'un tècnic especialitzat i competent a càrrec del contractista. El coordinador rebrà una còpia de cada títol d'habilitació signada per l'operador de la màquina i del responsable tècnic que autoritza l'habilitació avalant la idoneïtat d'aquell per a fer la seva tasca en aquesta obra en concret.
- Tots els operadors de grua mòbil hauran d'estar en possessió del carnet de gruista segons la Instrucció Tècnica Complementària ''MIE-*AEM-4'' aprovada per rD 837/2003 expedit per l'òrgan competent o en defecte d'això certificat de formació com a operador de grua de l'Institut Gaudí de la Construcció o entitat similar; tot això per a assegurar el total coneixement dels equips de treball de manera que es pugui garantir la màxima seguretat en les tasques a desenvolupar.
- El delegat del contractista haurà de certificar que tots els operadors de grua mòbil es troben en possessió del carnet de gruista segons especificacions del paràgraf anterior, així mateix haurà de certificar que totes les grues mòbils que s'utilitzen en l'obra compleixen totes i cadascuna de les especificacions establertes en la ITC ''MIE-*AEM-4''.

**2.6. Treballadors Autònoms**

Persona física diferent del contractista i/o subcontractista que realitzarà de manera personal i directa una activitat professional sense cap subjecció a un contracte de treball i que assumirà contractualment davant el promotor, el contractista o el subcontractista el compromís de realitzar determinades parts o instal·lacions de l'obra.

Competències en matèria de seguretat i salut del treballador autònom:

- Aplicar els principis de l'acció preventiva que es recullen en l'article 15 de la Llei de prevenció de riscos laborals, en particular, a desenvolupar les tasques o activitats indicades en l'article 10 del RD 1627/1997.
- Complir les disposicions mínimes de seguretat i salut que estableix l'annex IV del RD 1627/1997, durant l'execució de l'obra.
- Complir les obligacions en matèria de prevenció de riscos que estableix per als treballadors l'article 29, 1,2, de la Llei de prevenció de riscos laborals.
- Ajustar la seva actuació en l'obra conforme als deures de coordinació d'activitats empresarials establertes en l'article 24 de la Llei de prevenció de riscos laborals, participant, en particular, en qualsevol mesura d'actuació coordinada que s'hagi establert.
- Utilitzar els equips de treball d'acord amb allò disposat en l'RD 1215/1997, de 18 de juliol, pel qual s'estableixen les disposicions mínimes de seguretat i salut per a la utilització dels equips de treball per part dels treballadors.
- Triar i utilitzar els equips de protecció individual, segons preveu l'RD 773/1997, de 30 de maig, sobre disposicions mínimes de seguretat i salut relatiu a la utilització dels equips de protecció individual per part dels treballadors.
- Atendre les indicacions i complir les instruccions del coordinador en matèria de seguretat i de salut durant l'execució de l'obra i de la direcció d'obra o direcció facultativa, si n'hi ha.
- Els treballadors autònoms hauran de complir allò establert en el Pla de Seguretat i Salut (PSS):
    - La maquinària, els aparells i les eines que s'utilitzin en l'obra, han de respondre a les prescripcions de seguretat i salut, equivalents i pròpies, dels equipaments de treball que l'empresari-contractista posa a la disposició dels seus treballadors.
    - Els autònoms i els empresaris que exerceixen personalment una activitat en l'obra han d'utilitzar equipament de protecció individual apropiat i respectar el manteniment, per al correcte funcionament dels diferents sistemes de protecció col·lectiva instal·lats en l'obra, segons el risc que s'hagi de prevenir i l'entorn del treball.

**2.7. Treballadors**

Persona física diferent del contractista, subcontractista i/o treballador autònom que realitzarà de manera personal i directa una activitat professional remunerada per compte d'altri, amb subjecció a un contracte laboral, i que assumirà contractualment davant l'empresari el compromís de desenvolupar en l'obra les activitats corresponents a la seva categoria i especialitat professional, seguint les instruccions d'aquell.

Competències en matèria de seguretat i salut del treballador:

- El deure d'obeir les instruccions del contractista en allò relatiu a seguretat i salut.
- El deure d'indicar els perills potencials.
- Té responsabilitat dels seus actes personals.
- Té el dret a rebre informació adequada i comprensible i a formular propostes, en relació amb la seguretat i salut, especialment sobre el Pla de Seguretat i Salut (PSS).
- Té el dret a la consulta i participació, d'acord amb l'article 18, 2 de la Llei de prevenció de riscos laborals.
- Té el dret de dirigir-se a l'autoritat competent.
- Té el dret d'interrompre el treball en cas de perill imminent i seriós per a la seva integritat i/o la dels seus companys o tercers aliens a l'obra.
- Té el dret de fer ús d'unes instal·lacions provisionals de salubritat i confort, previstes especialment per al personal d'obra, suficients, adequades i dignes, durant tota la seva permanència en l'obra.

**3. DOCUMENTACIÓ PREVENTIVA DE CARÀCTER CONTRACTUAL**

**3.1. Interpretació dels documents vinculants en matèria de Seguretat i Salut**

Excepte en el cas que l'escriptura del contracte o document de conveni contractual l'indiqui específicament d'una altra manera, l'ordre de prelació dels documents contractuals en matèria de seguretat i salut per a aquesta obra serà el següent:

- Escriptura del contracte o document del conveni contractual.
- Bases del concurs.
- Plec de prescripcions per a la redacció dels estudis de seguretat i salut i la coordinació de seguretat i salut en fase de projecte i/o d'obra.
- Plec de condicions generals del projecte i de l'Estudi de Seguretat i Salut.

- Plec de condicions facultatives i econòmiques del projecte i de l'estudi de seguretat i salut.
- Procediments operatius de seguretat i salut i/o procediments de control administratiu de seguretat, redactats durant la redacció del projecte i/o durant l'execució material de l'obra, pel coordinador de seguretat.
- Plans i detalls gràfics de l'Estudi de Seguretat i Salut.
- Pla d'acció preventiva de l'empresari-contractista.
- Pla de Seguretat i Salut de desenvolupament de l'Estudi de Seguretat i Salut del contractista per a l'obra en qüestió.
- Protocols, procediments, manuals i/o normes de seguretat i salut internes del contractista i/o subcontractista, d'aplicació en l'obra.

Feta aquesta excepció, els diferents documents que constitueixen el contracte seran considerats mútuament explicatius, però en el cas d'ambigüitats o discrepàncies interpretatives de temes relacionats amb la seguretat seran aclarits i corregits pel director d'obra qui, després de consultar amb el coordinador de seguretat, farà ús de la seva facultat d'aclarir al contractista les interpretacions pertinents.

Si, en el mateix sentit, el contractista descobreix errors, omissions, discrepàncies o contradiccions haurà de notificar-lo immediatament per escrit al director d'obra, qui, després de consultar amb el coordinador de seguretat, aclarirà ràpidament tots els assumptes, notificant la seva resolució al contractista. Qualsevol treball relacionat amb temes de seguretat i salut que hagués estat executat pel contractista sense prèvia autorització del director d'obra o del coordinador de seguretat, serà responsabilitat del contractista, romanent el director d'obra i el coordinador de seguretat eximits de qualsevol responsabilitat derivada de les conseqüències de les mesures preventives, tècnicament inadequades, que hagi pogut adoptar el contractista pel seu compte.

En el cas que el contractista no notifiqui per escrit el descobriment d'errors, omissions, discrepàncies o contradiccions, aquestes, no sols no l'eximeixen de l'obligació d'aplicar les mesures de seguretat i salut (raonablement exigibles per la reglamentació vigent, els usos i la praxi habitual de la seguretat integrada en la construcció que sigui manifestament indispensable per a dur a terme l'esperit o la intenció posada en el projecte i l'Estudi de Seguretat i Salut), sinó que hauran de ser materialitzades com si haguessin estat completes i correctament especificades en el projecte i en el corresponent Pla de Seguretat i Salut.

Totes les parts del contracte s'entenen com a complementàries entre si, per la qual cosa qualsevol treball requerit en un sol document, encara que no estigui citat en cap altre, tindrà el mateix caràcter contractual que si s'hagués recollit en tots.

**3.2. Vigència de l'Estudi de Seguretat i Salut**

El coordinador de seguretat (a la vista del contingut del Pla de Seguretat i Salut aportat pel contractista com a document de gestió preventiva d'adaptació de la seva pròpia ‘‘cultura preventiva interna d'empresa’’, el desenvolupament del contingut del projecte i l'Estudi de Seguretat i Salut per a l'execució material de l'obra), podrà indicar en l'acta d'aprovació del Pla de Seguretat, la declaració expressa de subsistència d'aquells aspectes que puguin estar, al seu criteri, millor desenvolupats en l'Estudi de Seguretat, que ampliïn i complementin els continguts del Pla de Seguretat i Salut del contractista.

Els procediments operatius i/o administratius de seguretat que poguessin redactar el coordinador de seguretat i salut amb posterioritat a l'aprovació del Pla de Seguretat i Salut, tindran la consideració de document de desenvolupament de l'Estudi i Pla de Seguretat, sent per conseqüent, vinculants per a les parts contractants.

**3.3. Pla de Seguretat i Salut del Contractista**

D'acord amb el que es disposa en l'RD 1627/1997, cada contractista està obligat a redactar, abans de l'inici dels seus treballs en l'obra, un Pla de Seguretat i Salut adaptant aquest Estudi de Seguretat i Salut als seus mitjans, mètodes d'execució i al Pla d'acció preventiva interna d'empresa, conforme al RD 39 / 1997 Llei de prevenció de riscos laborals (arts. 1, 2 ap. 1, 8 i 9)

El contractista en el seu Pla de Seguretat i Salut està obligat a incloure els requisits formals establerts en l'Art. 7 del RD 1627/ 1997, encara que disposa de plena llibertat per a estructurar formalment aquest Pla de Seguretat i Salut.

El contractista, en el seu Pla de Seguretat i Salut, adjuntarà, com a mínim, els plans següents amb els continguts que en cada cas s'indiquen.

Pla o plans de situació amb les característiques de l'entorn, indicant:

- Ubicació dels serveis públics.
    - Electricitat.
    - Clavegueram.
    - Aigua potable.
    - Gas.
    - Oleoductes.
    - Altres.
- Situació i amplària dels carrers (reals i previstes).
    - Accessos al recinte.
    - Garites de control d'accessos.
- Delimitat del perímetre del solar.
- Distàncies de l'edifici amb els límits del solar.
- Edificacions veïnes existents.
- Servituds.

Plans en planta d'ordenació general de l'obra, segons les diverses fases previstes en funció del seu pla d'execució real, indicant:

- Tancament del solar.
- Murs de contenció, atalussats, pous, corts del terreny i desnivells.
- Nivells definitius dels diferents accessos al solar i rasants de vials confrontants.
- Ubicació d'instal·lacions d'implantació provisional per al personal d'obra:
    - Banys: equipament (lavabos, excusats, dutxes, escalfador…).
    - Vestuaris del personal: equipament (taquilles, bancs correguts, estufes…).
    - Refetor o menjador: equipament (taules, seients, escalfaplats, frigorífic…).
    - Farmaciola: equipament.
    - Altres.
- Llocs destinats a apilaments.
    - Àrids i materials ensitjaments.
    - Armadures, barres, tubs i biguetes.
    - Materials paletitzats.
    - Fusta.
    - Materials ensacats.
    - Materials en caixes.

- Materials en bidons.
- Materials solts.
- Enderrocs i residus.
- Ferralla.
- Aigua.
- Combustibles.
- Substàncies tòxiques.
- Substàncies explosives i/o deflagrant.

- Ubicació de maquinària fixa i àmbit d'influència previst.
  - Aparells de manutenció mecànica: grues torre, muntacàrregues, cabrestants, maquinetes, baixants d'enderrocs, cintes transportadores, bomba d'extracció de fluids.
  - Estació de formigonada.
  - Sitja de morter.
  - Planta de piconat i/o selecció d'àrids.
- Circuits de circulació interna de vehicles, límits de circulació i zones d'aparcament. Senyalització de circulació.
- Circuits de circulació interna del personal d'obra. Senyalització de seguretat.
- Esquema d'instal·lació elèctrica provisional.
- Esquema d'instal·lació d'il·luminació provisional.
- Esquema d'instal·lació provisional de subministrament d'aigua.

Plans en planta i seccions d'instal·lació de Sistemes de Protecció Col·lectiva.
(*) Representació cronològica per fases d'execució.

- Protecció en previsió de caigudes de persones o objectes des de buits verticals de façanes:
  - Ubicació de bastida porticada d'estructura tubular que cobreix la totalitat dels fronts de façana amb avançament simultani a l'execució d'estructura fins a la finalització de tancaments i coberta (*).
    (*) Sistema de protecció col·lectiva preferent.
  - Ubicació i replanteig del conjunt de forquetes metàl·liques i xarxes de seguretat (*).
    (*) En cas de no realitzar-se seguretat integrada amb bastides tubulars, prèvia justificació en el ESS.
  - Ubicació i replanteig de xarxes de desencofrat.
  - Ubicació i replanteig de baranes de seguretat (*).
    (*) En cas de no realitzar-se seguretat integrada amb bastides tubulars, prèvia justificació en el ESS.
  - Ubicació i replanteig de marquesines en volada de seguretat (*).
    (*) En cas de no realitzar-se seguretat integrada amb bastides tubulars, prèvia justificació en el ESS.
- Protecció en previsió de caigudes de persones o objectes des de buits verticals d'escales:
  - Ubicació i replanteig de xarxes verticals de seguretat en perímetre i buit de travessers d'escales (*).
    (*) Sistema de protecció col·lectiva preferent.
  - Ubicació i replanteig de baranes de seguretat en perímetre i buit de travessers d'escales.
  - Protecció en previsió de caigudes de persones o objectes des de buits horitzontals de celoberts, xemeneies, buits d'instal·lacions i encofrats.
  - Ubicació i replanteig de condemna amb malla electrosoldada embrochalada en el cèrcol perimetral (*).
    (*) Sistema de protecció col·lectiva preferent en forjat
  - Ubicació i replanteig de xarxes horitzontals de seguretat en patis interiors.
  - Planta d'estructura amb ubicació i replanteig de xarxes horitzontals de seguretat sota taulers i sopandas d'encofrats horitzontals recuperables.
  - Ubicació i replanteig d'entarimat horitzontal de fusta en passos d'instal·lacions, arquetes i registres provisionals.
  - Ubicació i replanteig de barana perimetral de seguretat

Plans de proteccions en plataformes i zones de pas. Contingut:

- Passarel·les (ubicació i elements constitutius).
- Escales provisionals.
- Detalls de tapes provisionals d'arquetes o de buits.
- Abalisament i senyalització de zones de pas.
- Condemna d'accessos i proteccions en contenció d'estabilitat de terrenys.
  Ubicació de bastides penjants: projecte i replanteig dels pescants i les guindoles.
  Sàgola de cable per a ancoratge i lliscament de cinturó de seguretat en perímetres exteriors amb el risc de caigudes d'altura.

Pla o plans de distribució d'elements de seguretat per a l'ús i manteniment posterior de l'obra executada (*).

- Bastides suspeses sobre guindoles carrileres per a neteja de façana.
- Plataformes lliscants sobre carrils per a manteniment de paraments verticals.
- Bastides especials.
- Plataformes en volada i descarregadors mòbils per a introducció i evacuació d'equips.
- Baranes perimetrals mòbils per a treballs de manteniment en cobertes no transitables.
- Escales de gat amb enclavament d'accessos i equipament de sistema de protecció col·lectiva.
- Replanteig d'ancoratges i sàgoles per a cinturons en façanes, xemeneies, finestrals i patis.
- Replanteig de pescants mòbils o bigues retràctils.
- Escala d'incendis i/o mànega tèxtil ignífuga d'evacuació.
- Altres.
  (*) Solament en cas que estiguin contemplats en el projecte executiu.

Pla d'evacuació interna d'accidentats (*).

- Pla de carrers per a evacuació d'accidentats en obres urbanes.
- Pla de carreteres per a evacuació d'accidentats en obres aïllades.
  (*) Solament per a obres complexes o especials.

Altres.

**3.4. El ''Llibre d'Incidències''**

En l'obra existirà, adequadament protocol·litzat, el document oficial ‘‘Llibre d'incidències’’, facilitat pel Col·legi Professional corresponent al que pertanyi el tècnic que hagi aprovat el pla de seguretat i salut o per l'Oficina de Supervisió de Projectes o òrgan equivalent quan es tracti d'obres de les Administracions públiques.

Segons l'article 13 del Reial decret 1627/97 de 24 d'octubre, modificat pel RD 1109/2007, aquest llibre haurà d'estar permanentment en l'obra, en poder del coordinador de seguretat i salut, i a la disposició de la direcció d'obra o direcció facultativa, contractistes, subcontractistes i treballadors autònoms, les persones o òrgans amb responsabilitat en matèria de prevenció de les empreses intervinents en l'obra, tècnics dels òrgans especialitzats en matèria de seguretat i salut en el treball de les Administracions públiques competents, o si és el cas, del representant dels treballadors, els qui podran realitzar les anotacions que considerin adequades respecte a les desviacions en el compliment del Pla de Seguretat i Salut.

Quan es realitzi una anotació en el llibre d'incidències, el coordinador en matèria de seguretat i salut durant l'execució de l'obra o, quan no sigui necessària la designació de coordinador, la direcció facultativa, la notificarà al contractista afectat i als representants dels treballadors d'aquest i només en el cas que l'anotació es refereixi a qualsevol

incompliment dels advertiments o observacions prèviament anotades en aquest llibre així com en el supòsit de paralització dels treballs, haurà de remetre's una còpia a la Inspecció de Treball i Seguretat Social en el termini de vint-i-quatre hores i s'especificarà si l'anotació efectuada suposa una reiteració d'un advertiment o observació anterior o si, per contra, es tracta d'una nova observació.

**3.5. Caràcter vinculant del Contracte o document del ''Conveni de Prevenció i Coordinació'' i documentació contractual annexa en matèria de Seguretat**

El conveni de prevenció i coordinació subscrit entre el promotor (o el seu representant), contractista, projectista, coordinador de seguretat, direcció d'obra o direcció facultativa i representant sindical delegat de prevenció, podrà ser elevat a escriptura pública a requeriment de les parts atorgants d'aquest, sent de compte exclusiu del contractista totes les despeses notarials i fiscals que es derivin.

El promotor podrà, sempre amb prèvia notificació per escrit del contractista, assignar totes o part de les seves facultats assumides contractualment, a la persona física, jurídica o corporació que tingués a bé designar a aquest efecte, segons sigui procedent.

Els terminis i provisions de la documentació contractual contemplada en l'apartat 2.1. del present plec, juntament amb els terminis i provisions de tots els documents aquí incorporats per referència, constitueixen l'acord ple i total entre les parts i no durà a terme cap acord o enteniment de cap naturalesa, ni el promotor farà cap endós o representacions al contractista, excepte les quals s'estableixin expressament mitjançant contracte. Cap modificació verbal als mateixos tindrà validesa, força ni cap efecte.

El promotor i el contractista s'obligaran a si mateixos i als seus successors, representants legals i/o concessionaris, a complir els pactes en la documentació contractual vinculant en matèria de seguretat. El contractista no és agent o representant legal del promotor, per la qual cosa aquest no serà responsable en cap forma de les obligacions o responsabilitats en què incorri o assumeixi el contractista.

No es considerarà que alguna de les parts hagi renunciat a algun dret, poder o privilegi atorgat per qualsevol dels documents contractuals vinculants en matèria de seguretat, o provisió d'aquests, tret que tal renúncia hagi estat degudament expressada per escrit i reconeguda per les parts afectades.

Tots els recursos o remeis brindats per la documentació contractual vinculant en matèria de seguretat, hauran de ser presos i interpretats com a acumulatius, és a dir, addicionals a qualsevol altre recurs prescrit per la llei.

Les controvèrsies que puguin sorgir entre les parts, respecte a la interpretació de la documentació contractual vinculant en matèria de seguretat, serà competència de la jurisdicció civil, no obstant això, es consideraran actes jurídics separables els que es dictin en relació amb la preparació i adjudicació del contracte i, en conseqüència, podran ser impugnats davant l'ordre jurisdiccional contenciós administratiu d'acord amb la normativa reguladora de la citada jurisdicció.

**4. NORMATIVA LEGAL D'APLICACIÓ**

Per a la realització del Pla de Seguretat i Salut, el contractista tindrà en compte la normativa vigent en el decurs de la redacció del ESS (o EBSS), obligatòria o no, que pugui ser aplicable.

A títol orientatiu i sense caràcter limitatiu, s'adjunta una relació de normativa aplicable. El contractista, no obstant això, afegirà al llistat general de la normativa aplicable en la seva obra els canvis de caràcter tècnic particular que no estiguin en la relació i correspongui aplicar al seu pla.

**4.1. Textos generals**

- Convenis col·lectius.
- Reglament de seguretat i higiene en el treball en la indústria de la construcció. OM 20 de maig de 1952 (BOE 15 de juny de 1958). Modificada per Ordre 10 de desembre de 1953 (BOE 2 de febrer de 1956) i Ordre 23 de de setembre 1966 (BOE 1 d'octubre de 1966). Derogada parcialment per Ordre 20 de gener de 1956 (BOE 2 de febrer de 1956) i RD 2177/2004 (BOE 13 de novembre de 2004).
- Ordenança general de seguretat i higiene en el treball. OM 9 de març de 1971. (BOE 16 de març de 1971), en vigor parteixes del títol II. Derogada parcialment per rD 1316/1989 (BOE 2 de novembre de 1989), Llei 31/1995 (BOE 10 de novembre de 1995), RD 486/1997 (BOE 23 d'abril de 1997), RD 664/1997 (BOE 24 de maig de 1997), RD 665/1997 (BOE 24 de maig de 1997), RD 773/1997 (BOE 12 de juny de 1997), RD 1215/1997 (BOE 7 d'agost de 1997), RD 614/2001 (BOE 21 de juny de 2001) i RD 349/2003 (BOE 5 d'abril de 2003).
- Regulació de la jornada de treball, jornades especials i descans. RD 2001/1983 de 28 de juliol (BOE 29 de juliol de 1983). Modificacions per rD 2403/1985 (BOE 30 de desembre de 1985), RD 1346/1989 (BOE 7 de novembre 1989) i anul·lada parcialment per rD 1561/1995 de 21 de setembre (BOE 26 de setembre de 1995).
- Ordre de 20 de setembre de 1986, per la qual s'estableix el model de llibre d'incidències corresponent a les obres en les quals sigui obligatori un estudi de Seguretat i Higiene en el treball (BOE de 13 d'octubre de 1986).
- Establiment de models de notificació d'accidents de treball. OM 16 de desembre de 1987 (BOE 29 de desembre de 1987).
- Instrument de ratificació de 17 de juliol de 1990 del Conveni de 24 de juny de 1986 sobre Utilització de l'asbest en condicions de seguretat (numero 162 de la OIT), adoptat a Ginebra (BOE de 23 de novembre de 1990).
- Llei de prevenció de riscos laborals. Llei 31/1995 de novembre (BOE 10 de novembre de 1995). Complementada per rD 614/2001 de 8 de juny (BOE 21 de juny de 2001).
- Reial decret 363/1995, de 10 de març, per la qual s'aprova el reglament sobre notificació de substàncies noves i classificació, envasament i etiquetatge de substàncies perilloses (BOE de 5 de juny de 1995).
- Reial decret 1561/1995, de 21 de setembre, sobre jornades especials de treball (BOE de 26 de setembre de 1995).
- Reglament dels serveis de prevenció. RD 39/1997 de 17 de gener (BOE 31 de gener de 1997). Complementat per Ordre de 22 d'abril de 1997 (BOE 24 d'abril de 1997) i RD 688/2005 (BOE 11 de juny de 2006). Modificat per rD 780/1998 de 30 d'abril (BOE 1 de maig de 1998) i RD 604/2006 (BOE 29 de maig de 2006).
- Disposicions mínimes de seguretat i salut en els llocs de treball. RD 486/1997 de 14 d'abril de 1997 (BOE 23 d'abril de 1997). Complementat per Ordre TAS/2947/2007 (BOE 11 d'octubre de 2007) i modificat per rD 2177/2004 (BOE 13 de novembre de 2004).
- Disposicions mínimes de seguretat i salut relatives a la manipulació manual de càrregues que comportin riscos,

en particular dorsolumbars, per als treballadors. RD 487/1997 de 14 d'abril de 1997 (BOE 23 d'abril de 1997).

- Disposicions mínimes de seguretat i salut per a la utilització pels treballadors dels equips de treball. RD 1215/1997 de 18 de juliol (BOE 7 d'agost de 1997).
- Disposicions mínimes destinades a protegir la seguretat i la salut dels treballadors en les activitats mineres. RD 1389/1997 de 5 de setembre (BOE 7 d'octubre de 1997).
- Disposicions mínimes de seguretat i salut en les obres de construcció. RD 1627/1997 de 24 d'octubre (BOE 25 d'octubre de 1997). Modificat per rD 2177/2004 (BOE 13 de novembre 2004) i RD 604/2006 (BOE 29 de maig de 2006). Complementat per rD 1109/2007 (BOE 25 d'agost de 2007).
- "Ordre de 12 de gener de 1998, per la qual s'aprova el model de Llibre d'Incidències en els obris de construcció (DOGC Diari Oficial de la Generalitat de Catalunya de 27 de gener de 1998)".
- Disposicions mínimes de seguretat i salut en el treball en l'àmbit de les empreses de treball temporal. RD 216/1999 de 5 de febrer (BOE 24 de febrer de 1999).
- Llei 38/1999, de 5 de novembre, d'Ordenació de l'Edificació (BOE de 6 de novembre de 1999).
- Protecció de la seguretat i la salut dels treballadors contra els riscos relacionats amb els agents químics durant el treball. RD 374/2001 de 6 d'abril (BOE 1 de maig de 2001).
- Reial decret 783/2001, de 6 de juliol, pel qual s'aprova el Reglament sobre protecció sanitària contra radiacions ionitzants (BOE de 26 de juliol de 2001).
- Llei 54/2003, de 12 de desembre, de reforma del marc normatiu de la prevenció de riscos laborals (BOE de 13 de desembre de 2003).
- Reial decret 1801/2003, de 26 de desembre, sobre seguretat general dels productes (BOE 10 de gener de 2004).
- Reial decret 171/2004, pel qual es desenvolupa l'article 24 de la Llei 31/1995 de prevenció de laborals, en matèria de coordinació d'activitats empresarials (BOE 31 de gener de 2004).
- Reial decret 2177/2004, de 12 de novembre, pel qual es modifica l'RD 1215/1997, de 18 de juliol, en el qual s'estableixen les disposicions mínimes de seguretat i salut per a la utilització per part dels treballadors dels equips de treball, en matèria de treballs temporals en altura (BOE de 13 de novembre de 2004).
- Reial decret 1311/2005, de 4 de novembre, sobre la protecció de la salut i seguretat dels treballadors enfront dels riscos derivats o que puguin derivar-se de l'exposició a vibracions mecàniques.
- Reial decret 604/2006, de 19 de maig, pel qual es modifiquen l'RD 39/1997, de 17 de gener, pel qual s'aprova el Reglament dels Serveis de Prevenció, i l'RD 1627/1997, de 24 d'octubre, pel qual s'estableixen les disposicions mínimes de seguretat i salut en les obres de construcció (BOE 127 de 29 de maig).
- Reial decret 635/2006, de 26 de maig, sobre requisits mínims de seguretat en els túnels de carreteres de l'Estat.
- Llei ordinària 32/2006 reguladora de la subcontractació en el Sector de la Construcció (BOE 250 de 19 d'octubre).
- Reial decret 1299/2006, de 10 de novembre pel qual s'aprova el quadre de malalties professionals en el sistema de la Seguretat Social i s'estableixen criteris per a la seva notificació i registre (BOE de 19 de desembre de 2006)". Complementat per "Ordre TAS/1/2007 (BOE de 4 de gener de 2007).
- Llei orgànica 3/2007, de 22 de març, per a la igualtat efectiva de dones i homes (BOE 23 de març de 2007).
- Reial decret 1109/2007, de 24 d'agost, pel qual es desenvolupa la Llei 32/2006, de 18 d'octubre, reguladora de la subcontractació en el Sector de la Construcció (BOE 204 de 25 d'agost).
- "Decret 102/2008, de 6 de maig, de creació del Registre d'Empreses Acreditades de Catalunya per intervenir en el procés de contractació en el sector de la construcció (DOGC Diari Oficial de la Generalitat de Catalunya de 08 de maig de 2008)".
- Reial decret 1802/2008, de 3 de novembre, pel qual es modifica el Reglament sobre notificació de substàncies noves i classificació, envasament i etiquetatge de substàncies perilloses, aprovat per rD 363/1995, de 10 de març, amb la finalitat d'adaptar les seves disposicions al Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell (Reglament REACH).
- "Decret 10/2009, de 27 de gener. Decret de creació del Registre d'empreses sancionades per infraccions molt greus en matèria de prev enció de cingles laborals i del procediment per a la seva publicació (DOGC Diari Oficial de la Generalitat de Catalunya de 03 de febrer de 2009)."
- Reial decret 298/2009, de 6 de març, pel qual es modifica el Reial decret 39/1997, de 17 de gener, pel qual s'aprova el Reglament dels Serveis de Prevenció, en relació amb l'aplicació de mesures per a promoure la millora de la seguretat i de la salut en el treball de la treballadora embarassada, que hagi donat a llum o en període de lactància.
- Reial decret 330/2009, de 13 de març, pel qual es modifica el Reial decret 1311/2005, de 4 de novembre, sobre la protecció de la salut i la seguretat dels treballadors enfront dels riscos derivats o que puguin derivar-se de l'exposició a vibracions mecàniques.
- Reial decret 327/2009 de 13 de març, pel qual es modifica el Reial decret 1109/2007, de 24 d'agost, pel qual es desenvolupa la Llei 32/2006, de 18 d'octubre, reguladora de la subcontractació en el sector de la construcció (BOE 63 de 14 de març de 2009).
- Instrument de Ratificació del Conveni número 187 de la OIT, sobre el marc promocional per a la seguretat i salut en el treball, fet a Ginebra el 31 de maig de 2006 (BOE 187 de 4 d'agost de 2009).
- Reial decret 337/2010, de 19 de març, pel qual es modifiquen el Reial decret 39/1997, de 17 de gener, pel qual s'aprova el Reglament dels Serveis de Prevenció; el Reial decret 1109/2007, de 24 d'agost, pel qual es desenvolupa la Llei 32/2006, de 18 d'octubre, reguladora de la subcontractació en el sector de la construcció i el Reial decret 1627/1997, de 24 d'octubre, pel qual s'estableixen disposicions mínimes de seguretat i salut en obres de construcció (BOE 71 de 23 de març de 2010).

- Reglament (UE) núm. 276/2010 de la Comissió, de 31 de març de 2010, pel qual es modifica el Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i preparats químics (REACH), pel que fa al seu annex XVII (diclorometà, olis per a llums i líquids encenedors de barbacoa i compostos organoestànnics)

- Reial decret 486/2010, de 23 d'abril, sobre la protecció de la salut i la seguretat dels treballadors contra els riscos relacionats amb l'exposició a radiacions òptiques artificials (BOE 99 de 24 d'abril de 2010).

- Reial decret 717/2010, de 28 de maig, pel qual es modifiquen el Reial decret 363/1995, de 10 de març, pel qual s'aprova el Reglament sobre classificació, envasament i etiquetatge de substàncies perilloses i el Reial decret 255/2003, de 28 de febrer, pel qual s'aprova el Reglament sobre classificació, envasament i etiquetatge de preparats perillosos (BOE 139 de 8 de juny de 2010).

- Reial decret 1439/2010, de 5 de novembre, pel qual es modifica el Reglament sobre protecció sanitària contra radiacions ionitzants, aprovat per Reial decret 783/2001, de 6 de juliol (BOE 279 de 18 de Novembre de 2010).

- "Decret 171/2010, de 16 de novembre, del registri de delegats i delegades de prevenció (DOGC núm. 5764 de 26 de Novembre de 2010)."

- Reial decret 843/2011, de 17 de juny, pel qual s'estableixen els criteris bàsics sobre l'organització de recursos per a desenvolupar l'activitat sanitària dels serveis de prevenció.

- Llei 22/2011, de 28 de juliol, de residus i sòls contaminats.

- Llei 33/2011, de 4 d'octubre, General de Salut Pública.

- Reglament (UE) núm. 109/2012 de la Comissió, de 9 de febrer de 2012, pel qual es modifica el Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i preparats químics (REACH) pel que fa al seu annex XVII (substàncies CMR).

- Reglament (UE) núm. 125/2012 de la Comissió, de 14 de febrer de 2012, pel qual es modifica l'annex XIV del Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i preparats químics (REACH).

- Reglament (UE) núm. 412/2012 de la Comissió, de 15 de maig de 2012, pel qual es modifica l'annex XVII del Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i preparats químics (REACH).

- Reial decret 1070/2012, de 13 de juliol, pel qual s'aprova el Pla estatal de protecció civil davant el risc químic.

- Reglament (UE) núm. 836/2012 de la Comissió, de 18 de setembre de 2012, pel qual es modifica, en relació amb el plom, l'annex XVII del Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i mescles químiques (REACH).

- Reglament (UE) núm. 835/2012 de la Comissió, de 18 de setembre de 2012, pel qual es modifica el Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i mescles químiques (REACH), pel que fa al seu annex XVII (cadmi).

- Reglament (UE) núm. 848/2012 de la Comissió, de 19 de setembre de 2012, pel qual es modifica, pel que fa als compostos de fenilmercurio, l'annex XVII del Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i mescles químiques (REACH).

- Reglament (UE) núm. 847/2012 de la Comissió, de 19 de setembre de 2012, pel qual es modifica, pel que fa al mercuri, l'annex XVII del Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i mescles químiques (REACH).

- Reglament (UE) núm. 126/2013 de la Comissió, de 13 de febrer de 2013, pel qual es modifica l'annex XVII del Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i preparats químics (REACH).

- Reglament (UE) núm. 348/2013 de la Comissió, de 17 d'abril de 2013, pel qual es modifica l'annex XIV del Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i mescles químiques (REACH).

- Resolució de 13 de maig de 2013, de la Direcció General d'Ocupació, per la qual es registra i publica l'Acta de l'acord de revisió parcial del V Conveni col·lectiu general del sector de la construcció.

- Llei 5/2013, d'11 de juny, per la qual es modifiquen la Llei 16/2002, d'1 de juliol, de prevenció i control integrats de la contaminació i la Llei 22/2011, de 28 de juliol, de residus i sòls contaminats.

- Ordre PRE/2056/2013, de 7 de novembre, per la qual es modifica l'annex VI del Reglament sobre classificació, envasament i etiquetatge de preparats perillosos, aprovat pel Reial decret 255/2003, de 28 de febrer.

- Resolució de 8 de novembre de 2013, de la Direcció General d'Ocupació, per la qual es registra i publica l'Acta dels acords sobre el procediment per a l'homologació d'activitats formatives en matèria de prevenció de riscos laborals, així com sobre el Reglament de condicions per al manteniment de l'homologació d'activitats formatives en matèria de prevenció de riscos laborals d'acord amb el que s'estableix en el V Conveni col·lectiu del sector de la construcció.

- Resolució de 15 de novembre de 2013, de la Secretaria d'Estat d'Administracions Públiques, per la qual s'actualitza i disposa la publicació del Sistema de Gestió de la Prevenció de Riscos Laborals en l'Administració General de l'Estat.

- Reial decret 842/2013, de 31 d'octubre, pel qual s'aprova la classificació dels productes de construcció i dels elements constructius en funció de les seves propietats de reacció i de resistència enfront del foc (BOE 281, de 23 de novembre de 2013).

- Directiva 2013/59/Euratom del Consell, de 5 de desembre de 2013, per la qual s'estableixen normes de seguretat bàsiques per a la protecció contra els perills derivats de l'exposició a radiacions ionitzants, i es deroguen les Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom i 2003/122/Euratom.

- Reial decret 97/2014, de 14 de febrer, pel qual es regulen les operacions de transport de mercaderies perilloses per carretera en territori espanyol (BOE 50, de 27 de febrer de 2014).

- Reial decret 337/2014, de 9 de maig, pel qual s'aproven el Reglament sobre condicions tècniques i garanties de seguretat en instal·lacions elèctriques d'alta tensió i les seves Instruccions Tècniques Complementàries ITC-*RAT 01 a 23.

- ''Llei 13/2014, del 30 d'octubre, d'accessibilitat.''

- Reglament (UE) no 1303/2014 de la Comissió, de 18 de novembre de 2014, sobre l'especificació tècnica d'interoperabilitat relativa a la «seguretat en els túnels ferroviaris» del sistema ferroviari de la Unió Europea.

- Reglament (UE) 2015/282 de la Comissió, de 20 de febrer de 2015, pel qual es modifiquen, en relació amb l'estudi ampliat de toxicitat per a la reproducció en una generació, els annexos VIII, IX i X del Reglament (CE) no 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i preparats químics (REACH).

- Reglament (UE) 2015/326 de la Comissió, de 2 de març de 2015, pel qual es modifica, en relació amb els hidrocarburs aromàtics policíclics i els ftalats, l'annex XVII del Reglament (CE) núm. 1907/2006 del Parlament Europeu i del Consell, relatiu al registre, l'avaluació, l'autorització i la restricció de les substàncies i preparats químics (REACH).

- Reial decret 598/2015, de 3 de juliol, pel qual es modifiquen el Reial decret 39/1997, de 17 de gener, pel qual s'aprova el Reglament dels serveis de prevenció , i altres Reials decrets : l'RD 485/97, l'RD 665/97 i l'RD 374/2001.

- Reial decret 840/2015, de 21 de setembre, pel qual s'aproven mesures de control dels riscos inherents als accidents greus en els quals intervinguin substàncies perilloses.

- Reial decret 899/2015, de 9 d'octubre, pel qual es modifica el Reial decret 39/1997, de 17 de gener, pel qual s'aprova el Reglament dels Serveis de Prevenció.

- Reial decret 901/2015, de 9 d'octubre, pel qual es modifica el Reial decret 843/2011, de 17 de juny, pel qual s'estableixen els criteris bàsics sobre l'organització de recursos per a desenvolupar l'activitat sanitària dels serveis de prevenció.

- Ordre ESS/2259/2015, de 22 d'octubre, per la qual es modifica l'Ordre TIN/2504/2010, de 20 de setembre, per la qual es desenvolupa el Reial decret 39/1997, de 17 de gener, pel qual s'aprova el Reglament dels Serveis de Prevenció, en el referit a l'acreditació d'entitats especialitzades com a serveis de prevenció, memòria d'activitats preventives i autorització per a realitzar l'activitat d'auditoria del sistema de prevenció de les empreses.

- Reial decret 1054/2015, de 20 de novembre, pel qual s'aprova el Pla Estatal de Protecció Civil davant el Risc Radiològic.

- Reial decret 1072/2015, de 27 de novembre, pel qual es modifica el Reial decret 2200/1995, de 28 de desembre, pel qual s'aprova el Reglament de la Infraestructura per a la Qualitat i la Seguretat Industrial.

- Directiva (UE) 2017/164 de la Comissió, de 31 de gener de 2017, per la qual s'estableix una quarta llista de valors límit d'exposició professional indicatius de conformitat amb la Directiva 98/24/CE del Consell i per la qual es modifiquen les Directives 91/322/CEE, 2000/39/CE i 2009/161/UE de la Comissió.

- Reial decret 115/2017, de 17 de febrer, pel qual es regula la comercialització i manipulació de gasos fluorats i equips basats en aquests, així com la certificació dels professionals que els utilitzen i pel qual s'estableixen els requisits tècnics per a les instal·lacions que desenvolupin activitats que emetin gasos fluorats (BOE 42, de 18 de febrer de 2017).

- Reial decret 656/2017, de 23 de juny, pel qual s'aprova el Reglament d'Emmagatzematge de Productes Químics i les seves Instruccions Tècniques Complementàries MIE APQ 0 a 10 (BOE 176, de 25 de juliol de 2017).

- Llei 9/2017, de 8 de novembre, de Contractes del Sector Públic, per la qual es transposen a l'ordenament jurídic espanyol les Directives del Parlament Europeu i del Consell 2014/23/UE i 2014/24/UE, de 26 de febrer de 2014 (BOE 272, de 09 de novembre de 2017).

- Ordre TEC/1146/2018, de 22 d'octubre, per la qual s'aprova la instrucció tècnica complementària 04.7.06 ''Control de gasos tòxics en l'atmosfera de les activitats subterrànies'' i es modifica la instrucció tècnica complementària 05.0.02 ''Especificacions per a mines subterrànies de carbó i labors amb el risc d'explosió. Continguts límits de metà en el corrent d'aire'', del Reglament General de Normes Bàsiques de Seguretat Minera.

- Resolució de 14 de novembre de 2018, de la Direcció General d'Indústria i de la Petita i mitjana empresa, per la qual s'actualitza el llistat de normes de la instrucció tècnica complementària ITC-*ICG 11 del Reglament tècnic de distribució i utilització de combustibles gasosos, aprovat pel Reial decret 919/2006, de 28 de juliol.

- Ordre PCI/1319/2018, de 7 de desembre, per la qual es modifica l'Annex II del Reial decret 1513/2005, de 16 de desembre, pel qual es desenvolupa la Llei 37/2003, de 17 de novembre, del soroll, referent a l'avaluació del soroll ambiental.

**4.2. Condicions ambientals**

- “Ordre de 27 de juny de 1985, sobre inscripció d'empreses amb risc per amiant (DOGC Diari Oficial de la Generalitat de Catalunya de 05 d’agost de 1985)”.

- “Ordre de 30 de juny de 1987, sobre registri de dades de control de l'ambient laboral i vigilància mèdica en empreses amb risc d'amiant (DOGC Diari Oficial de la Generalitat de Catalunya de 10 de juliol de 1987)”.

- Reial decret 108/1991, d'1 de febrer, sobre la prevenció i reducció de la contaminació del medi ambient produïda per l'amiant (BOE de 6 de febrer de 1991).

- Reial decret 664/1997, de 12 de maig, sobre la protecció dels treballadors contra els riscos relacionats amb l'exposició a agents biològics durant el treball (BOE de 24 de maig de 1997). Modificat per Ordre de 25 de març de 1998.

- Reial decret 665/1997, de 12 de maig, sobre la protecció dels treballadors contra els riscos relacionats amb l'exposició a agents cancerígens durant el treball (BOE de 24 de maig de 1997). Modificat per Reial decret 1124/2000 (BOE de 17 de juny de 2000) i Reial decret 349/2003 (BOE de 5 d'abril de 2003).

- Reial decret 212/2002, de 22 de febrer de 2002, pel qual es regulen les emissions sonores en l'entorn degudes a determinades màquines d'ús a l'aire lliure (BOE d'1 de març de 2002). Modificat per Reial decret 524/2006 (BOE de 4 de maig de 2006).

- Reial decret 681/2003, de 12 de juny, sobre la protecció de la salut i la seguretat dels treballadors exposats als riscos derivats d'atmosferes explosives en el lloc de treball (BOE de 18 de juny de 2003).

- Llei ordinària 37/2003 del Soroll de 17 de novembre (BOE de 18 novembre de 2003). Desenvolupada per Reial decret 1513/2005 (BOE de 17 de desembre de 2005) i Reial decret 1367/2007 (BOE de 23 d'octubre 2007).

- Protecció dels treballadors davant els riscos derivats de l'exposició al soroll durant el treball. Reial decret 286/2006, de 10 de març, sobre la protecció de la salut i seguretat dels treballadors contra els riscos relacionats amb l'exposició al soroll. (BOE 11 de març de 2006).

- Reial decret 1367/2007, de 19 d'octubre, pel qual es desenvolupa la Llei 37/2003, de 17 de novembre, del Soroll, referent a zonificació acústica, objectius de qualitat i emissions acústiques (BOE de 23 d'octubre de 2007).

- Llei 34/2007, de 15 de novembre, de qualitat de l'aire i protecció de l'atmosfera (BOE de 16 de novembre de 2007).

**4.3. Incendis**

- Ordenances municipals.

- “Decret 64/1995, de 7 de març, pel qual s’estableixen mesuris
de prevenció d’incendis forestals (DOGC Diari Oficial de la Generalitat de Catalunya de 10 de març de 1995)” i desenvolupada per “Ordre MAB/62/2003 (DOGC Diari Oficial de la Generalitat de Catalunya de 24 de Febrer de 2003)”.

- Reial decret 513/2017, de 22 de maig, pel qual s'aprova el Reglament d'instal·lacions de protecció contra incendis (BOE 139, de 12 de juny de 2017).

**4.4. Instal·lacions elèctriques**

- Ordre de 18 de juliol de 1978, per la qual s'aprova la Norma Tecnològica NTE-IEE/1978, “Instal·lacions d'electricitat: enllumenat exterior” (BOE de 12 d'agost de 1978).

- “Resolució de 4 de novembre de
1988, per la qual s’estableix un certificat sobre compliment dels distàncies reglamentàries d’obris
i construccions a línies elèctriques (DOGC Diari Oficial de la Generalitat de Catalunya de 30 de novembre de 1988)”.

- Llei 54/1997, de 27 de novembre de 1997, del Sector Elèctric (BOE de 28 de novembre de 1997). Complementada per Reial decret 1955/2000 (BOE de 27 de desembre de 2000).

- “Llei 6/2001, de 31 de maig, d’ordenació ambiental de l’enllumenament per a
la protecció del medi nocturn (DOGC Diari Oficial de la Generalitat de Catalunya de 12 de juny de 2001)”.

- Reial decret 614/2001, de 8 de juny, sobre disposicions mínimes per a la protecció de la salut i seguretat dels treballadors enfront del risc elèctric (BOE de 21 de juny de 2001).

- “Decret 329/2001, de 4
de desembre, pel qual s’aprova el Reglament del subministrament elèctric (DOGC Diari Oficial de la Generalitat de Catalunya de 18 de desembre de 2001)”.

- Reglament electrotècnic de baixa tensió. RD 842/2002 de 2 d'agost (BOE de 18 de setembre de 2002).

- Sentència de 17 de febrer de 2004, de la Sala Tercera del Tribunal Suprem, per la qual s'anul·la l'incís 4.2.c.2 de la ITC-*BT-03 annexa al Reglament Electrònic per a baixa tensió, aprovat per Reial decret 842/2002, de 2 d'agost.

- Reial decret 223/2008, de 15 de febrer, del Ministeri d'Indústria, Turisme i Comerç pel qual s'aproven el Reglament sobre condicions tècniques i garanties de seguretat en línies elèctriques d'alta tensió i les seves instruccions tècniques complementàries ITC-*LAT 01 a 09 (BOE de 19 de març de 2008)”.

- Instruccions Tècniques Complementàries del Reglament electrotècnic de baixa tensió: ITC-*BT-09 Instal·lacions d'enllumenat exterior i ITC-*BT-33 Instal·lacions provisionals i temporals d'obres.

**4.5. Equips i maquinària**

- Ordre de 30 de juliol de 1974, per la qual es determinen les condicions que han de reunir els aparells elevadors de propulsió hidràulica i les normes per a l'aprovació dels seus equips impulsors (BOE de 9 d'agost de 1974).

- Reglament d'aparells d'elevació i el seu manteniment. RD 2291/1985 de 8 de novembre (BOE d'11 de desembre de 1985). Derogat parcialment per rD 1314/1997 (BOE de 30 de setembre de 1997).

- Reial decret 474/1988, de 30 de març, pel qual es dicten les disposicions d'aplicació de la Directiva del Consell de les Comunitats Europees 84/528/CEE sobre aparells elevadors i de maneig mecànic (BOE de 20 de maig de 1988).

- Resolució de 3 abril de 1997, de la Direcció General de Tecnologia i Seguretat Industrial per la qual s'autoritza la instal·lació d'ascensors sense cambra de màquines (BOE de 23 d'abril de 1997).

- Reial decret 488/1997, de 14 d'abril, sobre disposicions mínimes de seguretat i salut relatives al treball amb equips que inclouen pantalles de visualització (BOE de 23 d'abril de 1997).

- Disposicions mínimes de seguretat i salut relatives a la utilització pels treballadors d'equips de protecció Individual. RD 773/1997 de 30 de maig (BOE 12 de juny de 1997).

- Reial decret 1215/1997, de 18 de juliol pel qual s'estableixen les disposicions mínimes de seguretat i salut per a la utilització pels treballadors dels equips de treball (BOE de 7 d'agost de 1997). Modificat per Reial decret 2177/2004 (BOE de 13 de novembre de 2004).

- Resolució de 10 de setembre de 1998, de la Direcció General de Tecnologia i Seguretat Industrial, per la qual s'autoritza la Instal·lació d'ascensors amb màquines en fossat (BOE de 25 setembre de 1998).

- Reial decret 1849/2000, de 10 de novembre, del Reglament de seguretat en les màquines, pel qual es deroguen diferents disposicions en matèria de normalització i homologació de productes industrials (BOE de 2 de desembre de 2000).

- Reial decret 2177/2004, de 12 de novembre, pel qual es modifica el Reial decret 1215/1997, de 18 de juliol, pel qual s'estableixen les disposicions mínimes de seguretat i salut per a la utilització pels treballadors dels equips de treball, en matèria de treballs temporals en altura (BOE de 13 de novembre de 2004).

- Reial decret 1311/2005, de 4 de novembre de 2005, sobre la protecció de la salut i la seguretat dels treballadors enfront dels riscos derivats o que puguin derivar-se de l'exposició a vibracions mecàniques (BOE de 5 de novembre de 2005).

- Reial decret 1644/2008, de 10 d'octubre, pel qual s'estableixen les normes per a la comercialització i posada en servei de les màquines (BOE 246, d'11 d'octubre de 2008).

- Reial decret 2060/2008, de 12 de desembre, pel qual s'aprova el Reglament d'equips a pressió i les seves instruccions tècniques complementàries (BOE 31, de 5 de febrer de 2009).

- Reial decret 1388/2011, de 14 d'octubre, pel qual es dicten les disposicions d'aplicació de la Directiva 2010/35/UE del Parlament Europeu i del Consell de 16 de juny de 2010 sobre equips a pressió transportables i per la qual es deroguen les Directives 76/767/CEE, 84/525/CEE, 84/526/CEE, 84/527/CEE i 1999/36/CE.

- Reial decret 494/2012, de 9 de març, pel qual es modifica el Reial decret 1644/2008, de 10 d'octubre, pel qual s'estableixen les normes per a la comercialització i posada en servei de les màquines, per a incloure els riscos d'aplicació de plaguicides.

- Reial decret 88/2013, de 8 de febrer, pel qual s'aprova la Instrucció Tècnica Complementària AEM 1 ''Ascensors'' del Reglament d'aparells d'elevació i manutenció, aprovat per Reial decret 2291/1985, de 8 de novembre (BOE 46, de 22 de febrer de 2013).

- Reial decret 709/2015, de 24 de juliol, pel qual s'estableixen els requisits essencials de seguretat per a la comercialització dels equips a pressió (BOE 210, de 2 de setembre de 2015).

- Reial decret 203/2016, de 20 de maig, pel qual s'estableixen els requisits essencials de seguretat per a la comercialització d'ascensors i components de seguretat per a ascensors (BOE 126, de 25 de maig de 2016).

- Reial decret 115/2017, de 17 de febrer, pel qual es regula la comercialització i manipulació de gasos fluorats i equips basats en aquests, així com la certificació dels professionals que els utilitzen i pel qual s'estableixen els requisits tècnics per a les instal·lacions que desenvolupin activitats que emetin gasos fluorats.

- Reial decret 656/2017, de 23 de juny, pel qual s'aprova el Reglament d'Emmagatzematge de Productes Químics i les seves Instruccions Tècniques Complementàries MIE APQ 0 a 10.

- Ordre FOM/606/2018, de 25 de maig, sobre el contingut de l'informe anual per al transport de mercaderies perilloses per carretera.

- Instruccions Tècniques Complementàries:

  ITC – MIE – AEM2: Grues torre desmuntables per a obres. RD 836/2003 de 27 de maig de 2003 (BOE 17 de juliol de 2003).
  ITC – MIE – AEM3: Carretes automotrius de manutenció. OM. 26 de maig de 1989 (BOE 9 de juny de 1989).
  ITC – MIE – AEM4: Reglament d'aparells d'elevació i manutenció, referents a grues mòbils autopropulsades. RD 837/2003 de 27 de maig de 2003 (BOE 17 de juliol de 2003).
  Norma UNE-58921-IN Instruccions per a la instal·laci, maneig, manteniment, revisions i inspeccions de les plataformes elevadores mòbils de personal (PEMP).

**4.6. Equips de protecció individual**

- Comercialització i lliure circulació intracomunitària dels equips de protecció individual. RD 1407/1992 de 20 de novembre (BOE 28 de desembre de 1992). Modificat per OM de 16 de maig de 1994, per rD 159/1995 de 3 de febrer (BOE 8 de març de 1995) i per la Resolució de 27 de maig de 2002 (BOE 4 de juliol de 2002). Complementat per la Resolució de 25 d'abril de 1996 (BOE de 28 de maig de 1996), Resolució de 18 de març de 1998 (BOE de 22 d'abril de 1998), Resolució de 29 d'abril de 1999 (BOE de 29 de juny de 1999), Resolució de 28 de juliol de 2000 (BOE de 8 de setembre de 2000) i Resolució de 7 de setembre de 2001 (BOE de 27 de setembre de 2001).

- Reial decret 159/1995, de 3 de febrer , pel qual es modifica el Reial decret 1407/1992, de 20 de novembre, pel qual es regula les condicions per a la comercialització i lliure circulació intracomunitària dels equips de protecció individual (BOE de 8 de març de 1995) modificat per Ordre de 20 de febrer de 1997 (BOE de 6 de març de 1997).

- RD 773/1997 de 30 de maig, sobre disposicions mínimes de seguretat i salut relatives a la utilització pels treballadors d'equips de protecció individual.

- Decisió de la Comissió, de 16 de març de 2006, relativa a la publicació de les referències de la norma EN 143:2000, Equips de protecció respiratòria. Filtres contra partícules. Requisits, assajos, marcat, de conformitat amb la Directiva 89/686/CEE del Consell (equips de protecció individual) [notificada amb el número C(2006) 777].

- Directiva 2014/68/UE del Parlament Europeu i del Consell, de 15 de maig de 2014, relativa a l'harmonització de les legislacions dels Estats membres sobre la comercialització d'equips a pressió (refosa).

- Normes Tècniques Reglamentàries.

**4.7. Senyalització**

- Disposicions mínimes en matèria de senyalització de seguretat i salut en el treball. RD 485/1997 (BOE 23 d'abril de 1997).

- Ordre de 31 d'agost de 1987 sobre Senyalització, abalisament, defensa, neteja i terminació d'obres fixes en vies fora de poblat (BOE de 18 de setembre de 1987).

- Normes sobre senyalització d'obres en carreteres. Instrucció 8.3. IC del MOPU.

**4.8. Diversos**

- Ordre de 20 de juny de 1986 sobre Catalogació i Homologació dels explosius, productes explosius i els seus accessoris (BOE d'1 de juliol de 1986).

- Ordre de 16 de desembre de 1987 per la qual s'estableixen nous models per a la notificació d'accidents de treball i es donen instruccions per al seu emplenament i tramitació (BOE de 29 de desembre de 1987). Modificada per Ordre TAS/2926/2002 (BOE de 21 de novembre de 2002).

- Resolució d'1 d'agost de 2007, de la Direcció General de Treball, per la qual s'inscriu en el registre i publica l'IV Conveni Col·lectiu General del Sector de la Construcció (BOE de 17 d'agost de 2007).

- Convenis col·lectius.

- Reial decret 1591/2009, de 16 d'octubre, pel qual es regulen els productes sanitaris (BOE 268 de 6 de novembre de 2009).

- Ordre TIN/1071/2010, de 27 d'abril, sobre els requisits i dades que han de reunir les comunicacions d'obertura o de represa d'activitats en els centres de Treball.

- Directiva 2014/28/UE del Parlament Europeu i del Consell, de 26 de febrer de 2014, relativa a l'harmonització de les legislacions dels Estats membres en matèria de comercialització i control d'explosius amb finalitats civils (refosa).

- Reial decret 130/2017, de 24 de febrer, pel qual s'aprova el Reglament d'Explosius (BOE 54, de 4 de març de 2017).

- Reial decret 257/2018, de 4 de maig, pel qual es modifica el Reial decret 1299/2006, de 10 de novembre, pel qual s'aprova el quadre de malalties professionals en el sistema de la Seguretat Social i s'estableixen criteris per a la seva notificació i registre.

**5. CONDICIONS ECONÒMIQUES**

**5.1. Criteris d'aplicació**

L'Art. 5.4 del RD 1627/1997 de 24 d'octubre, manté per al sector de la construcció, la necessitat d'estimar l'aplicació de la seguretat i salut com un cost ‘‘afegit’’ a l'Estudi de Seguretat i Salut, i per consegüent, incorporat al projecte.

El pressupost per a l'aplicació i execució de l'Estudi de Seguretat i Salut, haurà de quantificar el conjunt de ‘‘costos" previstos, tant als referents a la suma total com a la valoració unitària d'elements, amb referència al quadre de preus sobre el qual es calcula. Solament podran figurar partides alçades en els casos d'elements o operacions de difícil previsió.

Les mesures, qualitats i valoració recollides en el pressupost de l'Estudi de Seguretat i Salut podran ser modificades o substituïdes per alternatives proposades pel contractista en el seu Pla de Seguretat i Salut, prèvia justificació tècnica degudament motivada, sempre que això no suposi disminució de l'import total ni dels nivells de protecció continguts en l'Estudi de Seguretat i Salut. A aquest efecte, el pressupost del ESS haurà d'anar incorporat en el pressupost general de l'obra com un capítol més d'aquest.

La tendència a integrar la Seguretat i Salut (pressupost de Seguretat i Salut = 0), es contempla en el mateix cos legal quan el legislador indica que, no s'inclouran en el pressupost de l'Estudi de Seguretat i Salut els ‘‘costos’’ exigits per a la correcta execució professional dels treballs, conforme a les normes reglamentàries en vigor i els criteris tècnics generalment admesos, emeses dels organismes especialitzats. Aquest criteri és l'aplicat en el present ESS en l'apartat relatiu a Mitjans Auxiliars d'Utilitat Preventiva (MAUP).

**5.2. Certificació del pressupost del Pla de Seguretat i Salut**

Si bé el pressupost de seguretat, amb criteris de ‘‘Seguretat Integrada’’ hauria d'estar inclòs en les partides del projecte de forma no segregable, per a les obres de construcció, es precisa l'establiment d'un criteri respecte a la certificació de les partides contemplades en el pressupost del Pla de Seguretat i Salut del contractista per a cada obra.

El pressupost de seguretat i salut s'abonarà d'acord amb el que indiqui el corresponent contracte d'obra.

**5.3. Revisió de preus del Pla de Seguretat i Salut**

Els preus aprovats pel coordinador de seguretat i salut i continguts en el Pla de Seguretat i Salut del contractista, es mantindran durant la totalitat de l'execució material de l'obra.

Excepcionalment, quan el contracte s'hagi executat en un 20% i transcorregut com a mínim un any des de la seva adjudicació, podrà contemplar-se la possibilitat de revisió de preus del pressupost de seguretat, mitjançant els índexs o fórmules de caràcter oficial que determini l'òrgan de contractació, en els terminis contemplats en en en la Llei 9/2017, de 8 de novembre, de Contractes del Sector Públic, per la qual es transposen a l'ordenament jurídic espanyol les Directives del Parlament Europeu i del Consell 2014/23/UE i 2014/24/UE, de 26 de febrer de 2014.

**5.4. Penalitzacions per incompliment en matèria de Seguretat**

A criteri i per unanimitat entre el coordinador de seguretat i salut i la resta dels components de la direcció d'obra o direcció facultativa, la reiteració d'incompliments en l'aplicació dels compromisos adquirits en el pla de seguretat i salut, per acció o omissió del personal propi i/o dels subcontractistes i treballadors autònoms contractats per ells, portaran aparellats conseqüentment per al contractista les següents penalitzacions:

1. MOLT LLEU : 3% del Benefici industrial de l'obra contractada
2. LLEU : 20% del Benefici industrial de l'obra contractada
3. GREU : 75% del Benefici industrial de l'obra contractada
4. MOLT GREU : 75% del Benefici industrial de l'obra contractada
5. CRÍTIC : Paralització dels treballadors + 100% del Benefici industrial de l'obra contractada + Pèrdua d'homologació com a contractista, per la mateixa propietat durant 2 anys.

**6. CONDICIONS TÈCNIQUES GENERALS DE SEGURETAT**

**6.1. Previsions del Contractista en l'aplicació de les Tècniques de Seguretat**

La prevenció de la sinistralitat laboral pretén aconseguir uns objectius concrets, que en el nostre cas són: detectar i corregir els riscos d'accidents laborals.

El contractista principal haurà de reflectir en el seu Pla de Seguretat i Salut la manera concreta de desenvolupar les tècniques de seguretat i salut i com les aplicarà en l'obra.

A continuació, es nomenen, a títol orientatiu, una sèrie de descripcions de les diferents tècniques analítiques i operatives de seguretat:

**– Tècniques analítiques de seguretat**

Els tècniques analítiques de seguretat i salut tenen com a objectiu exclusiu la detecció de riscos i la recerca de les causes.

**Prèvies als accidents**

- Inspeccions de seguretat.
- Anàlisi de treball.
- Anàlisi estadística de la sinistralitat.
- Anàlisi de l'entorn de treball.

**Posteriors als accidents**

- Notificació d'accidents.
- Registre d'accidents.
- Recerca tècnica d'accidents.

- **Tècniques operatives de seguretat**

  Les tècniques operatives de seguretat i salut pretenen eliminar les causes i a través d'aquestes corregir el risc.

  Segons si l'objectiu de l'acció correctora ha d'operar sobre la conducta humana o sobre els factors perillosos mesurats, el contractista haurà de demostrar que en el seu Pla de Seguretat i Salut i Higiene té desenvolupat un sistema d'aplicació de tècniques operatives sobre

**El factor tècnic**

- Sistemes de seguretat.
- Proteccions col·lectives i resguards.
- Manteniment preventiu.
- Proteccions personals.
- Normes.
- Senyalització.

**El factor humà**

- Test de selecció prelaboral del personal.
- Reconeixements mèdics prelaborals.
- Formació.
- Aprenentatge.
- Propaganda.
- Acció de grup.
- Disciplina.
- Incentius.

**6.2. Condicions Tècniques del Control de Qualitat de la Prevenció**

El contractista inclourà a les empreses subcontractades i treballadors autònoms, lligats a ell contractualment, en el desenvolupament del seu Pla de Seguretat i Salut; haurà d'incloure els documents tipus en el seu format real, així com els procediments d'emplenament utilitzats en la seva estructura empresarial, per a controlar la qualitat de la prevenció de la sinistralitat laboral. Aportem al present Estudi de Seguretat, a títol de guia, l'enunciat dels més importants:

- Programa implantat en l'empresa, de qualitat total o el reglamentari pla d'acció preventiva.
- Programa bàsic de formació preventiva estandarditzat pel contractista principal.
- Formats documentals i procediments d'emplenament, integrats a l'estructura de gestió empresarial, relatius al control administratiu de la prevenció.
- Comitè i/o comissions vinculats a la prevenció.
- Documents vinculants, actes i/o memorandums.
- Manuals i/o procediments segurs de treballs, d'ordre intern d'empresa.
- Control de qualitat de seguretat del producte.

**6.3. Condicions Tècniques dels Òrgans de l'Empresa Contractista competents en matèria de Seguretat i Salut**

El comitè o les persones encarregades de la promoció, coordinació i vigilància de la seguretat i salut de l'obra seran almenys les mínimes establertes per la normativa vigent per al cas concret de l'obra de referència, assenyalant específicament al Pla de Seguretat la seva relació amb l'organigrama general de seguretat i salut de l'empresa adjudicatària de les obres.

El contractista acreditarà l'existència d'un Servei Tècnic de Seguretat i Salut (propi o concertat) com a departament staff depenent de la direcció de l'empresa contractista, dotada dels recursos, mitjans i qualificació necessària conforme al RD 39/1997 ‘‘Reglament dels serveis de prevenció’’. En tot cas el constructor comptarà amb l'ajuda del departament tècnic de seguretat i salut de la Mútua d'Accidents de Treball amb la qual tingui establerta pòlissa.

El coordinador de seguretat i salut podrà vedar la participació en aquesta obra del delegat sindical de prevenció que no reuneixi, al seu criteri, la capacitació tècnica preventiva per al correcte compliment de la seva important missió.

L'empresari contractista, com a màxim responsable de la seguretat i salut de la seva empresa, haurà de fixar els àmbits de competència funcional dels delegats sindicals de prevenció en aquesta obra.

L'obra disposarà d'un tècnic de seguretat i salut (propi o concertat) a temps parcial, que assessori els responsables tècnics (i conseqüentment de seguretat) de l'empresa constructora en matèria preventiva, així com una brigada de reposició i manteniment de les proteccions de seguretat, amb indicació de la seva composició i temps de dedicació a aquestes funcions.

**6.4. Obligacions de l'Empresa Contractista competent en matèria de Medicina del Treball**

El Servei de Medicina del Treball integrat en el Servei de Prevenció, o si és el cas el quadre facultatiu competent, d'acord

amb la reglamentació oficial, serà l'encarregat de vetllar per les condicions higièniques que haurà de reunir el centre de treball.

Respecte a les instal·lacions mèdiques en l'obra, existirà almenys una farmaciola d'urgències, que estarà degudament senyalitzat i contindrà allò disposat en la normativa vigent; es revisarà periòdicament el control d'existències.

En el Pla de Seguretat i Salut i Higiene el contractista principal desenvoluparà l'organigrama pertinent i al seu torn les funcions i competències de la seva estructura en medicina preventiva.

Tot el personal de l'obra (propi, subcontractat o autònom), amb independència del termini de durada de les condicions particulars de la seva contractació, haurà d'haver passat un reconeixement mèdic d'ingrés i estar classificat d'acord amb les seves condicions psicofísiques.

Independentment del reconeixement d'ingrés, serà necessari fer a tots els treballadors del centre de treball (propis i subcontractats) -segons ve senyalitzat en la vigent reglamentació sobre aquest tema-, com a mínim un reconeixement periòdic anual.

Paral·lelament l'equip mèdic del Servei de Prevenció de l'empresa (propi, mancomunat o assistit per Mútua d'Accidents) s'haurà d'establir en el Pla de Seguretat i Salut un programa d'actuació cronològica en les matèries de la seva competència, com ara:

- Higiene i prevenció en el treball.
- Medicina preventiva dels treballadors.
- Assistència mèdica.
- Educació sanitària i preventiva dels treballadors.
- Participació en comitè de seguretat i salut.
- Organització i actualització del fitxer i arxiu de medicina d'empresa

**6.5. Competències dels Col·laboradors Prevencionistas en l'obra**

D'acord amb les necessitats de disposar d'un interlocutor alternatiu en absència del Cap d'Obra, es nomenarà un Supervisor de Seguretat i Salut (equivalent a l'antic vigilant de seguretat), considerant-se en principi l'Encarregat General de l'obra com a persona més adequada per a complir-lo, en absència d'un altre treballador més qualificat en aquests treballs a criteri del contractista. La seva nominació es formalitzarà per escrit i es notificarà al Coordinador de Seguretat.

Es nomenarà un socorrista, preferiblement amb coneixements en primers auxilis, amb la missió de realitzar petites cures i organitzar l'evacuació dels accidentats als centres assistencials que corresponguin i que a més serà l'encarregat del control de la dotació de la farmaciola.

A efectes pràctics, i amb independència del Comitè de Seguretat i Salut, si la importància de l'obra l'aconsella, es constituirà a peu d'obra una ‘‘Comissió Tècnica Interempresarial de Responsables de Seguretat’’, integrada pels màxims responsables tècnics de les empreses participants en cada fase de l'obra. Aquesta Comissió, es reunirà com a mínim mensualment, i serà presidida pel Cap d'Obra del contractista amb l'assessorament de l'el seu Servei de Prevenció (propi o concertat).

**6.6. Competències de Formació en Seguretat en l'obra**

El contractista haurà d'agregar al Pla de Seguretat i Salut, un programa d'actuació que reflecteixi un sistema d'entrenament inicial bàsic de tots els treballadors nous. El mateix criteri se seguirà si són traslladats a un nou lloc de treball o ingressen com a operadors de màquines, vehicles o aparells d'elevació.

S'impartirà entre el personal, la formació adequada per a assegurar el correcte ús dels mitjans posats al seu abast per a millorar el rendiment, qualitat i seguretat en el seu treball.

**7. PLEC DE CONDICIONS TÈCNIQUES ESPECÍFIQUES DE SEGURETAT DELS EQUIPS, MÀQUINES I/O MÀQUINES-EINES**

**7.1. Definició i característiques dels Equips, Màquines i/o Màquines-Eines**

**– Definició**

És un conjunt de peces o òrgans units entre si, dels quals almenys un és mòbil i, si és el cas, d'òrgans d'accionament, circuits de comandament i de potència, etc., associats de manera solidària per a una aplicació determinada, en particular destinada a la transformació, tractament, desplaçament i accionament d'un material.

El terme equipo i/o màquina també cobreix:

- Un conjunt de màquines que estiguin disposades i siguin accionades per a funcionar solidàriament.
- Un mateix equip intercanviable, que modifiqui la funció d'una màquina, que es comercialitzi en condicions que permetin al propi operador, acoblar a una màquina, a una sèrie d'elles o a un tractor, sempre que aquest equip no sigui una peça de recanvi o una eina.

Quan l'equip, màquina i/o màquina ferratge disposi de components de seguretat que es comercialitzin per separat per a garantir una funció de seguretat en el seu ús normal, aquests adquireixen, a l'efecte del present Estudi de Seguretat i Salut, la consideració de Mig Auxiliar d'Utilitat Preventiva (MAUP).

**– Característiques**

Els equips de treball i màquines aniran acompanyats d'unes instruccions d'utilització, esteses pel fabricant o importador, en les quals figuraran les especificacions de manutenció, instal·lació i utilització, així com les normes de seguretat i qualsevol altra instrucció que, de manera específica, sigui exigida en les corresponents Instruccions Tècniques Complementàries (ITC); aquestes inclouran els plans i esquemes necessaris per al manteniment i verificació tècnica, estant ajustats a les normes UNE que li siguin aplicable. Portaran a més, una placa de material durador i fixada amb solidesa en un lloc ben visible, en la qual figuressin, com a mínim, les següents dades:

- Nom del fabricant.
- Any de fabricació, importació i/o subministrament.
- Tipus i número de fabricació.
- Potència en Kw.
- Contrasenya d'homologació CE i certificat de seguretat d'ús d'una entitat acreditada, si escau.

**7.2. Condicions d'elecció, utilització, magatzematge i manteniment dels Equips, Màquines i/o Màquines-Eines**

**– Elecció d'un equip**

Els equips, màquines i/o màquines eines hauran de seleccionar-se basant-se en uns criteris de garanties de seguretat per als seus operadors i respecte al seu medi ambient de treball.

**– Condicions d'utilització dels equips, màquines i/o màquines eines**

Són les contemplades en l'Annex II del RD 1215, de 18 de juliol, sobre ‘‘Disposicions mínimes de seguretat i salut per a la utilització dels treballadors dels equips de treball":

**– Emmagatzematge i manteniment**

- Se seguiran escrupolosament les recomanacions de magatzematge i citacions, fixades pel fabricant i contingudes en el seu ‘‘Guia de manteniment preventiu’‘.
- Es reemplaçaran els elements, es netejaran, greixaran, pintaran, ajustaran i es col·locaran en el lloc assignat, seguint les instruccions del fabricant.
- S'emmagatzemaran en compartiments amplis i secs, amb temperatures compreses entre 15 i 25 °C.
- El magatzematge, control de l'estat d'utilització i els lliuraments d'equips estaran documentades i custodiades, amb justificant de recepció de conformitat, lliurament i rebut, per un responsable tècnic, delegat per l'usuari.

**7.3. Normativa aplicable**

– Directives comunitàries relatives a la seguretat de les màquines, transposicions i dates d'entrada en vigor

Sobre comercialització i/o posada en servei a la Unió Europea

Directiva fonamental.

- Directiva 2006/42/CE del Parlament Europeu i del Consell, de 17 de maig de 2006, relativa a les màquines i per la qual es modifica la Directiva 95/16/CE (refosa)).

  Entrada en vigor del Reial decret 1644/2008, de 10 d'octubre, pel qual s'estableixen les normes per a la comercialització i posada en servei de les màquines.

Excepcions:

- Carretones automotors de manutenció: el 1/7/95, amb període transitori fins a el1/1/96.
- Màquines per a elevació o desplaçament de persones: el 9/2/95, amb període transitori fins al 1/1/97.
- Components de Seguretat (inclou ROPS i FOPS, veure la Comunicació de la Comissió 94/C253/03 - DOTZE ISP C253, de 10/9/94): el 9/2/95, amb període transitori fins al 1/1/97.
- Marcat: el 9/2/95, amb període transitori fins al 1/1/97.

  Altres Directives

- Directiva del Consell 73/23/CEE, de 19/2/73, relativa a l'aproximació de les legislacions dels Estats membres sobre el material elèctric destinat a utilitzar-se amb determinats límits de tensió (DOTZE núm. L 77, de 26/3/73), modificada per la Directiva del Consell 93/68/CEE.
  Transposada pel Reial decret 7/1988, de 8 de gener (BOE de 14/1/88), modificat pel Reial decret 154/1995 de 3 de febrer (BOE de 3/3/95).
  Entrada en vigor del RD 7/1988: el 1/12/88.
  Entrada en vigor del RD 154/1995: el 4/3/95, amb període transitori fins al 1/1/97.
  Sobre aquest tema , veure també la Resolució del 11/6/98 de la Direcció General de Tecnologia i Seguretat Industrial (BOE de 13/7/98).

- Directiva 2014/29/UE del Parlament Europeu i del Consell, de 26 de febrer de 2014, sobre l'harmonització de les legislacions dels Estats membres en matèria de comercialització dels recipients a pressió simples.

- Directiva 2014/30/UE del Parlament Europeu i del Consell, de 26 de febrer de 2014, sobre l'harmonització de les legislacions dels Estats membres en matèria de compatibilitat electromagnètica (refosa).

- Directiva 2014/34/UE del Parlament Europeu i del Consell, de 26 de febrer de 2014, sobre l'harmonització de les legislacions dels Estats membres en matèria d'aparells i sistemes de protecció per a ús en atmosferes potencialment explosives (refosa).

- Directiva 2014/68/UE del Parlament Europeu i del Consell, de 15 de maig de 2014, relativa a l'harmonització de les legislacions dels Estats membres sobre la comercialització d'equips a pressió.

- Reglament (UE) 2016/426 del Parlament Europeu i del Consell, de 9 de març de 2016, sobre els aparells que cremen combustibles gasosos i pel qual es deroga la Directiva 2009/142/CE.

- Onze Directives, amb les seves corresponents modificacions i adaptacions al progrés tècnic, relatives a l'aproximació de la legislació dels Estats membres sobre determinació de l'emissió sonora de màquines i materials utilitzats en les obres de construcció.
  Transposades pel Reial decret 245/1989, de 27 de febrer (BOE de 11/3/89); Ordre Ministerial de 17/11/1989 (BOE de 1/12/89), Ordre Ministerial de 18/7/1991 (BOE de 26/7/91), Reial decret 71/1992, de 31 de gener (BOE de 6/2/92) i Ordre Ministerial de 29/3/1996 (BOE de 12/4/96).
  Entrada en vigor: En funció de cada directiva.

  Sobre utilització de màquines i equips per al treball:

- Directives 2009/104/CE del Parlament Europeu i del Consell, de 16 de setembre de 2009, relativa a les disposicions mínimes de seguretat i de salut per a la utilització pels treballadors en el treball dels equips de treball (segona Directiva específica conformement a l'article 16, apartat 1, de la Directiva 89/391/CEE).

  – Normativa d'aplicació restringida

- Reial decret 1849/2000, de 10 de Novembre, pel qual es deroguen diferents disposicions en matèria de normalització i homologació de productes industrials (BOE de 2/12/2000), i Ordre Ministerial de 8/4/1991, per la qual s'aprova la Instrucció Tècnica Complementària MSG-SM-1 del Reglament de Seguretat de les Màquines, referent a màquines, elements de màquines o sistemes de protecció, usats (BOE de 11/5/91).

- Ordre Ministerial, de 26/5/1989, per la qual s'aprova la Instrucció Tècnica Complementària MIE-*AEM-3 del Reglament d'Aparells d'Elevació i Manutenció referent a Carretons automotors de manteniment (BOE de 9/6/89).
  • Reial decret 836/2003, de 27 de juny, per la qual s'aprova la nova Instrucció Tècnica Complementària MIE-*AEM-2 del Reglament d'Aparells d'elevació i Manutenció, referent a Grues Torre desmuntables per a obres (BOE de 17/7/03).

- Reial decret 837/2003, de 27 de juny, pel qual s'aprova el nou text modificat i refós de la Instrucció Tècnica Complementària MIE-*AEM-4 del Reglament d'Aparells d'elevació i Manutenció, referent a Grues mòbils

autopropulsades usades (BOE de 17/7/03).

- Reial decret 1849/2000, de 10 de novembre, pel qual es deroguen diferents disposicions en matèria de normalització i homologació de productes industrials (BOE de 2/12/00).

- Ordre Ministerial, de 9/3/1971, per la qual s'aprova l'Ordenança General de Seguretat i Higiene en el Treball (BOE de 16/3/71; BOE de 17/3/71 i BOE de 6/4/71). Anul·lada parcialment pel R.D 614/2001 de 8 de juny. (BOE de 21/6/01).

**8. Signatures**

Barcelona, Febrer de 2024
L'enginyer Autor del Projecte

Fco. Javier Jordán García
PEDELTA, S.L.

# DOCUMENT NÚM. 4: PRESSUPOSTOS

# AMIDAMENTS

# AMIDAMENTS



Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 01 ESTUDIO DE SEGURIDAD Y SALUD
Titol 3 01 EQUIPOS PROTECCIÓN INDIVIDUAL

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | H1411111 | u | Casco de seguridad para uso normal, contra golpes, de polietileno con un peso máximo de 40 |
| | | | Casco de seguridad para uso normal, contra golpes, de polietileno con un peso máximo de 400 g, homologado según UNE-EN 812 |
| | | | AMIDAMENT DIRECTE 8,000 |
| 2 | H1421110 | u | Gafas de seguridad antiimpactos estándar, con montura universal, con visor transparente y tr |
| | | | Gafas de seguridad antiimpactos estándar, con montura universal, con visor transparente y tratamiento contra el empañamiento, homologadas según UNE-EN 167 y UNE-EN 168 |
| | | | AMIDAMENT DIRECTE 8,000 |
| 3 | H1423230 | u | Gafas de seguridad para corte oxiacetilénico, con montura universal de varilla de acero recubi |
| | | | Gafas de seguridad para corte oxiacetilénico, con montura universal de varilla de acero recubierta de PVC, con visores circulares de 50 mm de D oscuros de color DIN 5, homologadas según UNE-EN 175 y UNE-EN 169 |
| | | | AMIDAMENT DIRECTE 4,000 |
| 4 | H142AC60 | u | Pantalla facial para soldadura eléctrica, con marco abatible de mano y soporte de poliéster ref |
| | | | Pantalla facial para soldadura eléctrica, con marco abatible de mano y soporte de poliéster reforzado con fibra de vidrio vulcanizada de 1,35 mm de espesor, con visor inactínico semioscuro con protección DIN 12, homologada según UNE-EN 175 |
| | | | AMIDAMENT DIRECTE 2,000 |
| 5 | H142CD70 | u | Pantalla facial para protección de riesgos mecánicos, con visor de malla de rejilla metálica, pa |
| | | | Pantalla facial para protección de riesgos mecánicos, con visor de malla de rejilla metálica, para ensamblar al casco con arnés abatible, homologada según UNE-EN 1731 |
| | | | AMIDAMENT DIRECTE 2,000 |
| 6 | H1431101 | u | Protector auditivo de tapón de espuma, homologado según UNE-EN 352-2 y UNE-EN 458 |
| | | | Protector auditivo de tapón de espuma, homologado según UNE-EN 352-2 y UNE-EN 458 |
| | | | AMIDAMENT DIRECTE 50,000 |
| 7 | H1445003 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 140 |
| | | | Mascareta de protecció respiratòria, homologada segons UNE-EN 140 |
| | | | AMIDAMENT DIRECTE 50,000 |
| 8 | H1455710 | u | Pareja de guantes de alta resistencia al corte y abrasión para chatarra, con dedos y palma de |
| | | | Pareja de guantes de alta resistencia al corte y abrasión para chatarra, con dedos y palma de caucho rugoso sobre soporte de algodón, y sujeción elástica a la muñeca, homologados según UNE-EN 388 y UNE-EN 420 |
| | | | AMIDAMENT DIRECTE 8,000 |
| 9 | H1459630 | u | Pareja de guantes para soldador, con palma de piel, forro interior de algodón, y manga larga d |
| | | | Pareja de guantes para soldador, con palma de piel, forro interior de algodón, y manga larga de apriete forrada de dril fuerte, homologados según UNE-EN 407 y UNE-EN 420 |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Pressupost Estudi Seguretat i Salut

# AMIDAMENTS



| | | | |
|---|---|---|---|
| | | | AMIDAMENT DIRECTE 4,000 |
| 10 | H145C002 | u | Pareja de guantes de protección contra riesgos mecánicos comunes de construcción nivel 3, |
| | | | Pareja de guantes de protección contra riesgos mecánicos comunes de construcción nivel 3, homologados según UNE-EN 388 y UNE-EN 420 |
| | | | AMIDAMENT DIRECTE 4,000 |
| 11 | H145K153 | u | Pareja de guantes de material aislante para trabajos eléctricos, clase 00, logotipo beige, tensi |
| | | | Pareja de guantes de material aislante para trabajos eléctricos, clase 00, logotipo beige, tensión máxima 500 V, homologados según UNE-EN 420 |
| | | | AMIDAMENT DIRECTE 4,000 |
| 12 | H1463253 | u | Pareja de botas dieléctricas resistentes a la humedad, de piel rectificada, con tobillera acolch |
| | | | Pareja de botas dieléctricas resistentes a la humedad, de piel rectificada, con tobillera acolchada suela antideslizante y antiestática, cuña amortiguadora para el talón, lengüeta de fuelle, de desprendimiento rápido, sin herramienta metálica, con puntera reforzada, homologadas según DIN 48 |
| | | | AMIDAMENT DIRECTE 4,000 |
| 13 | H1465275 | u | Pareja de botas bajas de seguridad industrial para trabajos de construcción en general, resist |
| | | | Pareja de botas bajas de seguridad industrial para trabajos de construcción en general, resistentes a la humedad, de piel rectificada, con tobillera acolchada, con puntera metálica, suela antideslizante, cuña amortiguadora de impactos en el talón y sin plantilla metálica , homologadas según UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 y UNE-EN ISO 20347 |
| | | | AMIDAMENT DIRECTE 8,000 |
| 14 | H146J364 | u | Pareja de plantillas anticlavos de fleje de acero de 0,4 mm de espesor, de 120 kg de resisten |
| | | | Pareja de plantillas anticlavos de fleje de acero de 0,4 mm de espesor, de 120 kg de resistencia a la perforación, pintadas con pinturas epoxi y forradas, homologadas según UNE-EN ISO 20344 y UNE-EN 12568 |
| | | | AMIDAMENT DIRECTE 10,000 |
| 15 | H147L015 | u | Aparato de anclaje para equipo de protección individual contra caída de altura, homologado s |
| | | | Aparato de anclaje para equipo de protección individual contra caída de altura, homologado según UNE-EN 795, con fijación con taco mecánico |
| | | | AMIDAMENT DIRECTE 4,000 |
| 16 | H147N000 | u | Faja de protección dorslumbar |
| | | | Faja de protección dorslumbar |
| | | | AMIDAMENT DIRECTE 8,000 |
| 17 | H1481343 | u | Mono de trabajo para construcción de obras lineales en servicio, de poliéster y algodón (65%- |
| | | | Mono de trabajo para construcción de obras lineales en servicio, de poliéster y algodón (65%-35%), color amarillo, trama 240, con bolsillos interiores y tiras reflectantes, homologada según UNE-EN 340 |
| | | | AMIDAMENT DIRECTE 4,000 |
| 18 | H1481654 | u | Mono de trabajo para soldadores y/o trabajadores de tubos, de algodón sanforizado (100%), |
| | | | Mono de trabajo para soldadores y/o trabajadores de tubos, de algodón sanforizado (100%), color azul vergara, trama 320, con bolsillos interiores dotados de cremalleras metálicas, homologada según UNE-EN 340, UNE-EN 470- 1 y UNE-EN 348 |

# AMIDAMENTS



AMIDAMENT DIRECTE 4,000

19 H1484110 u Camiseta de trabajo, de algodón

Camiseta de trabajo, de algodón

AMIDAMENT DIRECTE 8,000

20 H1487460 u Impermeable con chaqueta, capucha y pantalón, para obras públicas, de PVC soldado de 0,4

Impermeable con chaqueta, capucha y pantalón, para obras públicas, de PVC soldado de 0,4 mm de grosor, de color vivo, homologado según UNE-EN 340

AMIDAMENT DIRECTE 8,000

21 H148D900 u Arnés para señalista, con tiras reflectantes en la cintura, en el pecho, en la espalda y en los ti

Arnés para señalista, con tiras reflectantes en la cintura, en el pecho, en la espalda y en los tirantes, homologado según UNE-EN 340 y UNE-EN 471

AMIDAMENT DIRECTE 3,000

22 H1485800 u Chaleco reflectante con tiras reflectantes en la cintura, en el pecho y en la espalda, homologa

Chaleco reflectante con tiras reflectantes en la cintura, en el pecho y en la espalda, homologada según UNE-EN 471

AMIDAMENT DIRECTE 8,000

23 H147D501 u Sistema anticaída compuesto por un arnés anticaída con tirantes, bandas secundarias, band

Sistema anticaída compuesto por un arnés anticaída con tirantes, bandas secundarias, bandas subglutias, bandas de muslo, apoyo dorsal para sujeción, elementos de ajuste, elemento dorsal de enganche de arnés anticaída y hebilla, incorporado a un subsistema antici absorbente de energía, homologado según UNE-EN 361, UNE-EN 362, UNE-EN 364, UNE-EN 365 y UNE-EN 355

AMIDAMENT DIRECTE 2,000

Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 01 ESTUDIO DE SEGURIDAD Y SALUD
Titol 3 02 EQUIPOS DE PROTECCIÓN COLECTIVA

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|

1 H152U000 m Valla de advertencia o balizamiento de 1 m de altura con malla de polietileno naranja, fijada a

Valla de advertencia o balizamiento de 1 m de altura con malla de polietileno naranja, fijada a 1 m del perímetro de limite de excavación o de losa con soportes de acero alojados hormigonados

AMIDAMENT DIRECTE 60,000

2 H1534001 u Pieza de plástico en forma de seta, de color rojo, para protección de los extremos de las arm

Pieza de plástico en forma de seta, de color rojo, para protección de los extremos de las armaduras para cualquier diámetro, con desmontaje incluido

AMIDAMENT DIRECTE 50,000

3 H152J105 m Cable fiador para el cinturón de seguridad, fijado en anclajes de servicio y montaje y desmon

Cable fiador para el cinturón de seguridad, fijado en anclajes de servicio y con el montaje y desmontaje incluido para todas las fases necesarias durante las obras



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
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# AMIDAMENTS



AMIDAMENT DIRECTE 40,000

4 HBBAA005 u Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circula

Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con cantos y banda transversal descendente de izquierda a derecha a 45°, en color rojo, diámetro 29 cm, con cartel explicativo rectangular, para ser vista hasta 12 m, fijada y con el desmontaje incluido

AMIDAMENT DIRECTE 1,000

5 HBBAA007 u Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circula

Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con cantos y banda transversal descendente de izquierda a derecha a 45°, en color rojo, diámetro 10 cm, con cartel explicativo rectangular, para ser vista hasta 3 m, fijada y con el desmontaje incluido

AMIDAMENT DIRECTE 2,000

6 HBBAB115 u Señal de obligación, normalizada con pictograma blanco sobre fondo azul, de forma circular c

Señal de obligación, normalizada con pictograma blanco sobre fondo azul, de forma circular con cantos en color blanco, diámetro 29 cm, con cartel explicativo rectangular, por ser vista hasta 12 m, fijada y con el desmontaje incluido

AMIDAMENT DIRECTE 2,000

7 HBBAC005 u Señal indicativa de la ubicación de equipos de extinción de incendios, normalizada con pictogr

Señal indicativa de la ubicación de equipos de extinción de incendios, normalizada con pictograma blanco sobre fondo rojo, de forma rectangular o cuadrada, lado mayor 29 cm, por ser vista hasta 12 m de distancia, fijada y con el desmontaje incluido

AMIDAMENT DIRECTE 2,000

8 HBBAC013 u Señal indicativa de información de salvamento o socorro, normalizada con pictograma blanco

Señal indicativa de información de salvamento o socorro, normalizada con pictograma blanco sobre fondo verde, de forma rectangular o cuadrada, lado mayor 60 cm, para ser vista hasta 25 m de distancia, fijada y con el desmontaje incluido

AMIDAMENT DIRECTE 2,000

9 HBBAE001 u Letrero adhesivo ( MIE-RAT.10 ) de maniobra para cuadro o pupitre de control eléctrico, adhe

Letrero adhesivo ( MIE-RAT.10 ) de maniobra para cuadro o pupitre de control eléctrico, adherido

AMIDAMENT DIRECTE 2,000

10 HBBAF004 u Señal de advertencia, normalizada con pictograma negro sobre fondo amarillo, de forma trian

Señal de advertencia, normalizada con pictograma negro sobre fondo amarillo, de forma triangular con el canto negro, lado mayor 41 cm, con cartel explicativo rectangular, por ser vista hasta 12 m de distancia, fijada y con el desmontaje incluido

AMIDAMENT DIRECTE 2,000

11 HM31161J u Extintor de polvo seco, de 6 kg de carga, con presión incorporada, pintado, con soporte en la

Extintor de polvo seco, de 6 kg de carga, con presión incorporada, pintado, con soporte en la pared y con el desmontaje incluido

AMIDAMENT DIRECTE 2,000

# AMIDAMENTS



| | | | | |
|---|---|---|---|---|
| 12 | HBC12100 | u | Cono de plástico reflectante de 30 cm de altura | |
| | | | Cono de plástico reflectante de 30 cm de altura, montaje y desmontaje incluido para todas las fases necesarias durante las obras | |
| | | | AMIDAMENT DIRECTE | 10,000 |

Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 01 ESTUDIO DE SEGURIDAD Y SALUD
Titol 3 03 IMPLANTACIÓN PROVISIONAL DEL PERSONAL DE OBRA

| NUM. | CODI | UA | DESCRIPCIÓ | |
|---|---|---|---|---|
| 1 | H6AA2111 | m | Valla móvil, de 2 m de altura, de acero galvanizado, con malla electrosoldada de 90x150 mm | |
| | | | Valla móvil, de 2 m de altura, de acero galvanizado, con malla electrosoldada de 90x150 mm y de 4.5 y 3.5 mm de D, bastidor de 3.5x2 m de tubo de 40 mm de D, fijado a pies prefabricados de hormigón, montaje y desmontaje incluido para todas las fases necesarias durante las obras | |
| | | | AMIDAMENT DIRECTE | 200,000 |
| 2 | HQU1B150 | mes | Alquiler de módulo prefabricado para equipamiento sanitarios a obra de 3,7x2,4 m con cierres | |
| | | | Alquiler de módulo prefabricado para equipamiento sanitarios a obra de 3,7x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 1 punto de luz, interruptor, enchufes y protección diferencial, y equipado con 2 inodoros, 2 duchas, lavabo colectivo con 2 grifos y termo eléctrico 50 litros, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat | |
| | | | AMIDAMENT DIRECTE | 6,000 |
| 3 | HQU1D190 | mes | Alquiler de módulo prefabricado para equipamiento de vestuarios en obra de 8x2,4 m con cier | |
| | | | Alquiler de módulo prefabricado para equipamiento de vestuarios en obra de 8x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 2 puntos de luz, interruptor, enchufes y protección diferencial, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat | |
| | | | AMIDAMENT DIRECTE | 6,000 |
| 4 | HQU1E170 | mes | Alquiler de módulo prefabricado para equipamiento de comedor a obra de 6x2,4 m con cierres | |
| | | | Alquiler de módulo prefabricado para equipamiento de comedor a obra de 6x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 1 punto de luz, interruptor, enchufes y protección diferencial, y equipado con fregadero de 1 fregadero con grifo y encimera, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat | |
| | | | AMIDAMENT DIRECTE | 6,000 |
| 5 | HQU22301 | u | Armario metálico individual de doble compartimento interior, de 0,4x0,5x1,8 m, colocado y con | |
| | | | Armario metálico individual de doble compartimento interior, de 0,4x0,5x1,8 m, colocado y con el desmontaje incluido | |
| | | | AMIDAMENT DIRECTE | 8,000 |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
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# AMIDAMENTS



| | | | | |
|---|---|---|---|---|
| 6 | HQU25701 | u | Banco de madera, de 3,5 m de largo y 0,4 m de ancho, con capacidad para 5 personas, colo | |
| | | | Banco de madera, de 3,5 m de largo y 0,4 m de ancho, con capacidad para 5 personas, colocado y con el desmontaje incluido | |
| | | | AMIDAMENT DIRECTE | 2,000 |
| 7 | HQU27902 | u | Mesa de madera con tablero de melamina, de 3,5 m de largo y 0,8 m de ancho, con capacida | |
| | | | Mesa de madera con tablero de melamina, de 3,5 m de largo y 0,8 m de ancho, con capacidad para 10 personas, colocada y con el desmontaje incluido | |
| | | | AMIDAMENT DIRECTE | 1,000 |
| 8 | HQU2AF02 | u | Nevera eléctrica, de 100 l de capacidad, colocada y con el desmontaje incluido | |
| | | | Nevera eléctrica, de 100 l de capacidad, colocada y con el desmontaje incluido | |
| | | | AMIDAMENT DIRECTE | 1,000 |
| 9 | HQU2D102 | u | Plancha eléctrica para calentar comidas, de 60x45 cm, colocada y con el desmontaje incluido | |
| | | | Plancha eléctrica para calentar comidas, de 60x45 cm, colocada y con el desmontaje incluido | |
| | | | AMIDAMENT DIRECTE | 1,000 |
| 10 | HQU2E001 | u | Horno microondas para calentar comidas, colocado y con el desmontaje incluido | |
| | | | Horno microondas para calentar comidas, colocado y con el desmontaje incluido | |
| | | | AMIDAMENT DIRECTE | 1,000 |
| 11 | HQU2GF01 | u | Recipiente para recogida de basura, de 100 l de capacidad, colocado y con el desmontaje incl | |
| | | | Recipiente para recogida de basura, de 100 l de capacidad, colocado y con el desmontaje incluido | |
| | | | AMIDAMENT DIRECTE | 1,000 |
| 12 | HQU2P001 | u | Colgador para ducha, colocado y con el desmontaje incluido | |
| | | | Colgador para ducha, colocado y con el desmontaje incluido | |
| | | | AMIDAMENT DIRECTE | 8,000 |

# QUADRE DE PREUS NÚM. 1

# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|
| P-1 | H1411111 | u | Casco de seguridad para uso normal, contra golpes, de polietileno con un peso máximo de 4<br>Casco de seguridad para uso normal, contra golpes, de polietileno con un peso máximo de 400 g, homologado según UNE-EN 812<br>(SIS EUROS AMB VINT-I-CINC CÈNTIMS) | 6,25 € |
| P-2 | H1421110 | u | Gafas de seguridad antiimpactos estándar, con montura universal, con visor transparente y t<br>Gafas de seguridad antiimpactos estándar, con montura universal, con visor transparente y tratamiento contra el empañamiento, homologadas según UNE-EN 167 y UNE-EN 168<br>(SET EUROS AMB TRENTA-TRES CÈNTIMS) | 7,33 € |
| P-3 | H1423230 | u | Gafas de seguridad para corte oxiacetilénico, con montura universal de varilla de acero recu<br>Gafas de seguridad para corte oxiacetilénico, con montura universal de varilla de acero recubierta de PVC, con visores circulares de 50 mm de D oscuros de color DIN 5, homologadas según UNE-EN 175 y UNE-EN 169<br>(CINC EUROS AMB TRES CÈNTIMS) | 5,03 € |
| P-4 | H142AC60 | u | Pantalla facial para soldadura eléctrica, con marco abatible de mano y soporte de poliéster r<br>Pantalla facial para soldadura eléctrica, con marco abatible de mano y soporte de poliéster reforzado con fibra de vidrio vulcanizada de 1,35 mm de espesor, con visor inactínico semioscuro con protección DIN 12, homologada según UNE-EN 175<br>(DEU EUROS AMB QUARANTA CÈNTIMS) | 10,40 € |
| P-5 | H142CD70 | u | Pantalla facial para protección de riesgos mecánicos, con visor de malla de rejilla metálica, p<br>Pantalla facial para protección de riesgos mecánicos, con visor de malla de rejilla metálica, para ensamblar al casco con arnés abatible, homologada según UNE-EN 1731<br>(NOU EUROS AMB SEIXANTA-UN CÈNTIMS) | 9,61 € |
| P-6 | H1431101 | u | Protector auditivo de tapón de espuma, homologado según UNE-EN 352-2 y UNE-EN 458<br>Protector auditivo de tapón de espuma, homologado según UNE-EN 352-2 y UNE-EN 458<br>(ZERO EUROS AMB VINT-I-TRES CÈNTIMS) | 0,23 € |
| P-7 | H1445003 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 140<br>Mascareta de protecció respiratòria, homologada segons UNE-EN 140<br>(UN EUROS AMB CINQUANTA CÈNTIMS) | 1,50 € |
| P-8 | H1455710 | u | Pareja de guantes de alta resistencia al corte y abrasión para chatarra, con dedos y palma d<br>Pareja de guantes de alta resistencia al corte y abrasión para chatarra, con dedos y palma de caucho rugoso sobre soporte de algodón, y sujeción elástica a la muñeca, homologados según UNE-EN 388 y UNE-EN 420<br>(DOS EUROS AMB SETANTA-SIS CÈNTIMS) | 2,76 € |
| P-9 | H1459630 | u | Pareja de guantes para soldador, con palma de piel, forro interior de algodón, y manga larga<br>Pareja de guantes para soldador, con palma de piel, forro interior de algodón, y manga larga de apriete forrada de dril fuerte, homologados según UNE-EN 407 y UNE-EN 420<br>(NOU EUROS AMB VUITANTA-SIS CÈNTIMS) | 9,86 € |
| P-10 | H145C002 | u | Pareja de guantes de protección contra riesgos mecánicos comunes de construcción nivel 3,<br>Pareja de guantes de protección contra riesgos mecánicos comunes de construcción nivel 3, homologados según UNE-EN 388 y UNE-EN 420<br>(VUIT EUROS AMB VINT CÈNTIMS) | 8,20 € |

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# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|
| P-11 | H145K153 | u | Pareja de guantes de material aislante para trabajos eléctricos, clase 00, logotipo beige, tens<br>Pareja de guantes de material aislante para trabajos eléctricos, clase 00, logotipo beige, tensión máxima 500 V, homologados según UNE-EN 420<br>(VINT EUROS AMB NORANTA-DOS CÈNTIMS) | 20,92 € |
| P-12 | H1463253 | u | Pareja de botas dieléctricas resistentes a la humedad, de piel rectificada, con tobillera acolch<br>Pareja de botas dieléctricas resistentes a la humedad, de piel rectificada, con tobillera acolchada suela antideslizante y antiestática, cuña amortiguadora para el talón, lengüeta de fuelle, de desprendimiento rápido, sin herramienta metálica, con puntera reforzada, homologadas según DIN 48<br>(SEIXANTA-CINC EUROS AMB NORANTA-UN CÈNTIMS) | 65,91 € |
| P-13 | H1465275 | u | Pareja de botas bajas de seguridad industrial para trabajos de construcción en general, resis<br>Pareja de botas bajas de seguridad industrial para trabajos de construcción en general, resistentes a la humedad, de piel rectificada, con tobillera acolchada, con puntera metálica, suela antideslizante, cuña amortiguadora de impactos en el talón y sin plantilla metálica , homologadas según UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 y UNE-EN ISO 20347<br>(DISSET EUROS AMB VINT-I-SET CÈNTIMS) | 17,27 € |
| P-14 | H146J364 | u | Pareja de plantillas anticlavos de fleje de acero de 0,4 mm de espesor, de 120 kg de resisten<br>Pareja de plantillas anticlavos de fleje de acero de 0,4 mm de espesor, de 120 kg de resistencia a la perforación, pintadas con pinturas epoxi y forradas, homologadas según UNE-EN ISO 20344 y UNE-EN 12568<br>(DOS EUROS AMB SETANTA-DOS CÈNTIMS) | 2,72 € |
| P-15 | H147D501 | u | Sistema anticaída compuesto por un arnés anticaída con tirantes, bandas secundarias, band<br>Sistema anticaída compuesto por un arnés anticaída con tirantes, bandas secundarias, bandas subglutias, bandas de muslo, apoyo dorsal para sujeción, elementos de ajuste, elemento dorsal de enganche de arnés anticaída y hebilla, incorporado a un subsistema antici absorbente de energía, homologado según UNE-EN 361, UNE-EN 362, UNE-EN 364, UNE-EN 365 y UNE-EN 355<br>(DOS-CENTS VINT EUROS AMB CINQUANTA-VUIT CÈNTIMS) | 220,58 € |
| P-16 | H147L015 | u | Aparato de anclaje para equipo de protección individual contra caída de altura, homologado<br>Aparato de anclaje para equipo de protección individual contra caída de altura, homologado según UNE-EN 795, con fijación con taco mecánico<br>(VINT-I-QUATRE EUROS AMB VINT CÈNTIMS) | 24,20 € |
| P-17 | H147N000 | u | Faja de protección dorslumbar<br>Faja de protección dorslumbar<br>(VINT-I-TRES EUROS AMB SEIXANTA-SET CÈNTIMS) | 23,67 € |
| P-18 | H1481343 | u | Mono de trabajo para construcción de obras lineales en servicio, de poliéster y algodón (65<br>Mono de trabajo para construcción de obras lineales en servicio, de poliéster y algodón (65%-35%), color amarillo, trama 240, con bolsillos interiores y tiras reflectantes, homologada según UNE-EN 340<br>(VUITANTA-VUIT EUROS AMB TRES CÈNTIMS) | 88,03 € |
| P-19 | H1481654 | u | Mono de trabajo para soldadores y/o trabajadores de tubos, de algodón sanforizado (100%),<br>Mono de trabajo para soldadores y/o trabajadores de tubos, de algodón sanforizado (100%), color azul vergara, trama 320, con bolsillos interiores dotados de cremalleras metálicas, homologada según UNE-EN 340, UNE-EN 470- 1 y UNE-EN 348<br>(VINT-I-TRES EUROS AMB DIVUIT CÈNTIMS) | 23,18 € |

# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| P-20 | H1484110 | u | Camiseta de trabajo, de algodón | 2,84 | € |
| | | | Camiseta de trabajo, de algodón | | |
| | | | (DOS EUROS AMB VUITANTA-QUATRE CÈNTIMS) | | |
| P-21 | H1485800 | u | Chaleco reflectante con tiras reflectantes en la cintura, en el pecho y en la espalda, homolog | 16,24 | € |
| | | | Chaleco reflectante con tiras reflectantes en la cintura, en el pecho y en la espalda, homologada según UNE-EN 471 | | |
| | | | (SETZE EUROS AMB VINT-I-QUATRE CÈNTIMS) | | |
| P-22 | H1487460 | u | Impermeable con chaqueta, capucha y pantalón, para obras públicas, de PVC soldado de 0, | 6,65 | € |
| | | | Impermeable con chaqueta, capucha y pantalón, para obras públicas, de PVC soldado de 0,4 mm de grosor, de color vivo, homologado según UNE-EN 340 | | |
| | | | (SIS EUROS AMB SEIXANTA-CINC CÈNTIMS) | | |
| P-23 | H148D900 | u | Arnés para señalista, con tiras reflectantes en la cintura, en el pecho, en la espalda y en los t | 17,63 | € |
| | | | Arnés para señalista, con tiras reflectantes en la cintura, en el pecho, en la espalda y en los tirantes, homologado según UNE-EN 340 y UNE-EN 471 | | |
| | | | (DISSET EUROS AMB SEIXANTA-TRES CÈNTIMS) | | |
| P-24 | H152J105 | m | Cable fiador para el cinturón de seguridad, fijado en anclajes de servicio y montaje y desmo | 6,34 | € |
| | | | Cable fiador para el cinturón de seguridad, fijado en anclajes de servicio y con el montaje y desmontaje incluido para todas las fases necesarias durante las obras | | |
| | | | (SIS EUROS AMB TRENTA-QUATRE CÈNTIMS) | | |
| P-25 | H152U000 | m | Valla de advertencia o balizamiento de 1 m de altura con malla de polietileno naranja, fijada | 2,54 | € |
| | | | Valla de advertencia o balizamiento de 1 m de altura con malla de polietileno naranja, fijada a 1 m del perímetro de limite de excavación o de losa con soportes de acero alojados hormigonados | | |
| | | | (DOS EUROS AMB CINQUANTA-QUATRE CÈNTIMS) | | |
| P-26 | H1534001 | u | Pieza de plástico en forma de seta, de color rojo, para protección de los extremos de las arm | 0,26 | € |
| | | | Pieza de plástico en forma de seta, de color rojo, para protección de los extremos de las armaduras para cualquier diámetro, con desmontaje incluido | | |
| | | | (ZERO EUROS AMB VINT-I-SIS CÈNTIMS) | | |
| P-27 | H6AA2111 | m | Valla móvil, de 2 m de altura, de acero galvanizado, con malla electrosoldada de 90x150 mm | 3,06 | € |
| | | | Valla móvil, de 2 m de altura, de acero galvanizado, con malla electrosoldada de 90x150 mm y de 4.5 y 3.5 mm de D, bastidor de 3.5x2 m de tubo de 40 mm de D, fijado a pies prefabricados de hormigón, montaje y desmontaje incluido para todas las fases necesarias durante las obras | | |
| | | | (TRES EUROS AMB SIS CÈNTIMS) | | |
| P-28 | HBBAA005 | u | Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circul | 38,19 | € |
| | | | Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con cantos y banda transversal descendente de izquierda a derecha a 45°, en color rojo, diámetro 29 cm, con cartel explicativo rectangular, para ser vista hasta 12 m, fijada y con el desmontaje incluido | | |
| | | | (TRENTA-VUIT EUROS AMB DINOU CÈNTIMS) | | |
| P-29 | HBBAA007 | u | Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circul | 32,17 | € |
| | | | Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con cantos y banda transversal descendente de izquierda a derecha a 45°, en color rojo, diámetro 10 cm, con cartel explicativo rectangular, para ser vista hasta 3 m, fijada y | | |

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# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| | | | con el desmontaje incluido | | |
| | | | (TRENTA-DOS EUROS AMB DISSET CÈNTIMS) | | |
| P-30 | HBBAB115 | u | Señal de obligación, normalizada con pictograma blanco sobre fondo azul, de forma circular | 37,29 | € |
| | | | Señal de obligación, normalizada con pictograma blanco sobre fondo azul, de forma circular con cantos en color blanco, diámetro 29 cm, con cartel explicativo rectangular, por ser vista hasta 12 m, fijada y con el desmontaje incluido | | |
| | | | (TRENTA-SET EUROS AMB VINT-I-NOU CÈNTIMS) | | |
| P-31 | HBBAC005 | u | Señal indicativa de la ubicación de equipos de extinción de incendios, normalizada con picto | 31,04 | € |
| | | | Señal indicativa de la ubicación de equipos de extinción de incendios, normalizada con pictograma blanco sobre fondo rojo, de forma rectangular o cuadrada, lado mayor 29 cm, por ser vista hasta 12 m de distancia, fijada y con el desmontaje incluido | | |
| | | | (TRENTA-UN EUROS AMB QUATRE CÈNTIMS) | | |
| P-32 | HBBAC013 | u | Señal indicativa de información de salvamento o socorro, normalizada con pictograma blanc | 34,25 | € |
| | | | Señal indicativa de información de salvamento o socorro, normalizada con pictograma blanco sobre fondo verde, de forma rectangular o cuadrada, lado mayor 60 cm, para ser vista hasta 25 m de distancia, fijada y con el desmontaje incluido | | |
| | | | (TRENTA-QUATRE EUROS AMB VINT-I-CINC CÈNTIMS) | | |
| P-33 | HBBAE001 | u | Letrero adhesivo ( MIE-RAT.10 ) de maniobra para cuadro o pupitre de control eléctrico, adh | 5,66 | € |
| | | | Letrero adhesivo ( MIE-RAT.10 ) de maniobra para cuadro o pupitre de control eléctrico, adherido | | |
| | | | (CINC EUROS AMB SEIXANTA-SIS CÈNTIMS) | | |
| P-34 | HBBAF004 | u | Señal de advertencia, normalizada con pictograma negro sobre fondo amarillo, de forma tria | 46,46 | € |
| | | | Señal de advertencia, normalizada con pictograma negro sobre fondo amarillo, de forma triangular con el canto negro, lado mayor 41 cm, con cartel explicativo rectangular, por ser vista hasta 12 m de distancia, fijada y con el desmontaje incluido | | |
| | | | (QUARANTA-SIS EUROS AMB QUARANTA-SIS CÈNTIMS) | | |
| P-35 | HBC12100 | u | Cono de plástico reflectante de 30 cm de altura | 6,53 | € |
| | | | Cono de plástico reflectante de 30 cm de altura, montaje y desmontaje incluido para todas las fases necesarias durante las obras | | |
| | | | (SIS EUROS AMB CINQUANTA-TRES CÈNTIMS) | | |
| P-36 | HM31161J | u | Extintor de polvo seco, de 6 kg de carga, con presión incorporada, pintado, con soporte en la | 46,08 | € |
| | | | Extintor de polvo seco, de 6 kg de carga, con presión incorporada, pintado, con soporte en la pared y con el desmontaje incluido | | |
| | | | (QUARANTA-SIS EUROS AMB VUIT CÈNTIMS) | | |
| P-37 | HQU1B150 | mes | Alquiler de módulo prefabricado para equipamiento sanitarios a obra de 3,7x2,4 m con cierre | 61,56 | € |
| | | | Alquiler de módulo prefabricado para equipamiento sanitarios a obra de 3,7x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 1 punto de luz, interruptor, enchufes y protección diferencial, y equipado con 2 inodoros, 2 duchas, lavabo colectivo con 2 grifos y termo eléctrico 50 litros, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat | | |
| | | | (SEIXANTA-UN EUROS AMB CINQUANTA-SIS CÈNTIMS) | | |

# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| P-38 | HQU1D190 | mes | Alquiler de módulo prefabricado para equipamiento de vestuarios en obra de 8x2,4 m con ci | 73,10 | € |
| | | | Alquiler de módulo prefabricado para equipamiento de vestuarios en obra de 8x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 2 puntos de luz, interruptor, enchufes y protección diferencial, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat | | |
| | | | (SETANTA-TRES EUROS AMB DEU CÈNTIMS) | | |
| P-39 | HQU1E170 | mes | Alquiler de módulo prefabricado para equipamiento de comedor a obra de 6x2,4 m con cierr | 66,94 | € |
| | | | Alquiler de módulo prefabricado para equipamiento de comedor a obra de 6x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 1 punto de luz, interruptor, enchufes y protección diferencial, y equipado con fregadero de 1 fregadero con grifo y encimera, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat | | |
| | | | (SEIXANTA-SIS EUROS AMB NORANTA-QUATRE CÈNTIMS) | | |
| P-40 | HQU22301 | u | Armario metálico individual de doble compartimento interior, de 0,4x0,5x1,8 m, colocado y co | 62,57 | € |
| | | | Armario metálico individual de doble compartimento interior, de 0,4x0,5x1,8 m, colocado y con el desmontaje incluido | | |
| | | | (SEIXANTA-DOS EUROS AMB CINQUANTA-SET CÈNTIMS) | | |
| P-41 | HQU25701 | u | Banco de madera, de 3,5 m de largo y 0,4 m de ancho, con capacidad para 5 personas, colo | 25,18 | € |
| | | | Banco de madera, de 3,5 m de largo y 0,4 m de ancho, con capacidad para 5 personas, colocado y con el desmontaje incluido | | |
| | | | (VINT-I-CINC EUROS AMB DIVUIT CÈNTIMS) | | |
| P-42 | HQU27902 | u | Mesa de madera con tablero de melamina, de 3,5 m de largo y 0,8 m de ancho, con capacid | 32,02 | € |
| | | | Mesa de madera con tablero de melamina, de 3,5 m de largo y 0,8 m de ancho, con capacidad para 10 personas, colocada y con el desmontaje incluido | | |
| | | | (TRENTA-DOS EUROS AMB DOS CÈNTIMS) | | |
| P-43 | HQU2AF02 | u | Nevera eléctrica, de 100 l de capacidad, colocada y con el desmontaje incluido | 111,71 | € |
| | | | Nevera eléctrica, de 100 l de capacidad, colocada y con el desmontaje incluido | | |
| | | | (CENT ONZE EUROS AMB SETANTA-UN CÈNTIMS) | | |
| P-44 | HQU2D102 | u | Plancha eléctrica para calentar comidas, de 60x45 cm, colocada y con el desmontaje incluid | 63,47 | € |
| | | | Plancha eléctrica para calentar comidas, de 60x45 cm, colocada y con el desmontaje incluido | | |
| | | | (SEIXANTA-TRES EUROS AMB QUARANTA-SET CÈNTIMS) | | |
| P-45 | HQU2E001 | u | Horno microondas para calentar comidas, colocado y con el desmontaje incluido | 72,84 | € |
| | | | Horno microondas para calentar comidas, colocado y con el desmontaje incluido | | |
| | | | (SETANTA-DOS EUROS AMB VUITANTA-QUATRE CÈNTIMS) | | |
| P-46 | HQU2GF01 | u | Recipiente para recogida de basura, de 100 l de capacidad, colocado y con el desmontaje in | 46,60 | € |
| | | | Recipiente para recogida de basura, de 100 l de capacidad, colocado y con el desmontaje incluido | | |
| | | | (QUARANTA-SIS EUROS AMB SEIXANTA CÈNTIMS) | | |

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# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| P-47 | HQU2P001 | u | Colgador para ducha, colocado y con el desmontaje incluido | 2,21 | € |
| | | | Colgador para ducha, colocado y con el desmontaje incluido | | |
| | | | (DOS EUROS AMB VINT-I-UN CÈNTIMS) | | |

Barcelona, Marzo de 2022

El autor del proyecto
Fco.Javier Jordán García
Pedelta, S.L.

# QUADRE DE PREUS NÚM. 2

# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| P-1 | H1411111 | u | Casco de seguridad para uso normal, contra golpes, de polietileno con un peso máximo de 400 g, homologado según UNE-EN 812 | 6,25 | € |
| | B1411111 | u | Casc de seguretat per a ús normal, contra cops, de polietilè amb un pes màxim de 400 g, homologat segons UNE-EN 812 | 5,95000 | € |
| | | | Altres conceptes | 0,30000 | € |
| P-2 | H1421110 | u | Gafas de seguridad antiimpactos estándar, con montura universal, con visor transparente y tratamiento contra el empañamiento, homologadas según UNE-EN 167 y UNE-EN 168 | 7,33 | € |
| | B1421110 | u | Ulleres de seguretat antiimpactes estàndard, amb muntura universal, amb visor transparent i tractament contra l'entelament, homologades segons UNE-EN 167 i UNE-EN 168 | 6,98000 | € |
| | | | Altres conceptes | 0,35000 | € |
| P-3 | H1423230 | u | Gafas de seguridad para corte oxiacetilénico, con montura universal de varilla de acero recubierta de PVC, con visores circulares de 50 mm de D oscuros de color DIN 5, homologadas según UNE-EN 175 y UNE-EN 169 | 5,03 | € |
| | B1423230 | u | Ulleres de seguretat per a tall oxiacetilènic, amb muntura universal de barnilla d'acer recoberta de PVC, amb visors circulars de 50 mm de D foscos de color DIN 5, homologades segons UNE-EN 175 i UNE-EN 169 | 4,79000 | € |
| | | | Altres conceptes | 0,24000 | € |
| P-4 | H142AC60 | u | Pantalla facial para soldadura eléctrica, con marco abatible de mano y soporte de poliéster reforzado con fibra de vidrio vulcanizada de 1,35 mm de espesor, con visor inactínico semioscuro con protección DIN 12, homologada según UNE-EN 175 | 10,40 | € |
| | B142AC60 | u | Pantalla facial per a soldadura elèctrica, amb marc abatible de mà i suport de polièster reforçat amb fibra de vidre vulcanitzada d'1,35 mm de gruix, amb visor inactínic semifosc amb protecció DIN 12, homologada segons UNE-EN 175 | 9,90000 | € |
| | | | Altres conceptes | 0,50000 | € |
| P-5 | H142CD70 | u | Pantalla facial para protección de riesgos mecánicos, con visor de malla de rejilla metálica, para ensamblar al casco con arnés abatible, homologada según UNE-EN 1731 | 9,61 | € |
| | B142CD70 | u | Pantalla facial per a protecció de riscs mecànics, amb visor de malla de reixeta metàl·lica, per acoblar al casc amb arnès abatible, homologada segons UNE-EN 1731 | 9,15000 | € |
| | | | Altres conceptes | 0,46000 | € |
| P-6 | H1431101 | u | Protector auditivo de tapón de espuma, homologado según UNE-EN 352-2 y UNE-EN 458 | 0,23 | € |
| | B1431101 | u | Protector auditiu de tap d'escuma, homologat segons UNE-EN 352-2 i UNE-EN 458 | 0,22000 | € |
| | | | Altres conceptes | 0,01000 | € |
| P-7 | H1445003 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 140 | 1,50 | € |
| | B1445003 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 140 | 1,43000 | € |
| | | | Altres conceptes | 0,07000 | € |
| P-8 | H1455710 | u | Pareja de guantes de alta resistencia al corte y abrasión para chatarra, con dedos y palma de caucho rugoso sobre soporte de algodón, y sujeción elástica a la muñeca, homologados según UNE-EN 388 y UNE-EN 420 | 2,76 | € |
| | B1455710 | u | Parella de guants d'alta resistència al tall i a l'abrassió per a ferrallista, amb dits i palmell de cautxú rugós sobre suport de cotó i subjecció elàstica al canell, homologats segons UNE-EN 388 i UNE-EN 420 | 2,63000 | € |
| | | | Altres conceptes | 0,13000 | € |
| P-9 | H1459630 | u | Pareja de guantes para soldador, con palma de piel, forro interior de algodón, y manga larga de apriete forrada de dril fuerte, homologados según UNE-EN 407 y UNE-EN 420 | 9,86 | € |
| | B1459630 | u | Parella de guants per a soldador, amb palmell de pell, folre interior de cotó i mànega llarga de serratge folrada de dril fort, homologats segons UNE-EN 407 i UNE-EN 420 | 9,39000 | € |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
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QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| | | | Altres conceptes | 0,47000 | € |
| P-10 | H145C002 | u | Pareja de guantes de protección contra riesgos mecánicos comunes de construcción nivel 3, homologados según UNE-EN 388 y UNE-EN 420 | 8,20 | € |
| | B145C002 | u | Parella de guants de protecció contra riscs mecànics comuns de construcció nivell 3, homologats segons UNE-EN 388 i UNE-EN 420 | 7,81000 | € |
| | | | Altres conceptes | 0,39000 | € |
| P-11 | H145K153 | u | Pareja de guantes de material aislante para trabajos eléctricos, clase 00, logotipo beige, tensión máxima 500 V, homologados según UNE-EN 420 | 20,92 | € |
| | B145K153 | u | Parella de guants de material aïllant per a treballs elèctrics, classe 00, logotip color beix, tensió màxima 500 V, homologats segons UNE-EN 420 | 19,92000 | € |
| | | | Altres conceptes | 1,00000 | € |
| P-12 | H1463253 | u | Pareja de botas dieléctricas resistentes a la humedad, de piel rectificada, con tobillera acolchada suela antideslizante y antiestática, cuña amortiguadora para el talón, lengüeta de fuelle, de desprendimiento rápido, sin herramienta metálica, con puntera reforzada, homologadas según DIN 48 | 65,91 | € |
| | B1463253 | u | Parella de botes dielèctriques resistents a la humitat, de pell rectificada, amb turmellera encoixinada sola antilliscant i antiestàtica, falca amortidora per al taló, llengüeta de manxa, de despreniment ràpid, sense ferramenta metàl·lica, amb puntera reforçada, homologades segons DIN 4843 | 62,77000 | € |
| | | | Altres conceptes | 3,14000 | € |
| P-13 | H1465275 | u | Pareja de botas bajas de seguridad industrial para trabajos de construcción en general, resistentes a la humedad, de piel rectificada, con tobillera acolchada, con puntera metálica, suela antideslizante, cuña amortiguadora de impactos en el talón y sin plantilla metálica , homologadas según UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 y UNE-EN ISO 20347 | 17,27 | € |
| | B1465275 | u | Parella de botes baixes de seguretat industrial per a treballs de construcció en general, resistents a la humitat, de pell rectificada, amb turmellera encoixinada, amb puntera metàl·lica, sola antilliscant, falca amortidora d'impactes al taló i sense plantilla metàl·lica, homologades segons UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 i UNE-EN ISO 20347 | 16,45000 | € |
| | | | Altres conceptes | 0,82000 | € |
| P-14 | H146J364 | u | Pareja de plantillas anticlavos de fleje de acero de 0,4 mm de espesor, de 120 kg de resistencia a la perforación, pintadas con pinturas epoxi y forradas, homologadas según UNE-EN ISO 20344 y UNE-EN 12568 | 2,72 | € |
| | B146J364 | u | Parella de plantilles anticlaus de fleix d'acer de 0,4 mm de gruix, de 120 kg de resistència a la perforació, pintades amb pintures epoxi i folrades, homologades segons UNE-EN ISO 20344 i UNE-EN 12568 | 2,59000 | € |
| | | | Altres conceptes | 0,13000 | € |
| P-15 | H147D501 | u | Sistema anticaída compuesto por un arnés anticaída con tirantes, bandas secundarias, bandas subglutias, bandas de muslo, apoyo dorsal para sujeción, elementos de ajuste, elemento dorsal de enganche de arnés anticaída y hebilla, incorporado a un subsistema antici absorbente de energía, homologado según UNE-EN 361, UNE-EN 362, UNE-EN 364, UNE-EN 365 y UNE-EN 355 | 220,58 | € |
| | B147D501 | u | Sistema anticaiguda compost per un arnès anticaiguda amb tirants, bandes secundàries, bandes subglúties, bandes de cuixa, recolzament dorsal per a subjecció, elements d'ajust, element dorsal d'enganxament d'arnès anticaiguda i sivella, incorporat a un subsistema anticaiguda de tipus absorbent d'energia, homologat segons UNE-EN 361, UNE-EN 362, UNE-EN 364, UNE-EN 365 i UNE-EN 355 | 210,08000 | € |
| | | | Altres conceptes | 10,50000 | € |
| P-16 | H147L015 | u | Aparato de anclaje para equipo de protección individual contra caída de altura, homologado según UNE-EN 795, con fijación con taco mecánico | 24,20 | € |

# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | | PREU |
|---|---|---|---|---|---|
| | B1Z09F90 | u | Tac d'acer de d 10 mm, amb cargol, volandera i femella, per a seguretat i salut | 0,97000 | € |
| | B147L005 | u | Aparell d'ancoratge per a equip de protecció individual contra caiguda d'alçada, homologat segons UNE-EN 795 | 19,48000 | € |
| | | | Altres conceptes | 3,75000 | € |
| P-17 | H147N000 | u | Faja de protección dorslumbar | 23,67 | € |
| | B147N000 | u | Faixa de protecció dorslumbar | 22,54000 | € |
| | | | Altres conceptes | 1,13000 | € |
| P-18 | H1481343 | u | Mono de trabajo para construcción de obras lineales en servicio, de poliéster y algodón (65%-35%), color amarillo, trama 240, con bolsillos interiores y tiras reflectantes, homologada según UNE-EN 340 | 88,03 | € |
| | B1481343 | u | Granota de treball per a construcció d'obres lineals en servei, de polièster i cotó (65%-35%), color groc, trama 240, amb butxaques interiors i tires reflectants, homologada segons UNE-EN 340 | 83,84000 | € |
| | | | Altres conceptes | 4,19000 | € |
| P-19 | H1481654 | u | Mono de trabajo para soldadores y/o trabajadores de tubos, de algodón sanforizado (100%), color azul vergara, trama 320, con bolsillos interiores dotados de cremalleras metálicas, homologada según UNE-EN 340, UNE-EN 470- 1 y UNE-EN 348 | 23,18 | € |
| | B1481654 | u | Granota de treball per a soldadors i/o treballadors de tubs, de cotó sanforitzat (100%), color blau vergara, trama 320, amb butxaques interiors dotades de cremalleres metàl·liques, homologada segons UNE-EN 340, UNE-EN 470-1 i UNE-EN 348 | 22,08000 | € |
| | | | Altres conceptes | 1,10000 | € |
| P-20 | H1484110 | u | Camiseta de trabajo, de algodón | 2,84 | € |
| | B1484110 | u | Samarreta de treball, de cotó | 2,70000 | € |
| | | | Altres conceptes | 0,14000 | € |
| P-21 | H1485800 | u | Chaleco reflectante con tiras reflectantes en la cintura, en el pecho y en la espalda, homologada según UNE-EN 471 | 16,24 | € |
| | B1485800 | u | Armilla reflectant amb tires reflectants a la cintura, al pit i a l'esquena, homologada segons UNE-EN 471 | 15,47000 | € |
| | | | Altres conceptes | 0,77000 | € |
| P-22 | H1487460 | u | Impermeable con chaqueta, capucha y pantalón, para obras públicas, de PVC soldado de 0,4 mm de grosor, de color vivo, homologado según UNE-EN 340 | 6,65 | € |
| | B1487460 | u | Impermeable amb jaqueta, caputxa i pantalons, per a obres públiques, de PVC soldat de 0,4 mm de gruix, de color viu, homologat segons UNE-EN 340 | 6,33000 | € |
| | | | Altres conceptes | 0,32000 | € |
| P-23 | H148D900 | u | Arnés para señalista, con tiras reflectantes en la cintura, en el pecho, en la espalda y en los tirantes, homologado según UNE-EN 340 y UNE-EN 471 | 17,63 | € |
| | B148D900 | u | Arnès per a senyalista, amb tires reflectants a la cintura, al pit, a l'esquena i als tirants, homologat segons UNE-EN 340 i UNE-EN 471 | 16,79000 | € |
| | | | Altres conceptes | 0,84000 | € |
| P-24 | H152J105 | m | Cable fiador para el cinturón de seguridad, fijado en anclajes de servicio y con el montaje y desmontaje incluido para todas las fases necesarias durante las obras | 6,34 | € |
| | B0AC112D | m | Cable d'acer galvanitzat rígid de composició 1x7+0 i diàmetre 9 mm, per a seguretat i salut | 1,27200 | € |
| | | | Altres conceptes | 5,06800 | € |
| P-25 | H152U000 | m | Valla de advertencia o balizamiento de 1 m de altura con malla de polietileno naranja, fijada a 1 m del perímetro de limite de excavación o de losa con soportes de acero alojados hormigonados | 2,54 | € |

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# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | | PREU |
|---|---|---|---|---|---|
| | B152U000 | m | Malla de polietilè d'alta densitat color toronja per a tanques d'advertència o abalisament, d'1 m d'alçada, per a seguretat i salut | 0,52500 | € |
| | B1526EL6 | u | Muntant metàl·lic per a barana de seguretat, d'1 m d'alçària, per a allotjar en perforacions del sostre, per a 15 usos | 0,59000 | € |
| | | | Altres conceptes | 1,42500 | € |
| P-26 | H1534001 | u | Pieza de plástico en forma de seta, de color rojo, para protección de los extremos de las armaduras para cualquier diámetro, con desmontaje incluido | 0,26 | € |
| | B1534001 | u | Peça de plàstic en forma de bolet, de color vermell, per a protecció dels extrems de les armadures per a qualsevol diametre per a 5 usos | 0,03000 | € |
| | | | Altres conceptes | 0,23000 | € |
| P-27 | H6AA2111 | m | Valla móvil, de 2 m de altura, de acero galvanizado, con malla electrosoldada de 90x150 mm y de 4.5 y 3.5 mm de D, bastidor de 3.5x2 m de tubo de 40 mm de D, fijado a pies prefabricados de hormigón, montaje y desmontaje incluido para todas las fases necesarias durante las obras | 3,06 | € |
| | B1Z6AF0A | u | Dau de formigó de 38 kg per a peu de tanca mòbil de malla d'acer i per a 20 usos, per a seguretat i salut | 0,04500 | € |
| | B1Z6211A | m | Tanca mòbil, de 2 m d'alçària, d'acer galvanitzat, amb malla electrosoldada de 90x150 mm i de 4.5 i 3.5 mm de diàmetre, bastidor de 3.5x2 m de tub de 40 mm de diàmetre per a fixar a peus prefabricats de formigó, per a 20 usos, per a seguretat i salut | 0,70000 | € |
| | | | Altres conceptes | 2,31500 | € |
| P-28 | HBBAA005 | u | Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con cantos y banda transversal descendente de izquierda a derecha a 45°, en color rojo, diámetro 29 cm, con cartel explicativo rectangular, para ser vista hasta 12 m, fijada y con el desmontaje incluido | 38,19 | € |
| | BBBAD015 | u | Cartell explicatiu del contingut de la senyal, amb llegenda indicativa de prohibició, amb el text en negre sobre fons vermell, de forma rectangular, amb el cantell negre, costat major 29 cm, per ésser vist fins 12 m, per a seguretat i salut | 8,86000 | € |
| | BBBAA005 | u | Senyal de prohibició, normalitzada amb pictograma negre sobre fons blanc, de forma circular amb cantells i banda transversal descendent d'esquerra a dreta a 45° en color vermell, de diàmetre 29 cm, per ésser vista fins 12 m, per a seguretat i salut | 5,81000 | € |
| | | | Altres conceptes | 23,52000 | € |
| P-29 | HBBAA007 | u | Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con cantos y banda transversal descendente de izquierda a derecha a 45°, en color rojo, diámetro 10 cm, con cartel explicativo rectangular, para ser vista hasta 3 m, fijada y con el desmontaje incluido | 32,17 | € |
| | BBBAD017 | u | Cartell explicatiu del contingut de la senyal, amb llegenda indicativa de prohibició, amb el text en negre sobre fons vermell, de forma rectangular, amb el cantell negre, costat major 10 cm, per ésser vist fins 3 m, per a seguretat i salut | 6,10000 | € |
| | BBBAA007 | u | Senyal de prohibició, normalitzada amb pictograma negre sobre fons blanc, de forma circular amb cantells i banda transversal descendent d'esquerra a dreta a 45° en color vermell, de diàmetre 10 cm, per ésser vista fins 3 m, per a seguretat i salut | 2,84000 | € |
| | | | Altres conceptes | 23,23000 | € |
| P-30 | HBBAB115 | u | Señal de obligación, normalizada con pictograma blanco sobre fondo azul, de forma circular con cantos en color blanco, diámetro 29 cm, con cartel explicativo rectangular, por ser vista hasta 12 m, fijada y con el desmontaje incluido | 37,29 | € |
| | BBBAB115 | u | Senyal de obligació, normalitzada amb pictograma blanc sobre fons blau, de forma circular amb cantells en color blanc, de diàmetre 29 cm, per ésser vista fins 12 m, per a seguretat i salut | 5,95000 | € |
| | BBBAD025 | u | Cartell explicatiu del contingut de la senyal, amb llegenda indicativa d'obligació, amb el text en blanc sobre fons blau, de forma rectangular, amb el cantell blanc, costat major 29 cm, per ésser vist fins 12 m, per a seguretat i salut | 7,86000 | € |

# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| | | | Altres conceptes | 23,48000 | € |
| P-31 | HBBAC005 | u | Señal indicativa de la ubicación de equipos de extinción de incendios, normalizada con pictograma blanco sobre fondo rojo, de forma rectangular o cuadrada, lado mayor 29 cm, por ser vista hasta 12 m de distancia, fijada y con el desmontaje incluido | 31,04 | € |
| | BBBAC005 | u | Senyal indicativa de la ubicació d'equips d'extinció d'incendis, normalitzada amb pictograma blanc sobre fons vermell, de forma rectangular o quadrada, costat major 29 cm, per ésser vista fins 12 m de distància, per a seguretat i salut | 7,86000 | € |
| | | | Altres conceptes | 23,18000 | € |
| P-32 | HBBAC013 | u | Señal indicativa de información de salvamento o socorro, normalizada con pictograma blanco sobre fondo verde, de forma rectangular o cuadrada, lado mayor 60 cm, para ser vista hasta 25 m de distancia, fijada y con el desmontaje incluido | 34,25 | € |
| | BBBAC013 | u | Senyal indicativa d'informació de salvament o socors, normalitzada amb pictograma blanc sobre fons verd, de forma rectangular o quadrada, costat major 60 cm, per ésser vista fins 25 m de distància, per a seguretat i salut | 10,92000 | € |
| | | | Altres conceptes | 23,33000 | € |
| P-33 | HBBAE001 | u | Letrero adhesivo ( MIE-RAT.10 ) de maniobra para cuadro o pupitre de control eléctrico, adherido | 5,66 | € |
| | BBBAE001 | u | Rètol adhesiu ( MIE-RAT.10 ) de maniobra per a quadre o pupitre de control elèctric, per a seguretat i salut | 5,39000 | € |
| | | | Altres conceptes | 0,27000 | € |
| P-34 | HBBAF004 | u | Señal de advertencia, normalizada con pictograma negro sobre fondo amarillo, de forma triangular con el canto negro, lado mayor 41 cm, con cartel explicativo rectangular, por ser vista hasta 12 m de distancia, fijada y con el desmontaje incluido | 46,46 | € |
| | BBBAD004 | u | Cartell explicatiu del contingut de la senyal, amb llegenda indicativa d'advertència, amb el text en negre sobre fons groc, de forma rectangular, amb el cantell negre, costat major 41 cm, per ésser vist fins 12 m, per a seguretat i salut | 13,00000 | € |
| | BBBAF004 | u | Senyal d'advertència, normalitzada amb pictograma negre sobre fons groc, de forma triangular amb el cantell negre, costat major 41 cm, per ésser vista fins 12 m, per a seguretat i salut | 9,55000 | € |
| | | | Altres conceptes | 23,91000 | € |
| P-35 | HBC12100 | u | Cono de plástico reflectante de 30 cm de altura, montaje y desmontaje incluido para todas las fases necesarias durante las obras | 6,53 | € |
| | BBC12102 | u | Con d'abalisament de plàstic reflector de 30 cm d'alçària, per a 2 usos, per a seguretat i salut | 5,89000 | € |
| | | | Altres conceptes | 0,64000 | € |
| P-36 | HM31161J | u | Extintor de polvo seco, de 6 kg de carga, con presión incorporada, pintado, con soporte en la pared y con el desmontaje incluido | 46,08 | € |
| | B1ZM1000 | u | Part proporcional d'elements especials per a extintors, per a seguretat i salut | 0,29000 | € |
| | BM311611 | u | Extintor de pols seca, de càrrega 6 kg, amb pressió incorporada, pintat, per a seguretat i salut | 33,78000 | € |
| | | | Altres conceptes | 12,01000 | € |
| P-37 | HQU1B150 | mes | Alquiler de módulo prefabricado para equipamiento sanitarios a obra de 3,7x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 1 punto de luz, interruptor, enchufes y protección diferencial, y equipado con 2 inodoros, 2 duchas, lavabo colectivo con 2 grifos y termo eléctrico 50 litros, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat | 61,56 | € |

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# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| | BQU1B150 | mes | Lloguer de mòdul prefabricat per a equipament sanitaris a obra de 3,7x2,4 m amb tancaments formats per placa de dues planxes d'acer prelacat i aïllament interior de 40mm de gruix i paviment format per tauler aglomarat hidròfug amb acabat de PVC sobre xapa galvanitzada i llana mineral de vidre, instal·lació elèctrica amb 1 punt de llum, interruptor, endolls i protecció diferencial, i equipat amb 2 inodors, 2 dutxes, lavabo col·lectiu amb 2 aixetes i termos elèctric 50 litres | 58,63000 | € |
| | | | Altres conceptes | 2,93000 | € |
| P-38 | HQU1D190 | mes | Alquiler de módulo prefabricado para equipamiento de vestuarios en obra de 8x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 2 puntos de luz, interruptor, enchufes y protección diferencial, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat | 73,10 | € |
| | BQU1D190 | mes | Lloguer de mòdul prefabricat per equipament de vestidors a obra de 8x2,4 m amb tancaments formats per placa de dues planxes d'acer prelacat i aïllament interior de 40mm de gruix i paviment format per tauler aglomarat hidròfug amb acabat de PVC sobre xapa galvanitzada i llana mineral de vidre, instal·lació elèctrica amb 2 punts de llum, interruptor, endolls i protecció diferencial | 69,62000 | € |
| | | | Altres conceptes | 3,48000 | € |
| P-39 | HQU1E170 | mes | Alquiler de módulo prefabricado para equipamiento de comedor a obra de 6x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 1 punto de luz, interruptor, enchufes y protección diferencial, y equipado con fregadero de 1 fregadero con grifo y encimera, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat | 66,94 | € |
| | BQU1E170 | mes | Lloguer de mòdul prefabricat per a equipament de menjador a obra de 6x2,4 m amb tancaments formats per placa de dues planxes d'acer prelacat i aïllament interior de 40mm de gruix i paviment format per tauler aglomarat hidròfug amb acabat de PVC sobre xapa galvanitzada i llana mineral de vidre, instal·lació elèctrica amb 1 punt de llum, interruptor, endolls i protecció diferencial, i equipat amb aigüera de 1 pica amb aixeta i taulell | 63,75000 | € |
| | | | Altres conceptes | 3,19000 | € |
| P-40 | HQU22301 | u | Armario metálico individual de doble compartimento interior, de 0,4x0,5x1,8 m, colocado y con el desmontaje incluido | 62,57 | € |
| | BQU22303 | u | Armari metàl·lic individual amb doble compartiment interior, de 0,4x0,5x1,8 m, per a 3 usos, per a seguretat i salut | 54,17000 | € |
| | | | Altres conceptes | 8,40000 | € |
| P-41 | HQU25701 | u | Banco de madera, de 3,5 m de largo y 0,4 m de ancho, con capacidad para 5 personas, colocado y con el desmontaje incluido | 25,18 | € |
| | BQU25700 | u | Banc de fusta de 3,5 m de llargària i 0,4 m d'amplària, amb capacitat per a 5 persones per a 4 usos , per a seguretat i salut | 20,73000 | € |
| | | | Altres conceptes | 4,45000 | € |
| P-42 | HQU27902 | u | Mesa de madera con tablero de melamina, de 3,5 m de largo y 0,8 m de ancho, con capacidad para 10 personas, colocada y con el desmontaje incluido | 32,02 | € |
| | BQU27900 | u | Taula de fusta amb tauler de melamina, de 3,5 m de llargària i 0,8 m d'amplària, amb capacitat per a 10 persones per a 4 usos , per a seguretat i salut | 22,90250 | € |
| | | | Altres conceptes | 9,11750 | € |
| P-43 | HQU2AF02 | u | Nevera eléctrica, de 100 l de capacidad, colocada y con el desmontaje incluido | 111,71 | € |

# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|
| | BQU2AF02 | u | Nevera elèctrica, de 100 l de capacitat, per a 2 usos, per a seguretat i salut | 98,80000 € |
| | | | Altres conceptes | 12,91000 € |
| P-44 | HQU2D102 | u | Plancha eléctrica para calentar comidas, de 60x45 cm, colocada y con el desmontaje incluido | 63,47 € |
| | BQU2D102 | u | Planxa elèctrica per a escalfar menjars, de 60x45 cm, per a 2 usos, per a seguretat i salut | 57,19000 € |
| | | | Altres conceptes | 6,28000 € |
| P-45 | HQU2E001 | u | Horno microondas para calentar comidas, colocado y con el desmontaje incluido | 72,84 € |
| | BQU2E002 | u | Forn microones, per a 2 usos, per a seguretat i salut | 68,29000 € |
| | | | Altres conceptes | 4,55000 € |
| P-46 | HQU2GF01 | u | Recipiente para recogida de basura, de 100 l de capacidad, colocado y con el desmontaje incluido | 46,60 € |
| | BQU2GF00 | u | Recipient per a recollida d'escombraries de 100 l de capacitat, per a seguretat i salut | 42,21000 € |
| | | | Altres conceptes | 4,39000 € |
| P-47 | HQU2P001 | u | Colgador para ducha, colocado y con el desmontaje incluido | 2,21 € |
| | BQZ1P000 | u | Penja-robes per a dutxa, per a seguretat i salut | 1,02000 € |
| | | | Altres conceptes | 1,19000 € |

Barcelona, Marzo de 2022

El autor del proyecto
Fco.Javier Jordán García
Pedelta, S.L.

# PRESSUPOST GENERAL

# PRESSUPOST



| | | |
|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC |
| Capítol | 01 | Estudio de Seguridad y Salud |
| Títol 3 | 01 | Equipos Protección Individual |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | H1411111 | u | Casco de seguridad para uso normal, contra golpes, de polietileno con un peso máximo de 400 g, homol<br>Casco de seguridad para uso normal, contra golpes, de polietileno con un peso máximo de 400 g, homologado según UNE-EN 812 (P - 1) | 6,25 | 8,000 | 50,00 |
| 2 | H1421110 | u | Gafas de seguridad antiimpactos estándar, con montura universal, con visor transparente y tratamient<br>Gafas de seguridad antiimpactos estándar, con montura universal, con visor transparente y tratamiento contra el empañamiento, homologadas según UNE-EN 167 y UNE-EN 168 (P - 2) | 7,33 | 8,000 | 58,64 |
| 3 | H1423230 | u | Gafas de seguridad para corte oxiacetilénico, con montura universal de varilla de acero recubierta d<br>Gafas de seguridad para corte oxiacetilénico, con montura universal de varilla de acero recubierta de PVC, con visores circulares de 50 mm de D oscuros de color DIN 5, homologadas según UNE-EN 175 y UNE-EN 169 (P - 3) | 5,03 | 4,000 | 20,12 |
| 4 | H142AC60 | u | Pantalla facial para soldadura eléctrica, con marco abatible de mano y soporte de poliéster reforzad<br>Pantalla facial para soldadura eléctrica, con marco abatible de mano y soporte de poliéster reforzado con fibra de vidrio vulcanizada de 1,35 mm de espesor, con visor inactínico semioscuro con protección DIN 12, homologada según UNE-EN 175 (P - 4) | 10,40 | 2,000 | 20,80 |
| 5 | H142CD70 | u | Pantalla facial para protección de riesgos mecánicos, con visor de malla de rejilla metálica, para e<br>Pantalla facial para protección de riesgos mecánicos, con visor de malla de rejilla metálica, para ensamblar al casco con arnés abatible, homologada según UNE-EN 1731 (P - 5) | 9,61 | 2,000 | 19,22 |
| 6 | H1431101 | u | Protector auditivo de tapón de espuma, homologado según UNE-EN 352-2 y UNE-EN 458<br>Protector auditivo de tapón de espuma, homologado según UNE-EN 352-2 y UNE-EN 458 (P - 6) | 0,23 | 50,000 | 11,50 |
| 7 | H1445003 | u | Mascareta de protecció respiratòria, homologada segons UNE-EN 140<br>Mascareta de protecció respiratòria, homologada segons UNE-EN 140 (P - 7) | 1,50 | 50,000 | 75,00 |
| 8 | H1455710 | u | Pareja de guantes de alta resistencia al corte y abrasión para chatarra, con dedos y palma de caucho<br>Pareja de guantes de alta resistencia al corte y abrasión para chatarra, con dedos y palma de caucho rugoso sobre soporte de algodón, y sujeción elástica a la muñeca, homologados según UNE-EN 388 y UNE-EN 420 (P - 8) | 2,76 | 8,000 | 22,08 |
| 9 | H1459630 | u | Pareja de guantes para soldador, con palma de piel, forro interior de algodón, y manga larga de apri<br>Pareja de guantes para soldador, con palma de piel, forro interior de algodón, y manga larga de apriete forrada de dril fuerte, homologados según UNE-EN 407 y UNE-EN 420 (P - 9) | 9,86 | 4,000 | 39,44 |
| 10 | H145C002 | u | Pareja de guantes de protección contra riesgos mecánicos comunes de construcción nivel 3, homologado<br>Pareja de guantes de protección contra riesgos mecánicos comunes de construcción nivel 3, homologados según UNE-EN 388 y UNE-EN 420 (P - 10) | 8,20 | 4,000 | 32,80 |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Pressupost Estudi Seguretat i Salut

# PRESSUPOST



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|---|---|---|---|---|---|---|
| 11 | H145K153 | u | Pareja de guantes de material aislante para trabajos eléctricos, clase 00, logotipo beige, tensión m<br>Pareja de guantes de material aislante para trabajos eléctricos, clase 00, logotipo beige, tensión máxima 500 V, homologados según UNE-EN 420 (P - 11) | 20,92 | 4,000 | 83,68 |
| 12 | H1463253 | u | Pareja de botas dieléctricas resistentes a la humedad, de piel rectificada, con tobillera acolchada<br>Pareja de botas dieléctricas resistentes a la humedad, de piel rectificada, con tobillera acolchada suela antideslizante y antiestática, cuña amortiguadora para el talón, lengüeta de fuelle, de desprendimiento rápido, sin herramienta metálica, con puntera reforzada, homologadas según DIN 48 (P - 12) | 65,91 | 4,000 | 263,64 |
| 13 | H1465275 | u | Pareja de botas bajas de seguridad industrial para trabajos de construcción en general, resistentes<br>Pareja de botas bajas de seguridad industrial para trabajos de construcción en general, resistentes a la humedad, de piel rectificada, con tobillera acolchada, con puntera metálica, suela antideslizante, cuña amortiguadora de impactos en el talón y sin plantilla metálica , homologadas según UNE-EN ISO 20344, UNE-EN ISO 20345, UNE-EN ISO 20346 y UNE-EN ISO 20347 (P - 13) | 17,27 | 8,000 | 138,16 |
| 14 | H146J364 | u | Pareja de plantillas anticlavos de fleje de acero de 0,4 mm de espesor, de 120 kg de resistencia a l<br>Pareja de plantillas anticlavos de fleje de acero de 0,4 mm de espesor, de 120 kg de resistencia a la perforación, pintadas con pinturas epoxi y forradas, homologadas según UNE-EN ISO 20344 y UNE-EN 12568 (P - 14) | 2,72 | 10,000 | 27,20 |
| 15 | H147L015 | u | Aparato de anclaje para equipo de protección individual contra caída de altura, homologado según UNE<br>Aparato de anclaje para equipo de protección individual contra caída de altura, homologado según UNE-EN 795, con fijación con taco mecánico (P - 16) | 24,20 | 4,000 | 96,80 |
| 16 | H147N000 | u | Faja de protección dorslumbar<br>Faja de protección dorslumbar (P - 17) | 23,67 | 8,000 | 189,36 |
| 17 | H1481343 | u | Mono de trabajo para construcción de obras lineales en servicio, de poliéster y algodón (65%-35%), c<br>Mono de trabajo para construcción de obras lineales en servicio, de poliéster y algodón (65%-35%), color amarillo, trama 240, con bolsillos interiores y tiras reflectantes, homologada según UNE-EN 340 (P - 18) | 88,03 | 4,000 | 352,12 |
| 18 | H1481654 | u | Mono de trabajo para soldadores y/o trabajadores de tubos, de algodón sanforizado (100%), color azul<br>Mono de trabajo para soldadores y/o trabajadores de tubos, de algodón sanforizado (100%), color azul vergara, trama 320, con bolsillos interiores dotados de cremalleras metálicas, homologada según UNE-EN 340, UNE-EN 470- 1 y UNE-EN 348 (P - 19) | 23,18 | 4,000 | 92,72 |
| 19 | H1484110 | u | Camiseta de trabajo, de algodón<br>Camiseta de trabajo, de algodón (P - 20) | 2,84 | 8,000 | 22,72 |
| 20 | H1487460 | u | Impermeable con chaqueta, capucha y pantalón, para obras públicas, de PVC soldado de 0,4 mm de groso<br>Impermeable con chaqueta, capucha y pantalón, para obras públicas, de PVC soldado de 0,4 mm de grosor, de color vivo, homologado según UNE-EN 340 (P - 22) | 6,65 | 8,000 | 53,20 |
| 21 | H148D900 | u | Arnés para señalista, con tiras reflectantes en la cintura, en el pecho, en la espalda y en los tira<br>Arnés para señalista, con tiras reflectantes en la cintura, en el pecho, en la espalda y en los tirantes, homologado según UNE-EN 340 y UNE-EN 471 (P - 23) | 17,63 | 3,000 | 52,89 |

## PRESSUPOST



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|---|---|---|---|---|---|---|
| 22 | H1485800 | u | **Chaleco reflectante con tiras reflectantes en la cintura, en el pecho y en la espalda, homologada se**<br>Chaleco reflectante con tiras reflectantes en la cintura, en el pecho y en la espalda, homologada según UNE-EN 471 (P - 21) | 16,24 | 8,000 | 129,92 |
| 23 | H147D501 | u | **Sistema anticaída compuesto por un arnés anticaída con tirantes, bandas secundarias, bandas subgluti**<br>Sistema anticaída compuesto por un arnés anticaída con tirantes, bandas secundarias, bandas subglutias, bandas de muslo, apoyo dorsal para sujeción, elementos de ajuste, elemento dorsal de enganche de arnés anticaída y hebilla, incorporado a un subsistema antici absorbente de energía, homologado según UNE-EN 361, UNE-EN 362, UNE-EN 364, UNE-EN 365 y UNE-EN 355 (P - 15) | 220,58 | 2,000 | 441,16 |

TOTAL Titol 3 01.01.01 2.293,17

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|---|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC | |
| Capítol | 01 | Estudio de Seguridad y Salud | |
| Titol 3 | 02 | Equipos de Protección Colectiva | |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | H152U000 | m | **Valla de advertencia o balizamiento de 1 m de altura con malla de polietileno naranja, fijada a 1 m**<br>Valla de advertencia o balizamiento de 1 m de altura con malla de polietileno naranja, fijada a 1 m del perímetro de limite de excavación o de losa con soportes de acero alojados hormigonados (P - 25) | 2,54 | 60,000 | 152,40 |
| 2 | H1534001 | u | **Pieza de plástico en forma de seta, de color rojo, para protección de los extremos de las armaduras**<br>Pieza de plástico en forma de seta, de color rojo, para protección de los extremos de las armaduras para cualquier diámetro, con desmontaje incluido (P - 26) | 0,26 | 50,000 | 13,00 |
| 3 | H152J105 | m | **Cable fiador para el cinturón de seguridad, fijado en anclajes de servicio y montaje y desmontaje i**<br>Cable fiador para el cinturón de seguridad, fijado en anclajes de servicio y con el montaje y desmontaje incluido para todas las fases necesarias durante las obras (P - 24) | 6,34 | 40,000 | 253,60 |
| 4 | HBBAA005 | u | **Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con can**<br>Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con cantos y banda transversal descendente de izquierda a derecha a 45°, en color rojo, diámetro 29 cm, con cartel explicativo rectangular, para ser vista hasta 12 m, fijada y con el desmontaje incluido (P - 28) | 38,19 | 1,000 | 38,19 |
| 5 | HBBAA007 | u | **Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con can**<br>Señal de prohibición, normalizada con pictograma negro sobre fondo blanco, de forma circular con cantos y banda transversal descendente de izquierda a derecha a 45°, en color rojo, diámetro 10 cm, con cartel explicativo rectangular, para ser vista hasta 3 m, fijada y con el desmontaje incluido (P - 29) | 32,17 | 2,000 | 64,34 |
| 6 | HBBAB115 | u | **Señal de obligación, normalizada con pictograma blanco sobre fondo azul, de forma circular con canto**<br>Señal de obligación, normalizada con pictograma blanco sobre fondo azul, de forma circular con cantos en color blanco, diámetro 29 cm, con cartel explicativo rectangular, por ser vista hasta 12 m, fijada y con el desmontaje incluido (P - 30) | 37,29 | 2,000 | 74,58 |
| 7 | HBBAC005 | u | **Señal indicativa de la ubicación de equipos de extinción de incendios, normalizada con pictograma bl**<br>Señal indicativa de la ubicación de equipos de extinción de incendios, | 31,04 | 2,000 | 62,08 |





## PRESSUPOST



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|---|---|---|---|---|---|---|
| | | | normalizada con pictograma blanco sobre fondo rojo, de forma rectangular o cuadrada, lado mayor 29 cm, por ser vista hasta 12 m de distancia, fijada y con el desmontaje incluido (P - 31) | | | |
| 8 | HBBAC013 | u | **Señal indicativa de información de salvamento o socorro, normalizada con pictograma blanco sobre fon**<br>Señal indicativa de información de salvamento o socorro, normalizada con pictograma blanco sobre fondo verde, de forma rectangular o cuadrada, lado mayor 60 cm, para ser vista hasta 25 m de distancia, fijada y con el desmontaje incluido (P - 32) | 34,25 | 2,000 | 68,50 |
| 9 | HBBAE001 | u | **Letrero adhesivo ( MIE-RAT.10 ) de maniobra para cuadro o pupitre de control eléctrico, adherido**<br>Letrero adhesivo ( MIE-RAT.10 ) de maniobra para cuadro o pupitre de control eléctrico, adherido (P - 33) | 5,66 | 2,000 | 11,32 |
| 10 | HBBAF004 | u | **Señal de advertencia, normalizada con pictograma negro sobre fondo amarillo, de forma triangular con**<br>Señal de advertencia, normalizada con pictograma negro sobre fondo amarillo, de forma triangular con el canto negro, lado mayor 41 cm, con cartel explicativo rectangular, por ser vista hasta 12 m de distancia, fijada y con el desmontaje incluido (P - 34) | 46,46 | 2,000 | 92,92 |
| 11 | HM31161J | u | **Extintor de polvo seco, de 6 kg de carga, con presión incorporada, pintado, con soporte en la pared**<br>Extintor de polvo seco, de 6 kg de carga, con presión incorporada, pintado, con soporte en la pared y con el desmontaje incluido (P - 36) | 46,08 | 2,000 | 92,16 |
| 12 | HBC12100 | u | **Cono de plástico reflectante de 30 cm de altura**<br>Cono de plástico reflectante de 30 cm de altura, montaje y desmontaje incluido para todas las fases necesarias durante las obras (P - 35) | 6,53 | 10,000 | 65,30 |

TOTAL Titol 3 01.01.02 988,39

| | | | |
|---|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC | |
| Capítol | 01 | Estudio de Seguridad y Salud | |
| Titol 3 | 03 | Implantación Provisional del Personal de Obra | |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | H6AA2111 | m | **Valla móvil, de 2 m de altura, de acero galvanizado, con malla electrosoldada de 90x150 mm y de 4.5**<br>Valla móvil, de 2 m de altura, de acero galvanizado, con malla electrosoldada de 90x150 mm y de 4.5 y 3.5 mm de D, bastidor de 3.5x2 m de tubo de 40 mm de D, fijado a pies prefabricados de hormigón, montaje y desmontaje incluido para todas las fases necesarias durante las obras (P - 27) | 3,06 | 200,000 | 612,00 |
| 2 | HQU1B150 | mes | **Alquiler de módulo prefabricado para equipamiento sanitarios a obra de 3,7x2,4 m con cierres formado**<br>Alquiler de módulo prefabricado para equipamiento sanitarios a obra de 3,7x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 1 punto de luz, interruptor, enchufes y protección diferencial, y equipado con 2 inodoros, 2 duchas, lavabo colectivo con 2 grifos y termo eléctrico 50 litros, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat<br>(P - 37) | 61,56 | 6,000 | 369,36 |

## PRESSUPOST



| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | HQU1D190 | mes | **Alquiler de módulo prefabricado para equipamiento de vestuarios en obra de 8x2,4 m con cierres forma** | 73,10 | 6,000 | 438,60 |
| | | | Alquiler de módulo prefabricado para equipamiento de vestuarios en obra de 8x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 2 puntos de luz, interruptor, enchufes y protección diferencial, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat<br>(P - 38) | | | |
| 4 | HQU1E170 | mes | **Alquiler de módulo prefabricado para equipamiento de comedor a obra de 6x2,4 m con cierres formados** | 66,94 | 6,000 | 401,64 |
| | | | Alquiler de módulo prefabricado para equipamiento de comedor a obra de 6x2,4 m con cierres formados por placa de dos planchas de acero prelacado y aislamiento interior de 40mm de espesor y pavimento formado por tablero aglomarado hidrófugo con acabado de PVC sobre chapa galvanizada y lana mineral de vidrio, instalación eléctrica 1 punto de luz, interruptor, enchufes y protección diferencial, y equipado con fregadero de 1 fregadero con grifo y encimera, inclou tots els serveis necessaris indicats per la Direcció d'obra per al l'instal·lació i suposat desmantellament per el bon funcionament del mòdul prefabricat<br>(P - 39) | | | |
| 5 | HQU22301 | u | **Armario metálico individual de doble compartimento interior, de 0,4x0,5x1,8 m, colocado y con el des** | 62,57 | 8,000 | 500,56 |
| | | | Armario metálico individual de doble compartimento interior, de 0,4x0,5x1,8 m, colocado y con el desmontaje incluido (P - 40) | | | |
| 6 | HQU25701 | u | **Banco de madera, de 3,5 m de largo y 0,4 m de ancho, con capacidad para 5 personas, colocado y con e** | 25,18 | 2,000 | 50,36 |
| | | | Banco de madera, de 3,5 m de largo y 0,4 m de ancho, con capacidad para 5 personas, colocado y con el desmontaje incluido (P - 41) | | | |
| 7 | HQU27902 | u | **Mesa de madera con tablero de melamina, de 3,5 m de largo y 0,8 m de ancho, con capacidad para 10 pe** | 32,02 | 1,000 | 32,02 |
| | | | Mesa de madera con tablero de melamina, de 3,5 m de largo y 0,8 m de ancho, con capacidad para 10 personas, colocada y con el desmontaje incluido (P - 42) | | | |
| 8 | HQU2AF02 | u | **Nevera eléctrica, de 100 l de capacidad, colocada y con el desmontaje incluido** | 111,71 | 1,000 | 111,71 |
| | | | Nevera eléctrica, de 100 l de capacidad, colocada y con el desmontaje incluido (P - 43) | | | |
| 9 | HQU2D102 | u | **Plancha eléctrica para calentar comidas, de 60x45 cm, colocada y con el desmontaje incluido** | 63,47 | 1,000 | 63,47 |
| | | | Plancha eléctrica para calentar comidas, de 60x45 cm, colocada y con el desmontaje incluido (P - 44) | | | |
| 10 | HQU2E001 | u | **Horno microondas para calentar comidas, colocado y con el desmontaje incluido** | 72,84 | 1,000 | 72,84 |
| | | | Horno microondas para calentar comidas, colocado y con el desmontaje incluido (P - 45) | | | |
| 11 | HQU2GF01 | u | **Recipiente para recogida de basura, de 100 l de capacidad, colocado y con el desmontaje incluido** | 46,60 | 1,000 | 46,60 |
| | | | Recipiente para recogida de basura, de 100 l de capacidad, colocado y con el desmontaje incluido (P - 46) | | | |
| 12 | HQU2P001 | u | **Colgador para ducha, colocado y con el desmontaje incluido** | 2,21 | 8,000 | 17,68 |
| | | | Colgador para ducha, colocado y con el desmontaje incluido (P - 47) | | | |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
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## PRESSUPOST



| | | | |
|---|---|---|---|
| TOTAL | Titol 3 | 01.01.03 | 2.716,84 |

# RESUM DE PRESSUPOST

# RESUM DE PRESSUPOST



| NIVELL 2: CAPÍTOL | | | Import |
|---|---|---|---|
| Capítol | 01.01 | Estudio de Seguridad y Salud | 5.998,40 |
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC | 5.998,40 |
| | | | 5.998,40 |

| NIVELL 1: OBRA | | | Import |
|---|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC | 5.998,40 |
| | | | 5.998,40 |

# ANNEX NÚM. 13: PLA DE TREBALLS

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 25/01/2024 | DJS | | |
| | | | | |
| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| Totes | Creació del document |
| | |
| | |
| | |

NOM FITXER : 240126 PMAN-FGC-PED-PLA DE TREBALLS-V00

**ÍNDEX**

1 OBJECTE ..... 1

2 PLA DE TREBALLS ..... 1

# 1 OBJECTE

L'objecte del present annex és concretar i justificar el termini d'execució de les obres de reparació del pont sobre la carretera de Vic de la línia Llobregat-Anoia de FGC.

En compliment de l'article 132 del Reglament general de la Llei de l'Administració pública, aprovat pel Reial decret 1098/2001 de 12 d'octubre de 2001 i de l'apartat 1 paràgraf e) de l'article 233 de la Llei 9/2017, de 8 de novembre , de contractes del sector públic, per la qual es transposen a l'ordenament jurídic espanyol les directives del Parlament Europeu i del Consell 2014/23/UE i 2014/24/UE, de 26 de febrer de 2014 s'elabora el Pla de treballs, a el que s'estudia amb caràcter indicatiu el possible desenvolupament de les obres.

# 2 PLA DE TREBALLS

S'ha realitzat el Diagrama de Gantt representatiu de l'estructuració de les obres, amb indicació del termini total estimat per a la finalització de les obres.

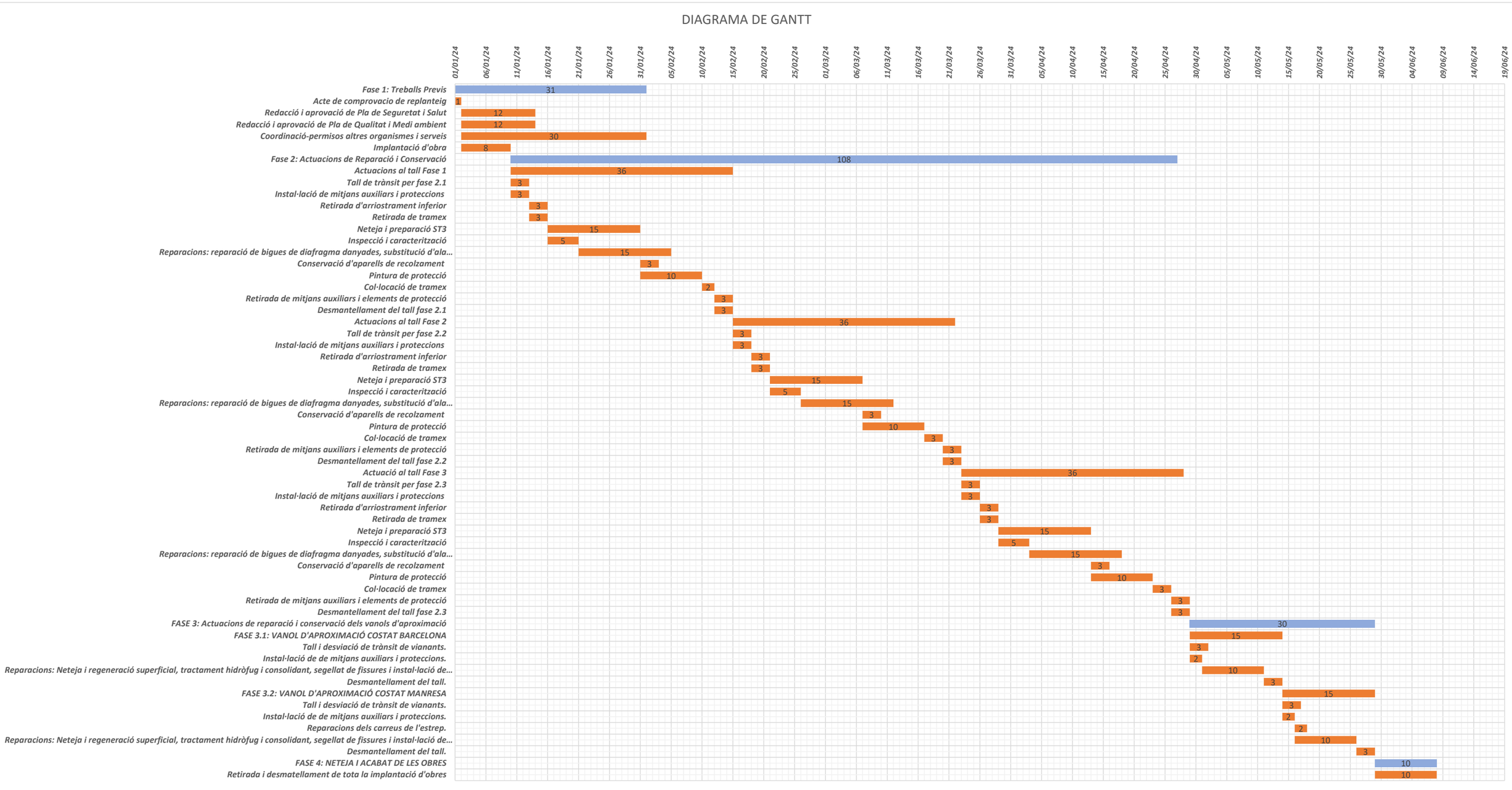
En qualsevol cas, atès el caràcter indicatiu del pla, la Constructora adjudicatària de les obres modificarà o adaptarà el pla a les seues necessitats i/o criteris.

El diagrama s'ha realitzat tenint en compte les activitats corresponents a les unitats d'obra més importants, exposant les indicacions dels terminis parcials.

De la mateixa manera, s'ha tingut en compte el rendiment dels equips que figuren a l'annex de Justificació de Preus i el volum d'obra que cal construir. Amb aquest darrer, s'ha calculat la durada en dies de cada part de les obres i posteriorment s'ha aplicat un coeficient corrector per compensar les pèrdues per condicions climatològiques adverses i imprevistes.

A continuació, s'hi inclou el pla de treballs amb un termini d'execució total de les obres de 6 MESOS.

# DIAGRAMA DE GANTT



# ANNEX NÚM. 14: ORGANITZACIÓ I DESENVOLUPAMENT DE L'OBRA

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 01/02/2024 | DJS | JJO | JJO |
| 1 | 13/02/2024 | DJS | | |
| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| Totes | Creació del document |
| | |
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NOM FITXER : 240313 PMAN-FGC-PED-ORGANITZACIÓ I DESENVOLUPAMENT DE L'OBRA-V01

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# 1 OBJECTE

L'objecte del present annex es definir y justifica les diferents fases d'execució de les obres definides al present "Projecte de reparació del pont de ctra. de Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya".

Els principals objectius són, minimitzar l'aferrament als usuaris de la zona, així com als treballadors de l'obra i assolir el màxim nivell de seguretat, reordenar la circulació a la zona afectada, i adaptar-ne el comportament a la situació de les obres.

Per completar els objectius descrits sobre aquestes línies, es proposa un programa de treball per fases, s'analitza la viabilitat de cadascuna d'aquestes fases i es coordina aquesta organització dels treballs amb el Pla de treball corresponent.

Els criteris de disseny segueixen els establerts a la Norma 8.3 IC "Senyalització, abalisament i defensa de les obres" de 31 d'agost de 1987 que publica la mateixa Direcció General de Carreteres del Ministeri de Foment.

En qualsevol cas, aquesta proposta la desenvoluparà i completarà, prèviament a l'execució de les obres, el contractista, quedant subjecta a l'aprovació o modificació per part de la Direcció Facultativa de les obres.

# 2 SITUACIÓ ACTUAL

El pont sobre la carretera de Vic de FGC al PK 60+720, es troba a la carretera de Vic al terme municipal de Manresa, Barcelona.

És un pont de estructura metàl·lica, el pont té un únic vanol (isostàtic) amb longitud de 17,9 m i 8,8 m d'amplada.

Els estreps del pont presenten paraments frontals plans de maçoneria carejada amb carreus en cantonades i imposta de coronació. Els paraments laterals són murs envoltats de la mateixa tipologia que els frontals. Amb l'existència de dos passos inferiors, en ambdós estreps. Els murs guardabalast són de carreuat, a l'estrep d'entrada, i de formigó, al de sortida. Les coronacions de suports són de carreuat.

El pont es constituït per les bigues principals són gelosies a Cruz de Sant Andreu, amb sustentació isostàtica i longitud entre suports de 17,3 m. Consten de 9 mòduls de 1,82 m, amb diagonals creuades a tots ells. El seu cantell màxim és de 2,002 m i la separació entre els seus eixos de 8,8 m. Els cordons estan constituïts per seccions a "T", invertida la inferior, i són variables en anar entrant xapes de reforç. Tant el superior com l'inferior estan reforçats amb perfils angulars simples. Els muntants estan constituïts per xapes i angulars. Les diagonals estan formades per parells d'angulars de diferents mides units entre si per xapes d'ànima. Hi ha cartells als nusos superiors extrems i a les unions amb les biguetes i elements d'arriostraments.

La posició del tauler és inferior en relació amb les bigues principals.

Les biguetes tenen una longitud teòrica de 8,8 m i estan modulades cada 1,82 m, coincidint amb els muntants de les bigues principals. Són bigues armades d'ànima plena, constituïdes per xapes i quatre angulars, amb angulars de reforç a les ales inferiors que no és existent al costat exterior de les biguetes extremes. Tenen secció variable amb un cantell màxim de 0,74 m, al centre de va, i cantell mínim de 0,72 m en els suports. Les unions amb les bigues principals són reblonades i es realitzen a través de les cartel·les de rigidesa dels muntants.

Els travessers originals han estat substituïts per bigues al calaix. La separació transversal entre eixos és de 1,06 m, sent 1,88 m la distància entre el travesser exterior i la biga principal, per a ambdues vies, finalment, la separació entre els travessers interiors és de 2,92 m. Tenen una llum de 1,82 m i 0,303 m de cantell. S'uneixen a les biguetes mitjançant cargols d'alta resistència a través de casquets d'angular.

El pont disposa d'un arriostrament horitzontal contravent entre les dues bigues, amb modulació cada tres mòduls de biga, a nivell del seu cordó inferior, constituït per una gelosia a la Creu de Sant Andreu. A més, recentment, s'ha disposat un arriostrament contravent nou entre els travessers interiors de cada via, resolt també mitjançant una gelosia a Cruz de San Andrés, modulada igual que les biguetes del tauler.

Finalment, existeixen pòrtics de frenada disposats en els mòduls 2n i 8è, resolts mitjançant mòduls a "K" entre el travesser exterior i el cordó inferior de la biga principal adjacent, i per mòduls a Cruz de San Andrés entre els travessers dels mòduls afectats.

Totes les unions són roblonades, excepte a les diagonals de l'arriostrament inferior reforçades. Les unions es fan a través de cartel·les, presentant excentricitat totes les diagonals.

El pont també disposa de dues passejades de servei interiors a les bigues principals que han estat producte de les feines de renovació. A més, s'han disposat pòrtics de suport de canonades a la zona d'entrevies, cobertes per una xapa estriada que dóna lloc a un tercer passeig.

La xapa de pis és metàl·lica estriada, i està roblonada als perfils que les sustenten, on també existeix unes baranes als passeigs laterals.

# 3 DESCRIPCIÓ DE LA SOLUCIÓ ADOPTADA

- Es proposa les següents actuacions recomanades de reparació:
- Reparació de bigues de diafragma danyades.
- Substitució d'ala inferior de les bigues i arriostrament inferior.
- Reparació de fissura en diagonal
- Reparació de soldadures

- Revisió de bigues del tramex
- Manteniment dels aparells de suport
- Pintat
- Neteja d'estreps
- Neteja de paraments de carreu
- Segellat de fissures en carreus
- Reposició d'arrebossat en voltes mitjançant aplicació de morter hidròfug
- Reparació d'arrebossats en murs laterals
- Reparació de rejuntats entre carreus degradats o fissurats
- Substitució de carreus trencats.

# 4 ORGANITZACIÓ DE L'OBRA

Per a la execució de la reparació del pont metàl·lic sobre la carretera de Vic de la línia Llobregat-Anoia de FGC s'han establert 4 fases d'obra.

## 4.1 FASES D'OBRA

L'estudi i el desenvolupament de l'obra es du a terme mitjançant la divisió en fases, que es detalla a continuació:

### 4.1.1 FASE 1: TREBALLS PREVIS

- Coordinació i obtenció de permisos amb altres organismes i serveis.
- S'instal·laran els tancaments de la zona de casetes, apilaments, contenidors, es col·locaran els senyals de seguretat i salut, s'habilitaran les casetes d'obra (oficina, menjador, sanitaris, vestidor, caseta d'eines) incloent els subministraments a casetes d'aigua, llum. Es prepararan les zones de recollida i es col·locaran els contenidors de residus.
- Gestió de compres i subcontractació.
- Acte de comprovació de replanteig, redacció i aprovació de Pla de Seguretat i Salut, Pla de Qualitat i Medi ambient.

### 4.1.2 FASE 2: ACTUACIONS DE REPARACIÓ I CONSERVACIÓ

#### *4.1.2.1 FASE 2.1: ACTUACIONS AL TALL FASE 1*

- Tall de trànsit per fases 2.1
- Instal·lació de mitjans auxiliars i proteccions (lones, xarxa, barrera new jersey etc.)
- Retirada d'arriostrament inferior
- Retirada de tramex
- Neteja i preparació ST3
- Campanya d´inspecció i caracterització
- Reparacions:
  - Reparació de bigues d'estrep danyades. Aquesta actuació de reparació en concret s'executarà en 2 fases de tall a nivell de trànsit ferroviari, simultani al tall de trànsit inferior de la fase 2.1. Durant l'actuació es preveu realitzar un tall de la circulació de les vies preferiblement a caps de setmana. El tall de la circulació de les vies per a aquesta actuació es preveu amb una duració d'un cap de setmana per cada estrep (2 caps de setmana de tall de circulació de les vies), encara que el carril costat Sant Fruitós n'hi ha la possibilitat de fer un tall parcial amb desviament del pas dels trens al carril costat Manresa. Es preveu que aquesta actuació es faci en torn diürn i nocturn.
  - Reparació de fissures i soldadures
  - Revisió de bigues del tramex
- Conservació d'aparells de suport
- Pintura de protecció
- Col·locació de tramex
- Reparacions dels carreus de l'estrep
- Retirada de mitjans auxiliars i elements de protecció
- Desmantellament del tall Fase 1

#### *4.1.2.2 FASE 2.2: ACTUACIONS AL TALL FASE 2*

- Tall de trànsit per fases 2.2
- Instal·lació de mitjans auxiliars i proteccions (lones, xarxa, barrera new jersey etc.)
- Retirada d'arriostrament inferior
- Retirada de tramex
- Netejat i preparació ST3
- Campanya d´inspecció i caracterització
- Reparacions:
  - Reparació de bigues d'estrep danyades. Aquesta actuació de reparació en concret s'executarà en 2 fases de tall a nivell de trànsit ferroviari, simultani al tall de trànsit inferior de la fase 2.1. Durant l'actuació es preveu realitzar un tall de la circulació de les vies preferiblement a caps de setmana. El tall de la circulació de les vies per a aquesta actuació es preveu amb una duració d'un cap de setmana per cada estrep (2 caps de setmana de tall de circulació de les vies), encara que el carril costat Sant Fruitós n'hi ha la possibilitat de fer un tall parcial amb desviament del pas dels trens al carril costat Manresa. Es preveu que aquesta actuació es faci en torn diürn i nocturn.

- Substitució d'ala inferior de les bigues i arriostrament inferior
- Reparació de fissures i soldadures
- Revisió de bigues del tramex

– Conservació d'aparells de suport
– Pintura de protecció
– Col·locació de tramex
– Reparacions dels carreus de l'estrep
– Retirada de mitjans auxiliars i elements de protecció
– Desmantellament del tall Fase 2

#### *4.1.2.3 ACTUACIONS AL TALL FASE 3*

– Tall de trànsit per fases 2.3
– Instal·lació de mitjans auxiliars i proteccions (lones, xarxa, barrera new jersey etc.)
– Retirada d'arriostrament inferior
– Retirada de tramex
– Neteja i preparació ST3
– Campanya d´inspecció i caracterització
– Reparacions: substitució d'ala inferior de les bigues i arriostrament inferior, reparació de fissures i soldadures i revisió de bigues del tramex
– Conservació d'aparells de suport
– Pintura de protecció
– Col·locació de tramex
– Retirada de mitjans auxiliars i elements de protecció
– Desmantellament del tall Fase 3

### 4.1.3 FASE 3: ACTUACIONS DE REPARACIÓ I COSERVACIÓ DELS VANOLS D'APROXIMACIÓ

#### *4.1.3.1 FASE 3.1: VANOL D'APROXIMACIÓ COSTAT BARCELONA*

– Es farà el tall i desviació de trànsit de vianants.
– Instal·lació de de mitjans auxiliars i proteccions.
– Reparacions: Neteja i regeneració superficial, tractament hidròfug i consolidant, segellat de fissures instal·lació de drens.
– Desmantellament de l'ocupació i mitjans

#### *4.1.3.2 FASE 3.1: VANOL D'APROXIMACIÓ COSTAT MANRESA*

– Es farà el tall i desviació de trànsit de vianants.
– Instal·lació de de mitjans auxiliars i proteccions.
– Reparacions dels carreus de l'estrep.
– Reparacions: Neteja i regeneració superficial, tractament hidròfug i consolidant, segellat de fissures i instal·lació de drens.
– Desmantellament de l'ocupació i mitjans

### 4.1.4 FASE 4: NETEJA I ACABAT DE LES OBRES

Es retirarà i desmantellarà tota la implantació d'obres (casetes d'obres, zona apilaments, subministraments a casetes d'aigua, llum, contenidors de residus, retirada de tancaments d'obra, retirada de senyals de seguretat i salut), es realitzaran els repassos i la reparació de petits desperfectes que indiqui la direcció d'obres i es procedirà a una neteja exhaustiva de tota la zona d'obres per tal de deixar-ho en condicions equivalents prèvia a l'execució de l'obra.

Un cop acabada la fase 4, s'estarà en condicions de fer l'acte de recepció d'obres i la signatura de l'acta de recepció. En aquest acte, es podrien detectar petits desperfectes i/o acabats de petita entitat pendents de realitzar i se'n podrà indicar l'esmena en un termini 1 mes, moment en què, si tot està correcte, es procedirà a realitzar l'acte de recepció definitiva.

D'altra banda, les durades estimades de les tasques a realitzar són les que es presenten a continuació:

Fase 1. TREBALLS PREVIS: 4 setmanes

Fase 2 ACTUACIONS DE REPARACIÓ I CONSERVACIÓ: 15 setmanes

Fase 3. ACTUACIONS DE REPARACIÓ I COSERVACIÓ DELS VANOLS D'APROXIMACIÓ: 4 setmanes

Fase 4.NETEJA I ACABAT DE LES OBRES: 2 setmanes

Al pla d'obres inclòs a l'annex del projecte es mostra el cronograma d'obres, amb detall de les partides/àmbits d'execució, durades, precedències i activitats successors, tipus de lligadures, obtenció del camí crític, etc.

És una durada total de 6 mesos.

# 5 OBJECTE

Es defineix la senyalització i abalisament d'obres durant les diferents fases d'execució de les obres definides en el present "Projecte de reparació Pont ctra. Vic. LOT 3 Línia Llobregat-Anoia FGC".

Els principals objectius són, minimitzar la inclinació als usuaris de la zona, així com als treballadors de l'obra i aconseguir el màxim nivell de seguretat, reordenar la circulació en la zona afectada, i adaptar el comportament d'aquesta a la situació de les obres.

Els criteris de disseny segueixen els establerts en la Norma 8.3-IC "Senyalització, abalisament i defensa de les obres" de 31 d'agost de 1987 que publica la pròpia Direcció General de Carreteres del Ministeri de Foment. En qualsevol cas, aquesta proposta la desenvoluparà i completarà, prèviament a l'execució de les obres, el contractista, quedant subjecta a l'aprovació o modificació per part de la Direcció Facultativa de les obres.

# 6 ORGANITZACIÓ DE L'OBRA

## 6.1 DESENVOLUPAMENT DE LES OBRES

Per l'execució de la reparació del pont a la carretera de Vic s'han establert 4 fases d'obra bàsiques.

Fase 1. TREBALLS PREVIS: 4 setmanes

Fase 2 ACTUACIONS DE REPARACIÓ I CONSERVACIÓ: 15 setmanes

Fase 3. ACTUACIONS DE REPARACIÓ I COSERVACIÓ DELS VANOLS D'APROXIMACIÓ: 4 setmanes

Fase 4.NETEJA I ACABAT DE LES OBRES: 2 setmanes

# 7 TALLS DE TRÀFIC

## 7.1 TRÀFIC FERROVIARI EN ÀMBIT SUPERIOR

En el àmbit superior es tracta del pas d'una via ferroviària de trens de FGC. Durant la realització de les obres de reparació del pont, la via es veurà afectada durant treballs nocturns determinats per les diferents fases. Mentre l'equip d'obra estigui treballant al pont, la via haurà de ser tallada amb pas alternatiu fins que acabi el treball i no hagi cap tipus de perill. Aquestes afeccions tenen una planificació segons fases i estarà subjecta a coordinació amb els permisos de FGC.

## 7.2 TRÀFIC VIARI EN ÀMBIT INFERIOR

El trànsit viari inferior del pont es troba obert actualment, les actuacions al pont requereix el tall de carrils per fases a la carretera per la reparació de l'estructura en l'àmbit inferior. Les actuacions a executar en l'àmbit superior en el qual el trànsit viari inferior no es veu afectat o es trobin prou allunyats d'aquest, no serà necessari tallar el trànsit, però sempre es plantejaran certes restriccions per la correcta funcionalitat del trànsit perquè no hi hagin accidents o similar.

Es realitzaran talls parcials dels carrils durant les reparacions puntuals en la part inferior del pont.

Com abans s'esmenta es plantejaran certes restriccions per la correcta funcionalitat i fluïdesa del trànsit degut a la reducció d'espai per al pas de vehicles.

- Fase 1: Es tallarà el sentit de circulació viaria del costat Barcelona i s'habilitarà un carril provisional al sentit contrari. S'adjunta el plànol al mateix annex, de l'exemple del tall a realitzar en aquesta fase. Exemple 2.7 del "Manual de ejemplos de sañalización de obras fijas" del Ministeri de Foment.
- Fase 2: Es tallarà el sentit de circulació viaria del costat Manresa i s'habilitarà un carril provisional al sentit contrari. S'adjunta el plànol al mateix annex, de l'exemple del tall a realitzar en aquesta fase. Exemple 2.7 del "Manual de ejemplos de sañalización de obras fijas" del Ministeri de Foment.
- Fase 3: Es tallarà un carril per cada sentit de circulació i deixant el carril exterior de cada sentit lliure. S'adjunta el plànol al mateix annex, de l'exemple del tall a realitzar en aquesta fase. Exemple 2.8 del "Manual de ejemplos de sañalización de obras fijas" del Ministeri de Foment.

# 8 SENYALITZACIÓ I ABALISAMENT DE LES OBRES

La senyalització i abalisament d'obra es projecta en aquelles situacions en les quals és necessari indicar la presència de desviament provisionals o la zona d'obres quan aquestes se situen fora de les plataformes de les carreteres existents per a fer perceptible la seva presència.

S'han tingut en compte els criteris indicats en la instrucció d'obres i el manual d'exemples de senyalització d'obres fixes del Ministeri de Foment, editat en 1998.

## 8.1 VALORACIÓ ECONÓMICA DE LA SENYALITZACIÓ I ABALISSAMENT DE L'OBRA

El conjunt d'actuacions necessàries a l'efecte d'organització i desenvolupament de les obres ha de quedar reflectit en el pressupost general de l'obra mitjançant una partida alçada de cobrament íntegre. Aquesta partida es justifica a continuació i puja a 11.417,57 € PEM. En el pressupost es detallen tots els elements a utilitzar de senyalització, desviament, abalisament i defensa de l'obra.

## 8.2 PLÀNOLS DE TALLS DE TRÀFIC I SENYALITZACIÓ DE LES OBRES

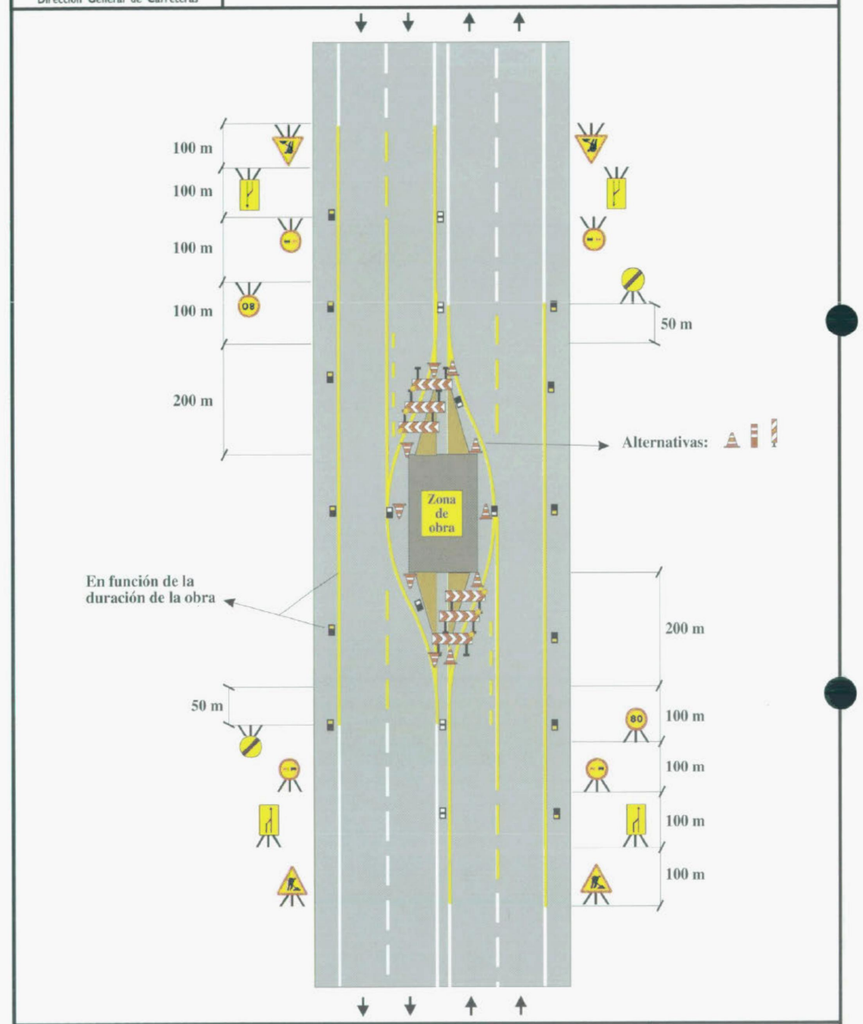
S'adjunta a continuació els plànols de desviaments de tràfic de vehicles durant l'execució de les obres de reparació.

En aquestes situacions es disposarà de la senyalització que se estimi necessària d'acord amb els exemples del "Manual de ejemplos de señalización de obres fijas" del Ministeri de Foment.

Ministerio de Fomento
Dirección General de Carreteras

# Señalización de Obras Fijas

## Calzada con 2 carriles en cada sentido




| | |
|---|---|
| Zona de obra: Ocupando un carril en cada sentido | Ejemplo: 2.8 |
| Por ejemplo: Mantenimiento, etc. | Figura: C7/18 |



26/01/2024 C:\DROPBOX (PEDELTA)\DATA\PRJA\ESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\06AF01-F02.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
EXEMPLES DE SENYALITZACIÓ (II)

DATA: GENER 2024

PLÀNOL NÚM.: 06A

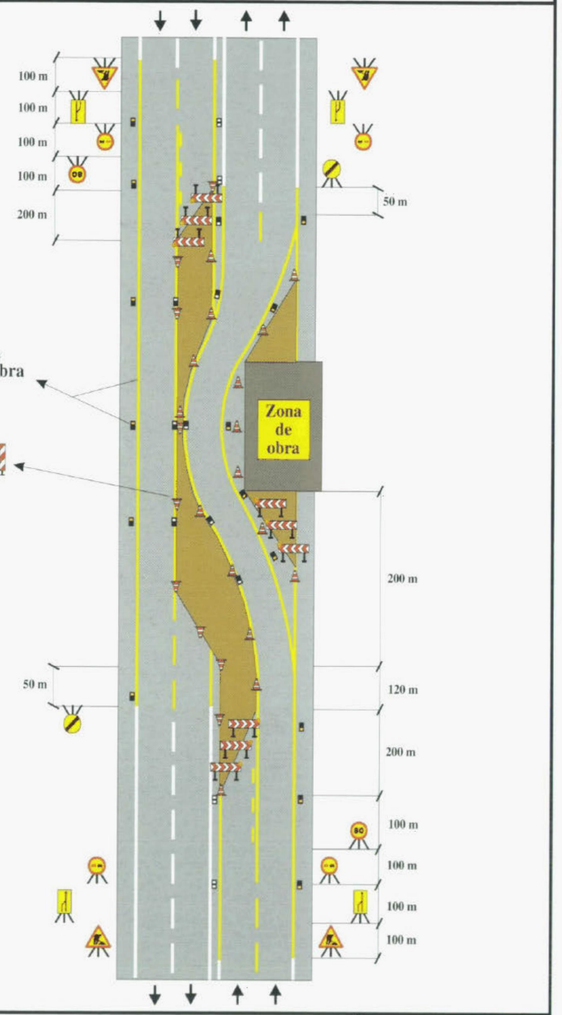
NOM FITXER: 06AF01-F02.dwg

FULL 2 DE 2

Ministerio de Fomento
Dirección General de Carreteras

# Señalización de Obras Fijas

## Calzada con 2 carriles en cada sentido




| | |
|---|---|
| Zona de obra: Ocupando dos carriles | Ejemplo: 2.7 |
| Por ejemplo: Mantenimiento, etc. | Figura: C7/18 |



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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
EXEMPLES DE SENYALITZACIÓ (I)

DATA: GENER 2024

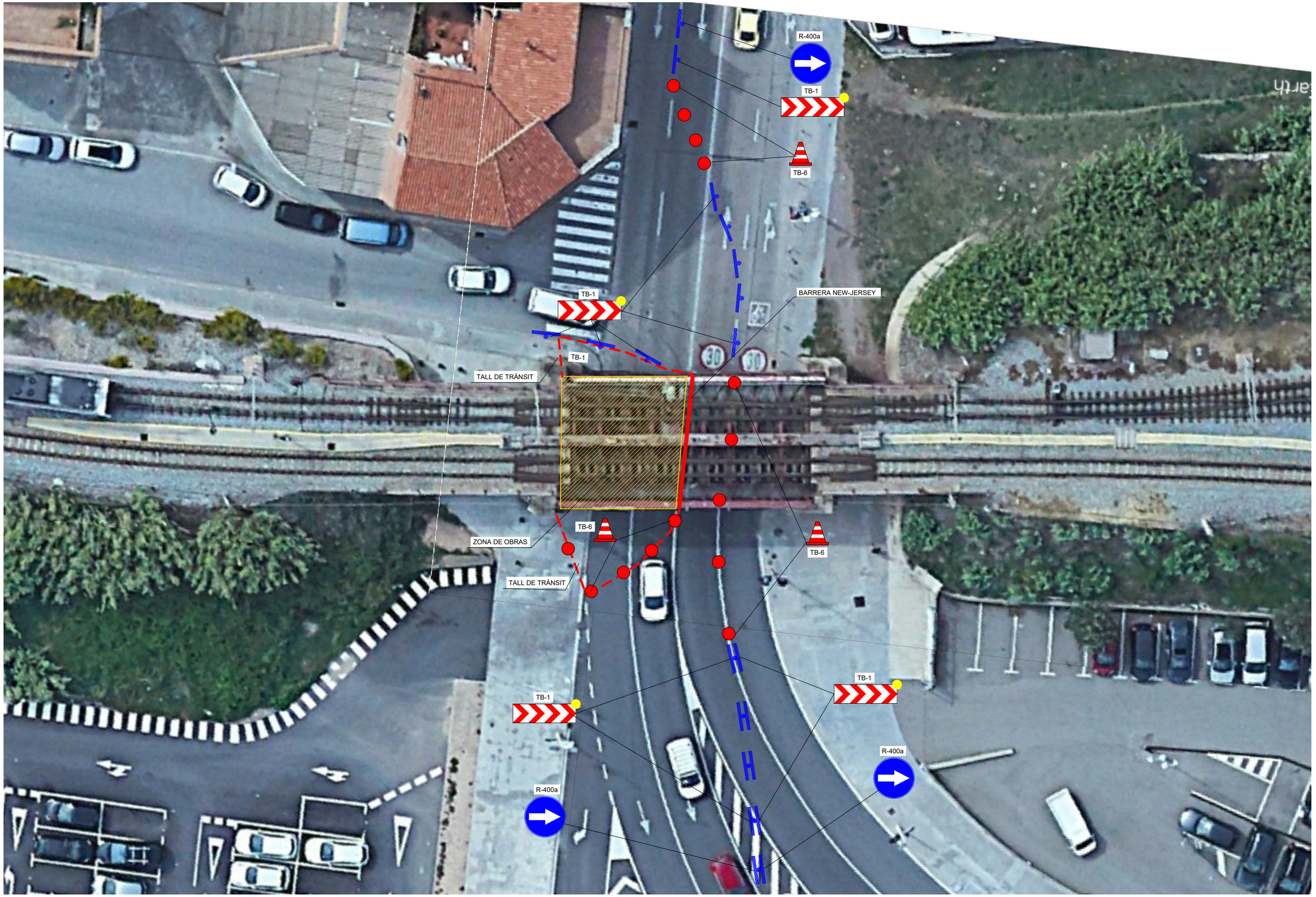
PLÀNOL NÚM.: 06A

NOM FITXER: 06AF01-F02.dwg

FULL 1 DE 2

## PONT SOBRE CARRETERA DE VIC

ESCALA 1:150



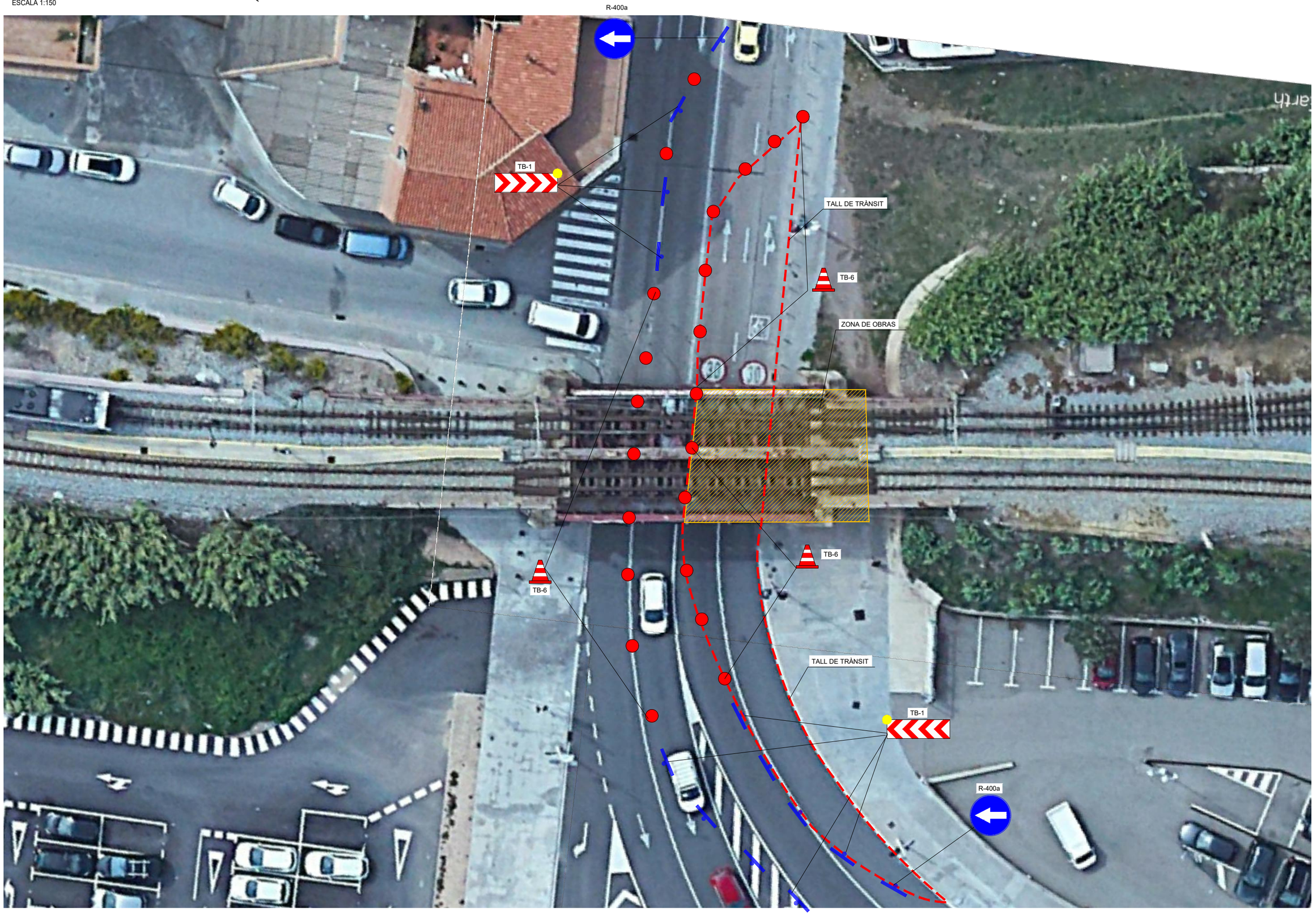

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| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FGC | CONSULTOR PEDELTA | AUTOR DEL PROJECTE JAVIER JORDÁN GARCÍA | TÍTOL DEL PROJECTE INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA | CLAU PROJECTE | ESCALES S/E ORIGINALS GRÀFIQUES | NOM DEL PLÀNOL PONT SOBRE LA CARRETERA DE VIC P.K. 060/720 SENYALITZACIÓ, ABALISAMENT I DEFENSES FASE 1 DESVIAMENT PROVISIONAL | DATA GENER 2024 / NOM FITXER 06BF01-F03.dwg | PLÀNOL NÚM. 08A / FULL 1 DE 3 |

# PONT SOBRE CARRETERA DE VIC

ESCALA 1:150




26/01/2024 C:\DROPBOX (PEDELTA SL)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\06BF01-F03.DWG

| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: S/E

ORIGINALS: GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
FASE 2 DESVIAMENT PROVISIONAL

DATA: GENER 2024

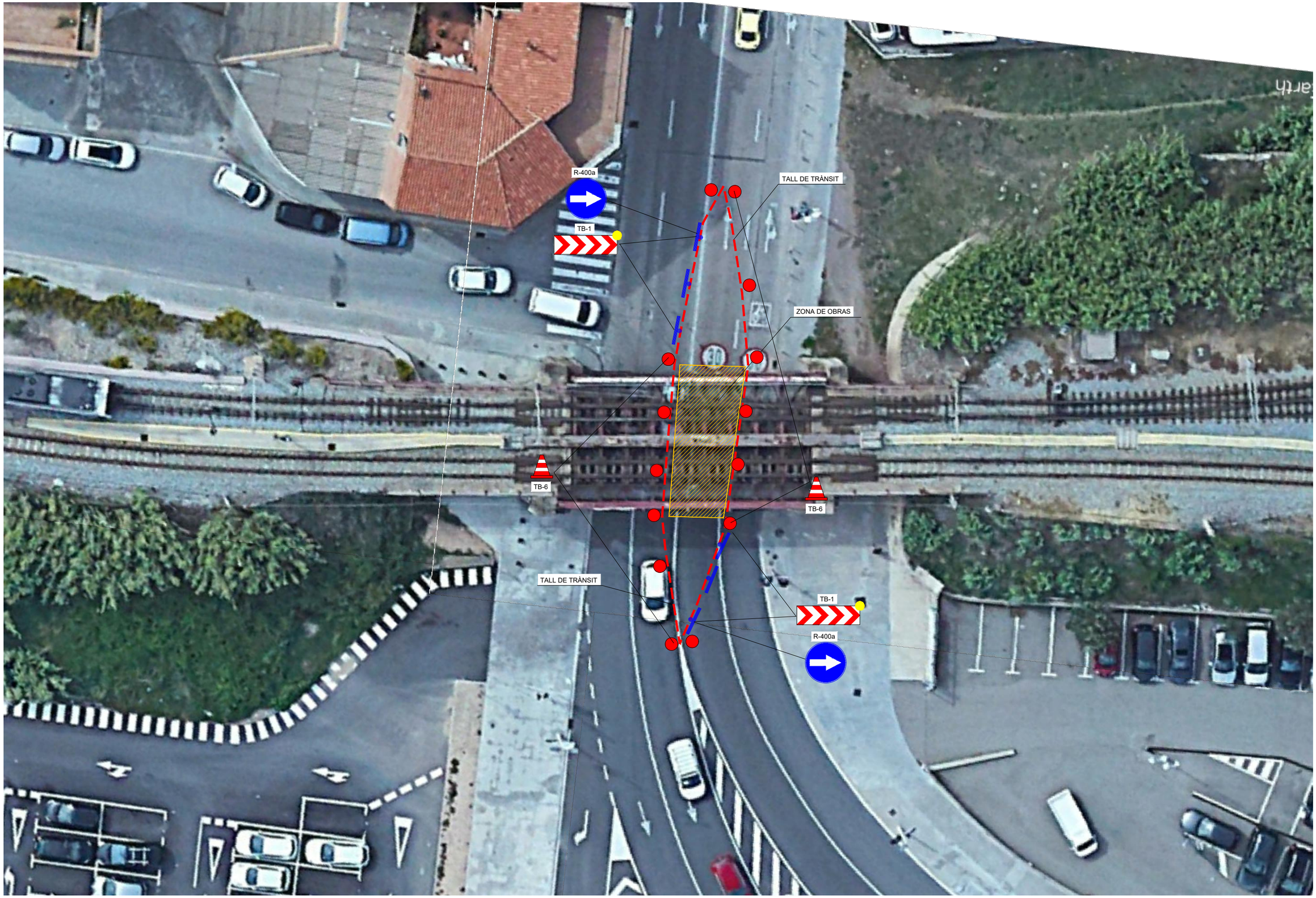
PLÀNOL NÚM.: 08A

NOM FITXER: 06BF01-F03.dwg

FULL 1 DE 3

## PONT SOBRE CARRETERA DE VIC

ESCALA 1:150




26/01/2024 C:\DROPBOX (PEDELTA SL)\DATA\PRJ\AESP23B117PMAN-FGC\07BIM\01PH1\04DRW\06BF01-F03.DWG

| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FGC | CONSULTOR PEDELTA | AUTOR DEL PROJECTE JAVIER JORDÁN GARCÍA | TÍTOL DEL PROJECTE INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA | CLAU PROJECTE | ESCALES S/E ORIGINALS GRÀFIQUES | NOM DEL PLÀNOL PONT SOBRE LA CARRETERA DE VIC P.K. 060/720 SENYALITZACIÓ, ABALISAMENT I DEFENSES FASE 3 DESVIAMENT PROVISIONAL | DATA GENER 2024 / NOM FITXER 06BF01-F03.dwg | PLÀNOL NÚM. 08A / FULL 1 DE 3 |

# ANNEX NÚM. 15: JUSTIFICACIÓ DE PREUS

# JUSTIFICACIÓ DE PREUS



MA D'OBRA

| CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|
| A01-FEOZ | h | Ayudante encofrador | 19,00000 | € |
| A01-FEP1 | h | Ayudante soldador | 19,07000 | € |
| A01-FEP9 | h | Ayudante pintor | 19,00000 | € |
| A01-FEPD | h | Ajudant electricista | 24,61000 | € |
| A01-FEPH | h | Ayudante montador | 19,00000 | € |
| A0121000 | h | Oficial 1a | 25,36000 | € |
| A0122000 | h | Oficial 1a paleta | 25,36000 | € |
| A012-FGC01 | dia | Protector de via | 350,00000 | € |
| A013U001 | h | Ajudant | 23,70000 | € |
| A0140000 | h | Manobre | 21,17000 | € |
| A0150000 | h | Manobre especialista | 21,89000 | € |
| A0D-0007 | h | Peón | 18,03000 | € |
| A0D-00072 | h | 2 Peón | 38,00000 | € |
| A0E-000A | h | Peón especialista | 18,57000 | € |
| A0F-000B | h | Oficial 1a | 28,61000 | € |
| A0F-000E | h | Oficial 1a electricista | 28,69000 | € |
| A0F-000T | h | Oficial 1a albañil | 20,40000 | € |
| A0F-000U | h | Oficial 1a picapedrer | 27,76000 | € |
| A0F-000V | h | Oficial 1a pintor | 20,40000 | € |
| A0F-000Y | h | Oficial 1a soldador | 20,74000 | € |
| A0J-0029 | h | Conservador-restaurador | 30,45000 | € |
| A0J-002A | h | Conservador- restaurador responsable de la intervenció | 34,00000 | € |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# JUSTIFICACIÓ DE PREUS



MAQUINÀRIA

| CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|
| C15018U0 | h | Camió de 150 hp, de 12 t (5,8 m3) | 38,54000 | € |
| C152-0039 | h | Camión grúa de 5 t | 48,05000 | € |
| C176-00FX | h | Formigonera de 165 l | 1,90000 | € |
| C206-00DW | h | Equipo y elementos auxiliares para soldadura eléctrica | 3,11000 | € |
| C207-00E1 | h | Equipo y elementos auxiliares para corte oxiacetilénico | 6,73000 | € |
| C20A-00HA | h | Equip polvoritzador de motxilla amb bomba manual | 1,54000 | € |
| C20G-00DT | h | Máquina taladradora | 3,42000 | € |
| CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 8,58000 | € |
| CZ15-00E5 | dia | Grup electrògen | 30,00000 | € |
| CZ172000 | h | Màquina de raig d'aigua a pressió | 3,62000 | € |
| CZ18-MAOMAN | dia | Plataforma elevadora | 260,00000 | € |

# JUSTIFICACIÓ DE PREUS



MATERIALS

| CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|
| B0111000 | m3 | Aigua | 1,56000 | € |
| B011-05MF | l | Aigua desionitzada no polaritzada | 0,31000 | € |
| B015-16HS | l | Diluent de pintura mineral al silicat, per a interiors i exteriors | 9,48000 | € |
| B03L-05N7 | t | Sorra de pedrera per a morters | 20,73000 | € |
| B0512401 | t | Ciment pòrtland amb filler calcari CEM II/B-L 32,5 R segons UNE-EN 197-1, en sacs | 101,19000 | € |
| B054-06DH | kg | Calç aèria hidratada CL 90-S, en sacs | 0,30000 | € |
| B055-067M | t | Cemento pórtland con caliza CEM II/B-L 32,5 R según UNE-EN 197-1, en sacos | 103,55000 | € |
| B0714000 | kg | Morter sintètic epoxi de resines epoxi | 3,25000 | € |
| B079-06TD | kg | Mortero polimérico de cemento con resinas epoxi para imprimación anticorrosiva y puente de unión | 5,75000 | € |
| B0AP-07IU | u | Tornillos en calidad 10.9, pretensados, arandela y tuerca de acero, 130 mm de longitud | 3,46000 | € |
| B0G3-1GB4 | m3 | Pedra calcària/arenítica Vinaixa en blocs escollits, deixat de serra, per a dovelles, traceries, capitells i treballs escultòrics | 173,76000 | € |
| B1-MAOMAN0 | m2 | Lones de protección | 2,00000 | € |
| B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 1,94000 | € |
| B44Z-0M0Y | kg | Acer S275JR segons UNE-EN 10025-2, format per peça simple, en perfils laminats en calent sèrie IPN, IPE, HEB, HEA, HEM i UPN, treballat al taller per a col·locar amb cargols i galvanitzat | 2,74000 | € |
| B44Z-0M1P | kg | Acero S355J0 según UNE-EN 10025-2, formado por pieza simple, para refuerzo de elementos de empotramiento, apoyo y rigidizado, en perfiles laminados en caliente serie L, LD, T, redondo, cuadrado, rectangular y plancha, trabajado en el taller para colocar con soldadura y con una capa de imprimación antioxidante | 1,37000 | € |
| B7J50060 | dm3 | Massilla per a segellats, d'aplicació amb pistola, de base polisulfurs bicomponent | 14,25000 | € |
| B7JZ1010 | dm3 | Imprimació prèvia per a segellats de massilla de silicona neutra | 24,94000 | € |
| B896-HYC4 | kg | Pintura al silicat, per a exteriors | 12,49000 | € |
| B898-2MHX | l | Pintura epoxi bicomponente, para sistemas de protección de del acero | 7,45000 | € |
| B898-2MHY | l | Pintura de poliuretano bicomponente, para sistemas de protección de del acero | 8,60000 | € |
| B8Z2-12Y5 | kg | Consolidant de silicat d'etil per a pedra natural | 22,69000 | € |
| B8ZH-358R | kg | Pintura de fons al silicat, per a exteriors | 9,67000 | € |
| BGD5-06SS | u | Piqueta de connexió a terra d'acer i recobriment de coure, de 2500 mm de llargària, de 18,3 mm de diàmetre, de 300 µm | 28,92000 | € |
| BGYD-0B2W | u | Part proporcional d'elements especials per a piquetes de connexió a terra | 5,07000 | € |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# JUSTIFICACIÓ DE PREUS



ELEMENTS COMPOSTOS

| CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|
| B07F-0LT6 | m3 | Morter mixt de ciment pòrtland amb filler calcari CEM II/B-L, calç i sorra, amb 200 kg/m3 de ciment, amb una proporció en volum 1:2:10 i 2,5 N/mm2 de resistència a compressió, elaborat a l'obra | 193,81000 | € |

Rend.: 1,000

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A0E-000A | h | Peón especialista | 1,050 | /R x | 18,57000 | = | 19,49850 | |
| | | Subtotal: | | | | | 19,49850 | 19,49850 |
| Maquinària | | | | | | | | |
| C176-00FX | h | Formigonera de 165 l | 0,725 | /R x | 1,90000 | = | 1,37750 | |
| | | Subtotal: | | | | | 1,37750 | 1,37750 |
| Materials | | | | | | | | |
| B0111000 | m3 | Aigua | 0,200 | x | 1,56000 | = | 0,31200 | |
| B055-067M | t | Cemento pórtland con caliza CEM II/B-L 32,5 R según UNE-EN 197-1, en sacos | 0,200 | x | 103,55000 | = | 20,71000 | |
| B054-06DH | kg | Calç aèria hidratada CL 90-S, en sacs | 400,000 | x | 0,30000 | = | 120,00000 | |
| B03L-05N7 | t | Sorra de pedrera per a morters | 1,530 | x | 20,73000 | = | 31,71690 | |
| | | Subtotal: | | | | | 172,73890 | 172,73890 |
| | | DESPESES AUXILIARS | 1,00 | % | | | | 0,19499 |
| | | COST DIRECTE | | | | | | 193,80989 |
| | | COST EXECUCIÓ MATERIAL | | | | | | 193,80989 |

| CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|
| D070A4D1 | m3 | Morter mixt de ciment pòrtland amb filler calcari CEM II/B-L, calç i sorra, amb 200 kg/m3 de ciment, amb una proporció en volum 1:2:10 i 2,5 N/mm2 de resistència a compressió, elaborat a l'obra | 196,86000 | € |

Rend.: 1,000

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A0150000 | h | Manobre especialista | 1,050 | /R x | 21,89000 | = | 22,98450 | |
| | | Subtotal: | | | | | 22,98450 | 22,98450 |
| Maquinària | | | | | | | | |
| C176-00FX | h | Formigonera de 165 l | 0,725 | /R x | 1,90000 | = | 1,37750 | |
| | | Subtotal: | | | | | 1,37750 | 1,37750 |
| Materials | | | | | | | | |
| B054-06DH | kg | Calç aèria hidratada CL 90-S, en sacs | 400,000 | x | 0,30000 | = | 120,00000 | |
| B0111000 | m3 | Aigua | 0,200 | x | 1,56000 | = | 0,31200 | |
| B0512401 | t | Ciment pòrtland amb filler calcari CEM II/B-L 32,5 R segons UNE-EN 197-1, en sacs | 0,200 | x | 101,19000 | = | 20,23800 | |
| B03L-05N7 | t | Sorra de pedrera per a morters | 1,530 | x | 20,73000 | = | 31,71690 | |
| | | Subtotal: | | | | | 172,26690 | 172,26690 |

## JUSTIFICACIÓ DE PREUS



ELEMENTS COMPOSTOS

| CODI | UA | DESCRIPCIÓ | | | PREU |
|---|---|---|---|---|---|
| | | DESPESES AUXILIARS | 1,00 | % | 0,22985 |
| | | COST DIRECTE | | | 196,85875 |
| | | COST EXECUCIÓ MATERIAL | | | 196,85875 |

D070A8B1 m3 Morter mixt de ciment pòrtland amb filler calcari CEM II/B-L, calç i sorra, amb 380 kg/m3 de ciment, amb una proporció en volum 1:0,5:4 i 10 N/mm2 de resistència a compressió, elaborat a l'obra — Rend.: 1,000 — 148,96000 €

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A0150000 | h | Manobre especialista | 1,050 | /R x | 21,89000 | = | 22,98450 | |
| | | Subtotal: | | | | | 22,98450 | 22,98450 |
| Maquinària | | | | | | | | |
| C176-00FX | h | Formigonera de 165 l | 0,725 | /R x | 1,90000 | = | 1,37750 | |
| | | Subtotal: | | | | | 1,37750 | 1,37750 |
| Materials | | | | | | | | |
| B054-06DH | kg | Calç aèria hidratada CL 90-S, en sacs | 190,000 | x | 0,30000 | = | 57,00000 | |
| B0512401 | t | Ciment pòrtland amb filler calcari CEM II/B-L 32,5 R segons UNE-EN 197-1, en sacs | 0,380 | x | 101,19000 | = | 38,45220 | |
| B03L-05N7 | t | Sorra de pedrera per a morters | 1,380 | x | 20,73000 | = | 28,60740 | |
| B0111000 | m3 | Aigua | 0,200 | x | 1,56000 | = | 0,31200 | |
| | | Subtotal: | | | | | 124,37160 | 124,37160 |

| | | |
|---|---|---|
| DESPESES AUXILIARS | 1,00 % | 0,22985 |
| COST DIRECTE | | 148,96345 |
| COST EXECUCIÓ MATERIAL | | 148,96345 |



## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

P-1 GD5AV009 Ud Desaigüe amb tubs ranurat de PVC de 90 mm de diàmetre, amb una profunditat mínima de 80cm i un vol de 20cm embolicat amb geotèxtil, la part vista amb camisa de PVC llis, executat amb sonda a rotació, inclós sellegat d'embocadures i cassoletes de morter, tant en paraments de pedra com en paraments de formigó, acabats i executat amb medis auxilliars d'acces com bastides, plataformes tissora o camió-cistella, inclou la part proporcional d'execució de peninsula de terres a riu que sigui necessari segons directrius de la direcció d'obra i sota el vist-i-plau de l'ACA. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 0,780 — 116,11 €

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A013U001 | h | Ajudant | 1,000 | /R x | 23,70000 | = | 30,38462 | |
| A0121000 | h | Oficial 1a | 1,000 | /R x | 25,36000 | = | 32,51282 | |
| | | Subtotal: | | | | | 62,89744 | 62,89744 |
| Maquinària | | | | | | | | |
| C20G-00DT | h | Máquina taladradora | 1,000 | /R x | 3,42000 | = | 4,38462 | |
| CZ15-00E5 | dia | Grup electrògen | 0,036 | /R x | 30,00000 | = | 1,38462 | |
| | | Subtotal: | | | | | 5,76924 | 5,76924 |
| Materials | | | | | | | | |
| B7JZ1010 | dm3 | Imprimació prèvia per a segellats de massilla de silicona neutra | 0,500 | x | 24,94000 | = | 12,47000 | |
| B7J50060 | dm3 | Massilla per a segellats, d'aplicació amb pistola, de base polisulfurs bicomponent | 0,500 | x | 14,25000 | = | 7,12500 | |
| B0111000 | m3 | Aigua | 1,000 | x | 1,56000 | = | 1,56000 | |
| B0714000 | kg | Morter sintètic epoxi de resines epoxi | 4,000 | x | 3,25000 | = | 13,00000 | |
| | | Subtotal: | | | | | 34,15500 | 34,15500 |
| Partides d'obra | | | | | | | | |
| P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,060 | x | 63,36000 | = | 3,80160 | |
| B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,140 | x | 28,30000 | = | 3,96200 | |
| | | Subtotal: | | | | | 3,96200 | 3,96200 |

| | | |
|---|---|---|
| COST DIRECTE | | 110,58528 |
| DESPESES INDIRECTES | 5,00 % | 5,52926 |
| COST EXECUCIÓ MATERIAL | | 116,11454 |

P-2 K4GRV531 m Reparació de fissures en obra de fàbrica en pilastra de paret feta amb pedra, previ repicat i sanejament dels elements soltos, segellat amb morter mixt 1:2:10, càrrega manual de runa sobre contenidor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 18,65 €

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Unitats | | Preu | | Parcial | Import |
| Ma d'obra | | | | | | | | | |
| | A0121000 | h | Oficial 1a | 0,400 | /R x | 25,36000 | = | 10,14400 | |
| | A0140000 | h | Manobre | 0,200 | /R x | 21,17000 | = | 4,23400 | |
| | | | | | Subtotal: | | | 14,37800 | 14,37800 |
| Materials | | | | | | | | | |
| | D070A4D1 | m3 | Morter mixt de ciment pòrtland amb filler calcari CEM II/B-L, calç i sorra, amb 200 kg/m3 de ciment, amb una proporció en volum 1:2:10 i 2,5 N/mm2 de resistència a compressió, elaborat a l'obra | 0,010 | x | 196,85875 | = | 1,96859 | |
| | | | | | Subtotal: | | | 1,96859 | 1,96859 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,010 | x | 63,36000 | = | 0,63360 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,020 | x | 28,30000 | = | 0,56600 | |
| | | | | | Subtotal: | | | 0,56600 | 0,56600 |
| | | | DESPESES AUXILIARS | | 1,50 | % | | | 0,21567 |
| | | | COST DIRECTE | | | | | | 17,76186 |
| | | | DESPESES INDIRECTES | | 5,00 | % | | | 0,88809 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 18,64995 |

P-3 K877VB1H m Rejuntat de juncts de parament vertical d'obra de fàbrica, deixant els juncts reenfonsats, amb morter mixt 1:0,5:4, amb prèvi buidat i neteja del material dels juncts, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,200 — 15,26 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0122000 | h | Oficial 1a paleta | 0,315 | /R x | 25,36000 | = | 6,65700 | |
| | A0140000 | h | Manobre | 0,315 | /R x | 21,17000 | = | 5,55713 | |
| | | | | | Subtotal: | | | 12,21413 | 12,21413 |
| Materials | | | | | | | | | |
| | D070A8B1 | m3 | Morter mixt de ciment pòrtland amb filler calcari CEM II/B-L, calç i sorra, amb 380 kg/m3 de ciment, amb una proporció en volum 1:0,5:4 i 10 N/mm2 de resistència a compressió, elaborat a l'obra | 0,0063 | x | 148,96345 | = | 0,93847 | |
| | | | | | Subtotal: | | | 0,93847 | 0,93847 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,008 | x | 63,36000 | = | 0,50688 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,018 | x | 28,30000 | = | 0,50940 | |
| | | | | | Subtotal: | | | 0,50940 | 0,50940 |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| | DESPESES AUXILIARS | 3,00 % | | 0,36642 |
| | COST DIRECTE | | | 14,53530 |
| | DESPESES INDIRECTES | 5,00 % | | 0,72677 |
| | COST EXECUCIÓ MATERIAL | | | 15,26207 |

P-4 K878V118 m2 Neteja de parament de pedra amb raig d'aigua a pressió, de 60 fins a 200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 7,19 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 2,53600 | |
| | A0140000 | h | Manobre | 0,100 | /R x | 21,17000 | = | 2,11700 | |
| | | | | | Subtotal: | | | 4,65300 | 4,65300 |
| Maquinària | | | | | | | | | |
| | CZ172000 | h | Màquina de raig d'aigua a pressió | 0,100 | /R x | 3,62000 | = | 0,36200 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,00215 | /R x | 30,00000 | = | 0,06450 | |
| | | | | | Subtotal: | | | 0,42650 | 0,42650 |
| Materials | | | | | | | | | |
| | B0111000 | m3 | Aigua | 0,600 | x | 1,56000 | = | 0,93600 | |
| | | | | | Subtotal: | | | 0,93600 | 0,93600 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00367 | x | 63,36000 | = | 0,23253 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00007 | x | 3.605,38000 | = | 0,25238 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,00826 | x | 28,30000 | = | 0,23376 | |
| | | | | | Subtotal: | | | 0,23376 | 0,23376 |

| | | | |
|---|---|---|---|
| DESPESES AUXILIARS | 2,50 % | | 0,11633 |
| COST DIRECTE | | | 6,85050 |
| DESPESES INDIRECTES | 5,00 % | | 0,34252 |
| COST EXECUCIÓ MATERIAL | | | 7,19302 |

P1MAO-MAN1 h Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) — Rend.: 1,000 — 66,53 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0121000 | h | Oficial 1a | 1,000 | /R x | 25,36000 | = | 25,36000 | |
| | A0D-00072 | h | 2 Peón | 1,000 | /R x | 38,00000 | = | 38,00000 | |
| | | | | | Subtotal: | | | 63,36000 | 63,36000 |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | COST DIRECTE | | | | | 63,36000 |
| | | | | DESPESES INDIRECTES | 5,00 | % | | | 3,16800 |
| | | | | COST EXECUCIÓ MATERIAL | | | | | 66,52800 |

P1MAO-MAN2 u Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) Rend.: 1,000 3.785,65 €

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A0121000 | h | Oficial 1a | 18,000 | /R x | 25,36000 | = | 456,48000 | |
| A0D-00072 | h | 2 Peón | 18,000 | /R x | 38,00000 | = | 684,00000 | |
| | | | | Subtotal: | | | 1.140,48000 | 1.140,48000 |
| Maquinària | | | | | | | | |
| C152-0039 | h | Camión grúa de 5 t | 18,000 | /R x | 48,05000 | = | 864,90000 | |
| | | | | Subtotal: | | | 864,90000 | 864,90000 |
| Materials | | | | | | | | |
| B1-MAOMA | m2 | Lones de protección | 800,000 | x | 2,00000 | = | 1.600,00000 | |
| | | | | Subtotal: | | | 1.600,00000 | 1.600,00000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| COST DIRECTE | | | | | 3.605,38000 | |
| DESPESES INDIRECTES | 5,00 | % | | | 180,26900 | |
| COST EXECUCIÓ MATERIAL | | | | | 3.785,64900 | |

P2142-4RMJ m2 Repicat d'arrebossat de morter de ciment, amb mitjans manuals i càrrega manual de runa sobre camió o contenidor Rend.: 1,000 11,53 €

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A0D-0007 | h | Peón | 0,600 | /R x | 18,03000 | = | 10,81800 | |
| | | | | Subtotal: | | | 10,81800 | 10,81800 |

| | | | | | | |
|---|---|---|---|---|---|---|
| DESPESES AUXILIARS | 1,50 | % | | | 0,16227 | |
| COST DIRECTE | | | | | 10,98027 | |
| DESPESES INDIRECTES | 5,00 | % | | | 0,54901 | |
| COST EXECUCIÓ MATERIAL | | | | | 11,52928 | |

P-5 P214X-HCU3A m Tall i retirada d'arriostrament inferior, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. Rend.: 1,050 20,89 €

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A01-FEPH | h | Ayudante montador | 0,100 | /R x | 19,00000 | = | 1,80952 | |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | A0E-000A | h | Peón especialista | 0,100 | /R x | 18,57000 | = | 1,76857 | |
| | A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 2,41524 | |
| | A012-FGC0 | dia | Protector de via | 0,0052 | /R x | 350,00000 | = | 1,73333 | |
| | | | | | Subtotal: | | | 7,72666 | 7,72666 |
| Maquinària | | | | | | | | | |
| | C152-0039 | h | Camión grúa de 5 t | 0,100 | /R x | 48,05000 | = | 4,57619 | |
| | C15018U0 | h | Camió de 150 hp, de 12 t (5,8 m3) | 0,100 | /R x | 38,54000 | = | 3,67048 | |
| | C207-00E1 | h | Equipo y elementos auxiliares para corte oxiacetilénico | 0,100 | /R x | 6,73000 | = | 0,64095 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0053 | /R x | 30,00000 | = | 0,15143 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,0052 | /R x | 260,00000 | = | 1,28762 | |
| | | | | | Subtotal: | | | 10,32667 | 10,32667 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00016 | x | 3.605,38000 | = | 0,57686 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00906 | x | 63,36000 | = | 0,57404 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,02039 | x | 28,30000 | = | 0,57704 | |
| | | | | | Subtotal: | | | 0,57704 | 0,57704 |
| | | | | DESPESES AUXILIARS | | 1,50 | % | | 0,11590 |
| | | | | COST DIRECTE | | | | | 19,89717 |
| | | | | DESPESES INDIRECTES | | 5,00 | % | | 0,99486 |
| | | | | COST EXECUCIÓ MATERIAL | | | | | 20,89203 |

P-6 P214X-HCU3B m2 Retirada de xapes d'acer inferior, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC Rend.: 1,080 20,23 €

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A01-FEPH | h | Ayudante montador | 0,100 | /R x | 19,00000 | = | 1,75926 | |
| A0E-000A | h | Peón especialista | 0,100 | /R x | 18,57000 | = | 1,71944 | |
| A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 2,34815 | |
| A012-FGC0 | dia | Protector de via | 0,00504 | /R x | 350,00000 | = | 1,63333 | |
| | | | | Subtotal: | | | 7,46018 | 7,46018 |
| Maquinària | | | | | | | | |
| C15018U0 | h | Camió de 150 hp, de 12 t (5,8 m3) | 0,100 | /R x | 38,54000 | = | 3,56852 | |
| C207-00E1 | h | Equipo y elementos auxiliares para corte oxiacetilénico | 0,100 | /R x | 6,73000 | = | 0,62315 | |
| CZ15-00E5 | dia | Grup electrògen | 0,00515 | /R x | 30,00000 | = | 0,14306 | |
| CZ18-MAO | dia | Plataforma elevadora | 0,00505 | /R x | 260,00000 | = | 1,21574 | |
| C152-0039 | h | Camión grúa de 5 t | 0,100 | /R x | 48,05000 | = | 4,44907 | |
| | | | | Subtotal: | | | 9,99954 | 9,99954 |

Partides d'obra

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00881 | x | 63,36000 | = | 0,55820 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00016 | x | 3.605,38000 | = | 0,57686 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,01982 | x | 28,30000 | = | 0,56091 | |
| | | | | | | Subtotal: | | 0,56091 | 0,56091 |
| | | | | DESPESES AUXILIARS | | 1,50 | % | | 0,11190 |
| | | | | COST DIRECTE | | | | | 19,26759 |
| | | | | DESPESES INDIRECTES | | 5,00 | % | | 0,96338 |
| | | | | COST EXECUCIÓ MATERIAL | | | | | 20,23097 |

P-7 P214X-HCU3C m — Retirada de la biga contracarril, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. — Rend.: 1,100 — 19,84 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A01-FEPH | h | Ayudante montador | 0,100 | /R x | 19,00000 | = | 1,72727 | |
| | A0E-000A | h | Peón especialista | 0,100 | /R x | 18,57000 | = | 1,68818 | |
| | A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 2,30545 | |
| | A012-FGC0 | dia | Protector de via | 0,005 | /R x | 350,00000 | = | 1,59091 | |
| | | | | | | Subtotal: | | 7,31181 | 7,31181 |
| Maquinària | | | | | | | | | |
| | C15018U0 | h | Camió de 150 hp, de 12 t (5,8 m3) | 0,100 | /R x | 38,54000 | = | 3,50364 | |
| | C207-00E1 | h | Equipo y elementos auxiliares para corte oxiacetilénico | 0,100 | /R x | 6,73000 | = | 0,61182 | |
| | CZ15-00E5 | dia | Grup electròmen | 0,00505 | /R x | 30,00000 | = | 0,13773 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,005 | /R x | 260,00000 | = | 1,18182 | |
| | C152-0039 | h | Camión grúa de 5 t | 0,100 | /R x | 48,05000 | = | 4,36818 | |
| | | | | | | Subtotal: | | 9,80319 | 9,80319 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00864 | x | 63,36000 | = | 0,54743 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00016 | x | 3.605,38000 | = | 0,57686 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,01946 | x | 28,30000 | = | 0,55072 | |
| | | | | | | Subtotal: | | 0,55072 | 0,55072 |
| | | | | DESPESES AUXILIARS | | 1,50 | % | | 0,10968 |
| | | | | COST DIRECTE | | | | | 18,89969 |
| | | | | DESPESES INDIRECTES | | 5,00 | % | | 0,94498 |
| | | | | COST EXECUCIÓ MATERIAL | | | | | 19,84467 |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| P-8 | P214X-HCU3D | m2 | Retirada del tramex trepitjable, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | Rend.: 1,010 | | | | | 21,69 € |
| | | | | Unitats | | Preu | | Parcial | Import |
| Ma d'obra | | | | | | | | | |
| | A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 2,51089 | |
| | A0E-000A | h | Peón especialista | 0,100 | /R x | 18,57000 | = | 1,83861 | |
| | A01-FEPH | h | Ayudante montador | 0,100 | /R x | 19,00000 | = | 1,88119 | |
| | A012-FGC0 | dia | Protector de via | 0,00539 | /R x | 350,00000 | = | 1,86782 | |
| | | | | | | Subtotal: | | 8,09851 | 8,09851 |
| Maquinària | | | | | | | | | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,005 | /R x | 260,00000 | = | 1,28713 | |
| | C207-00E1 | h | Equipo y elementos auxiliares para corte oxiacetilénico | 0,100 | /R x | 6,73000 | = | 0,66634 | |
| | C152-0039 | h | Camión grúa de 5 t | 0,100 | /R x | 48,05000 | = | 4,75743 | |
| | C15018U0 | h | Camió de 150 hp, de 12 t (5,8 m3) | 0,100 | /R x | 38,54000 | = | 3,81584 | |
| | | | | | | Subtotal: | | 10,52674 | 10,52674 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00942 | x | 63,36000 | = | 0,59685 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,0002 | x | 3.605,38000 | = | 0,72108 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,021 | x | 28,30000 | = | 0,59430 | |
| | | | | | | Subtotal: | | 0,59430 | 0,59430 |
| | | | | DESPESES AUXILIARS | | 1,50 | % | | 0,12148 |
| | | | | COST DIRECTE | | | | | 20,65896 |
| | | | | DESPESES INDIRECTES | | 5,00 | % | | 1,03295 |
| | | | | COST EXECUCIÓ MATERIAL | | | | | 21,69191 |

P-9 P214X-HCU3N m2 — Tall i retirada de xapes d'acer perforades en bigues diafragma, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,020 — 21,64 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A01-FEPH | h | Ayudante montador | 0,100 | /R x | 19,00000 | = | 1,86275 | |
| | A012-FGC0 | dia | Protector de via | 0,0054 | /R x | 350,00000 | = | 1,85294 | |
| | A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 2,48627 | |
| | A0E-000A | h | Peón especialista | 0,100 | /R x | 18,57000 | = | 1,82059 | |
| | | | | | | Subtotal: | | 8,02255 | 8,02255 |
| Maquinària | | | | | | | | | |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | C207-00E1 | h | Equipo y elementos auxiliares para corte oxiacetilénico | 0,100 | /R x | 6,73000 | = | 0,65980 | |
| | C152-0039 | h | Camión grúa de 5 t | 0,100 | /R x | 48,05000 | = | 4,71078 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,00545 | /R x | 30,00000 | = | 0,16029 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,00535 | /R x | 260,00000 | = | 1,36373 | |
| | C15018U0 | h | Camió de 150 hp, de 12 t (5,8 m3) | 0,100 | /R x | 38,54000 | = | 3,77843 | |
| | | | Subtotal: | | | | | 10,67303 | 10,67303 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00932 | x | 63,36000 | = | 0,59052 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00017 | x | 3.605,38000 | = | 0,61291 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,021 | x | 28,30000 | = | 0,59430 | |
| | | | Subtotal: | | | | | 0,59430 | 0,59430 |
| | | | DESPESES AUXILIARS | | 1,50 | % | | | 0,12034 |
| | | | COST DIRECTE | | | | | | 20,61365 |
| | | | DESPESES INDIRECTES | | 5,00 | % | | | 1,03068 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 21,64433 |

P-10 P214X-HCU3V m2 Reposició del tramex, amb càrrega mecànica amb grua sobre camió, transport, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 32,02 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 2,53600 | |
| | A01-FEPH | h | Ayudante montador | 0,100 | /R x | 19,00000 | = | 1,90000 | |
| | A0E-000A | h | Peón especialista | 0,100 | /R x | 18,57000 | = | 1,85700 | |
| | A0140000 | h | Manobre | 0,100 | /R x | 21,17000 | = | 2,11700 | |
| | A012-FGC0 | dia | Protector de via | 0,0054 | /R x | 350,00000 | = | 1,89000 | |
| | | | Subtotal: | | | | | 10,30000 | 10,30000 |
| Maquinària | | | | | | | | | |
| | CZ15-00E5 | dia | Grup electrògen | 0,120 | /R x | 30,00000 | = | 3,60000 | |
| | C152-0039 | h | Camión grúa de 5 t | 0,100 | /R x | 48,05000 | = | 4,80500 | |
| | C15018U0 | h | Camió de 150 hp, de 12 t (5,8 m3) | 0,100 | /R x | 38,54000 | = | 3,85400 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,005 | /R x | 260,00000 | = | 1,30000 | |
| | CZ172000 | h | Màquina de raig d'aigua a pressió | 1,000 | /R x | 3,62000 | = | 3,62000 | |
| | | | Subtotal: | | | | | 17,17900 | 17,17900 |
| Materials | | | | | | | | | |
| | B0111000 | m3 | Aigua | 0,080 | x | 1,56000 | = | 0,12480 | |
| | | | Subtotal: | | | | | 0,12480 | 0,12480 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,0002 | x | 3.605,38000 | = | 0,72108 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0095 | x | 63,36000 | = | 0,60192 | |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,050 | x | 28,30000 | = | 1,41500 | |
| | | | Subtotal: | | | | | 1,41500 | 1,41500 |
| | | | DESPESES AUXILIARS | | 1,50 | % | | | 0,15450 |
| | | | COST DIRECTE | | | | | | 30,49630 |
| | | | DESPESES INDIRECTES | | 5,00 | % | | | 1,52482 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 32,02112 |

P-11 P214X-HCU3X m Retirada de perfils angulars en bigues diafragma, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,550 — 13,37 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A012-FGC0 | dia | Protector de via | 0,0035 | /R x | 350,00000 | = | 0,79032 | |
| | A01-FEPH | h | Ayudante montador | 0,100 | /R x | 19,00000 | = | 1,22581 | |
| | A0E-000A | h | Peón especialista | 0,100 | /R x | 18,57000 | = | 1,19806 | |
| | A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 1,63613 | |
| | | | Subtotal: | | | | | 4,85032 | 4,85032 |
| Maquinària | | | | | | | | | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,0035 | /R x | 260,00000 | = | 0,58710 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0036 | /R x | 30,00000 | = | 0,06968 | |
| | C207-00E1 | h | Equipo y elementos auxiliares para corte oxiacetilénico | 0,100 | /R x | 6,73000 | = | 0,43419 | |
| | C152-0039 | h | Camión grúa de 5 t | 0,100 | /R x | 48,05000 | = | 3,10000 | |
| | C15018U0 | h | Camió de 150 hp, de 12 t (5,8 m3) | 0,100 | /R x | 38,54000 | = | 2,48645 | |
| | | | Subtotal: | | | | | 6,67742 | 6,67742 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,0001 | x | 3.605,38000 | = | 0,36054 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,006 | x | 63,36000 | = | 0,38016 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,014 | x | 28,30000 | = | 0,39620 | |
| | | | Subtotal: | | | | | 0,39620 | 0,39620 |
| | | | DESPESES AUXILIARS | | 1,50 | % | | | 0,07275 |
| | | | COST DIRECTE | | | | | | 12,73739 |
| | | | DESPESES INDIRECTES | | 5,00 | % | | | 0,63687 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 13,37426 |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | PREU |
|---|---|---|---|---|---|---|
| P-12 | P2Z6U00M | Ud | Manteniment d'aparells de recolzament, neteja i aplicació de greix, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | Rend.: 0,750 | 354,35 | € |

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A012-FGC0 | dia | Protector de via | 0,083 | /R x | 350,00000 | = | 38,73333 | |
| | A0J-0029 | h | Conservador-restaurador | 1,400 | /R x | 30,45000 | = | 56,84000 | |
| | A0J-002A | h | Conservador- restaurador responsable de la intervenció | 1,400 | /R x | 34,00000 | = | 63,46667 | |
| | | | Subtotal: | | | | | 159,04000 | 159,04000 |
| Maquinària | | | | | | | | | |
| | C152-0039 | h | Camión grúa de 5 t | 1,400 | /R x | 48,05000 | = | 89,69333 | |
| | C206-00DW | h | Equipo y elementos auxiliares para soldadura eléctrica | 1,500 | /R x | 3,11000 | = | 6,22000 | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 1,500 | /R x | 8,58000 | = | 17,16000 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,083 | /R x | 260,00000 | = | 28,77333 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,084 | /R x | 30,00000 | = | 3,36000 | |
| | | | Subtotal: | | | | | 145,20666 | 145,20666 |
| Materials | | | | | | | | | |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 1,500 | x | 1,94000 | = | 2,91000 | |
| | | | Subtotal: | | | | | 2,91000 | 2,91000 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,14415 | x | 63,36000 | = | 9,13334 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00267 | x | 3.605,38000 | = | 9,62636 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,32433 | x | 28,30000 | = | 9,17854 | |
| | | | Subtotal: | | | | | 9,17854 | 9,17854 |
| | | | DESPESES AUXILIARS | | 1,50 | % | | | 2,38560 |
| | | | COST DIRECTE | | | | | | 337,48050 |
| | | | DESPESES INDIRECTES | | 5,00 | % | | | 16,87403 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 354,35453 |

| NÚM | CODI | UA | DESCRIPCIÓ | | | PREU |
|---|---|---|---|---|---|---|
| P-13 | P2Z6U00N | m | Rectificat de biga contracarril i instal·lació, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | Rend.: 1,000 | 33,81 | € |

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|



## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0E-000A | h | Peón especialista | 1,000 | /R x | 18,57000 | = | 18,57000 | |
| | A012-FGC0 | dia | Protector de via | 0,00832 | /R x | 350,00000 | = | 2,91200 | |
| | A0121000 | h | Oficial 1a | 0,200 | /R x | 25,36000 | = | 5,07200 | |
| | | | Subtotal: | | | | | 26,55400 | 26,55400 |
| Maquinària | | | | | | | | | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,00832 | /R x | 260,00000 | = | 2,16320 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0085 | /R x | 30,00000 | = | 0,25500 | |
| | | | Subtotal: | | | | | 2,41820 | 2,41820 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,01453 | x | 63,36000 | = | 0,92062 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00027 | x | 3.605,38000 | = | 0,97345 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,033 | x | 28,30000 | = | 0,93390 | |
| | | | Subtotal: | | | | | 0,93390 | 0,93390 |
| | | | DESPESES AUXILIARS | | 1,50 | % | | | 0,39831 |
| | | | COST DIRECTE | | | | | | 32,19848 |
| | | | DESPESES INDIRECTES | | 5,00 | % | | | 1,60992 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 33,80840 |

| NÚM | CODI | UA | DESCRIPCIÓ | | | PREU |
|---|---|---|---|---|---|---|
| P-14 | P447-DMDM | kg | Acer S275J0 segons UNE-EN 10025-2, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat a taller i amb una capa d'imprimació antioxidant, per a reforç d'elements d'encastament, recolzament i rigiditzadors, col·locat a l'obra amb soldadura, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | Rend.: 1,000 | 5,65 | € |

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A01-FEP1 | h | Ayudante soldador | 0,040 | /R x | 19,07000 | = | 0,76280 | |
| | A012-FGC0 | dia | Protector de via | 0,0014 | /R x | 350,00000 | = | 0,49000 | |
| | A0F-000Y | h | Oficial 1a soldador | 0,040 | /R x | 20,74000 | = | 0,82960 | |
| | | | Subtotal: | | | | | 2,08240 | 2,08240 |
| Maquinària | | | | | | | | | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0014 | /R x | 30,00000 | = | 0,04200 | |
| | C206-00DW | h | Equipo y elementos auxiliares para soldadura eléctrica | 0,040 | /R x | 3,11000 | = | 0,12440 | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,040 | /R x | 8,58000 | = | 0,34320 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,0014 | /R x | 260,00000 | = | 0,36400 | |
| | | | Subtotal: | | | | | 0,87360 | 0,87360 |
| Materials | | | | | | | | | |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en | 1,000 | x | 1,94000 | = | 1,94000 | |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | | | calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | | | | | | |
| | | | | | Subtotal: | | 1,94000 | | 1,94000 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00004 | x | 3.605,38000 | = | 0,14422 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0024 | x | 63,36000 | = | 0,15206 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,00549 | x | 28,30000 | = | 0,15537 | |
| | | | | | Subtotal: | | | 0,15537 | 0,15537 |
| | | | | DESPESES AUXILIARS | | 1,50 | % | | 0,03124 |
| | | | | COST DIRECTE | | | | | 5,37889 |
| | | | | DESPESES INDIRECTES | | 5,00 | % | | 0,26894 |
| | | | | COST EXECUCIÓ MATERIAL | | | | | 5,64783 |

P-15 P448-DMDQ m — Reparació de cordó de soldadura segons classe d'execució exc3 de norma en-1090:2-2011, incloent retirada de cordó de soldadura existent fins a deixar exposat metall base, preparació de vores d'acord amb el mètode i procés de soldadura, alineat i fixació de xapes, preescalfament de xapes segons EN-ISO-13916 I 1011-2, execució de soldadures segons l'especificació que s'estableixi de WPS, soldadura de filet en angle amb gruix no inferior al valor mínim de coll per a cada unió soldada, inclòs classificació residus, càrrega , transport i cànon d'abocament i manteniment de l'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en feines en àmbit FGC — Rend.: 1,000 — 28,69 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A01-FEP1 | h | Ayudante soldador | 0,450 | /R x | 19,07000 | = | 8,58150 | |
| | A012-FGC0 | dia | Protector de via | 0,007 | /R x | 350,00000 | = | 2,45000 | |
| | A0F-000Y | h | Oficial 1a soldador | 0,450 | /R x | 20,74000 | = | 9,33300 | |
| | | | | | Subtotal: | | | 20,36450 | 20,36450 |
| Maquinària | | | | | | | | | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,007 | /R x | 260,00000 | = | 1,82000 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0073 | /R x | 30,00000 | = | 0,21900 | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,200 | /R x | 8,58000 | = | 1,71600 | |
| | C206-00DW | h | Equipo y elementos auxiliares para soldadura eléctrica | 0,200 | /R x | 3,11000 | = | 0,62200 | |
| | | | | | Subtotal: | | | 4,37700 | 4,37700 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,0002 | x | 3.605,38000 | = | 0,72108 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,012 | x | 63,36000 | = | 0,76032 | |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,02796 | x | 28,30000 | = | 0,79127 | |
| | | | | | Subtotal: | | | 0,79127 | 0,79127 |
| | | | | DESPESES AUXILIARS | | 1,50 | % | | 0,30547 |
| | | | | COST DIRECTE | | | | | 27,31964 |
| | | | | DESPESES INDIRECTES | | 5,00 | % | | 1,36598 |
| | | | | COST EXECUCIÓ MATERIAL | | | | | 28,68562 |

P-16 P448-DMD1N m — Subministrament i muntatge de rodapeu d'acer galvanitzat per inmersió format per perfil inferior tubular 60x60x4mm i xapa vertical continua de 400mm d'alçada i 6 mm de gruix, col·locats soldats i/o amb connectors a la relliga inclosos mitjans auxiliars i d'elevació necessaris per a la completa execució dels treballs. — Rend.: 1,000 — 160,36 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A01-FEP1 | h | Ayudante soldador | 0,250 | /R x | 19,07000 | = | 4,76750 | |
| | A013U001 | h | Ajudant | 0,250 | /R x | 23,70000 | = | 5,92500 | |
| | A0121000 | h | Oficial 1a | 0,250 | /R x | 25,36000 | = | 6,34000 | |
| | A012-FGC0 | dia | Protector de via | 0,040 | /R x | 350,00000 | = | 14,00000 | |
| | A0F-000Y | h | Oficial 1a soldador | 0,250 | /R x | 20,74000 | = | 5,18500 | |
| | | | | | Subtotal: | | | 36,21750 | 36,21750 |
| Maquinària | | | | | | | | | |
| | C206-00DW | h | Equipo y elementos auxiliares para soldadura eléctrica | 0,250 | /R x | 3,11000 | = | 0,77750 | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,250 | /R x | 8,58000 | = | 2,14500 | |
| | C152-0039 | h | Camión grúa de 5 t | 0,250 | /R x | 48,05000 | = | 12,01250 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,0395 | /R x | 260,00000 | = | 10,27000 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0403 | /R x | 30,00000 | = | 1,20900 | |
| | | | | | Subtotal: | | | 26,41400 | 26,41400 |
| Materials | | | | | | | | | |
| | B44Z-0M0Y | kg | Acer S275JR segons UNE-EN 10025-2, format per peça simple, en perfils laminats en calent sèrie IPN, IPE, HEB, HEA, HEM i UPN, treballat al taller per a col·locar amb cargols i galvanitzat | 28,000 | x | 2,74000 | = | 76,72000 | |
| | | | | | Subtotal: | | | 76,72000 | 76,72000 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00128 | x | 3.605,38000 | = | 4,61489 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,06894 | x | 63,36000 | = | 4,36804 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,15512 | x | 28,30000 | = | 4,38990 | |
| | | | | | Subtotal: | | | 4,38990 | 4,38990 |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|

| | | |
|---|---|---|
| COST DIRECTE | | 152,72433 |
| DESPESES INDIRECTES | 5,00 % | 7,63622 |
| COST EXECUCIÓ MATERIAL | | 160,36055 |

P-17 P448-DMDUA kg Reposició de perfils en costat tauler de bigues diafragma, incloent perfils L120x120x15 i Lx100x100x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants en L120x120x15, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. Rend.: 1,000 7,40 €

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A0121000 | h | Oficial 1a | 0,050 | /R x | 25,36000 | = | 1,26800 | |
| A01-FEPH | h | Ayudante montador | 0,050 | /R x | 19,00000 | = | 0,95000 | |
| A012-FGC0 | dia | Protector de via | 0,0018 | /R x | 350,00000 | = | 0,63000 | |
| | | | | Subtotal: | | | 2,84800 | 2,84800 |
| Maquinària | | | | | | | | |
| C20G-00DT | h | Máquina taladradora | 0,030 | /R x | 3,42000 | = | 0,10260 | |
| CZ15-00E5 | dia | Grup electrògen | 0,0019 | /R x | 30,00000 | = | 0,05700 | |
| CZ18-MAO | dia | Plataforma elevadora | 0,0018 | /R x | 260,00000 | = | 0,46800 | |
| CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,030 | /R x | 8,58000 | = | 0,25740 | |
| | | | | Subtotal: | | | 0,88500 | 0,88500 |
| Materials | | | | | | | | |
| B0AP-07IU | u | Tornillos en calidad 10.9, pretensados, arandela y tuerca de acero, 130 mm de longitud | 0,1875 | x | 3,46000 | = | 0,64875 | |
| B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 1,050 | x | 1,94000 | = | 2,03700 | |
| | | | | Subtotal: | | | 2,68575 | 2,68575 |
| Partides d'obra | | | | | | | | |
| P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00005 | x | 3.605,38000 | = | 0,18027 | |
| P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0032 | x | 63,36000 | = | 0,20275 | |
| B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,00721 | x | 28,30000 | = | 0,20404 | |
| | | | | Subtotal: | | | 0,20404 | 0,20404 |



## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|

| | | | |
|---|---|---|---|
| DESPESES AUXILIARS | 1,50 % | | 0,04272 |
| COST DIRECTE | | | 7,04853 |
| DESPESES INDIRECTES | 5,00 % | | 0,35243 |
| COST EXECUCIÓ MATERIAL | | | 7,40096 |

P-18 P448-DMDUB kg Reforçament de connexió entre bigues diafragma i bigues longitudinals incloent, nova xapa de 15 mm de gruix en acer S355J0 segons UNE-EN 10025-2, soldadura a xapes existents i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. Rend.: 1,000 5,53 €

| | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | |
| A01-FEOZ | h | Ayudante encofrador | 0,050 | /R x | 19,00000 | = | 0,95000 | |
| A012-FGC0 | dia | Protector de via | 0,0013 | /R x | 350,00000 | = | 0,45500 | |
| A0121000 | h | Oficial 1a | 0,050 | /R x | 25,36000 | = | 1,26800 | |
| | | | | Subtotal: | | | 2,67300 | 2,67300 |
| Maquinària | | | | | | | | |
| CZ15-00E5 | dia | Grup electrògen | 0,0014 | /R x | 30,00000 | = | 0,04200 | |
| CZ18-MAO | dia | Plataforma elevadora | 0,0014 | /R x | 260,00000 | = | 0,36400 | |
| CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,030 | /R x | 8,58000 | = | 0,25740 | |
| | | | | Subtotal: | | | 0,66340 | 0,66340 |
| Materials | | | | | | | | |
| B44Z-0M1P | kg | Acero S355J0 según UNE-EN 10025-2, formado por pieza simple, para refuerzo de elementos de empotramiento, apoyo y rigidizado, en perfiles laminados en caliente serie L, LD, T, redondo, cuadrado, rectangular y plancha, trabajado en el taller para colocar con soldadura y con una capa de imprimación antioxidante | 1,050 | x | 1,37000 | = | 1,43850 | |
| | | | | Subtotal: | | | 1,43850 | 1,43850 |
| Partides d'obra | | | | | | | | |
| P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0024 | x | 63,36000 | = | 0,15206 | |
| P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00004 | x | 3.605,38000 | = | 0,14422 | |
| B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,00537 | x | 28,30000 | = | 0,15197 | |
| | | | | Subtotal: | | | 0,15197 | 0,15197 |

| | | |
|---|---|---|
| DESPESES AUXILIARS | 1,50 % | 0,04010 |
| COST DIRECTE | | 5,26325 |
| DESPESES INDIRECTES | 5,00 % | 0,26316 |
| COST EXECUCIÓ MATERIAL | | 5,52641 |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | PREU |
|---|---|---|---|---|---|
| P-19 | P448-DMDUD | kg | Reforçament de perfil de l' ànima fissurat amb xapes cargolades planes de 90x15 en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant per a reforç en forma de sandvitx i unida mitjançant cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants a la xapa nova, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | Rend.: 1,000 | 7,40 € |

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A012-FGC0 | dia | Protector de via | 0,0018 | /R x | 350,00000 | = | 0,63000 | |
| | A0121000 | h | Oficial 1a | 0,050 | /R x | 25,36000 | = | 1,26800 | |
| | A01-FEPH | h | Ayudante montador | 0,050 | /R x | 19,00000 | = | 0,95000 | |
| | | | | | Subtotal: | | | 2,84800 | 2,84800 |
| Maquinària | | | | | | | | | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0019 | /R x | 30,00000 | = | 0,05700 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,0018 | /R x | 260,00000 | = | 0,46800 | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,030 | /R x | 8,58000 | = | 0,25740 | |
| | C20G-00DT | h | Máquina taladradora | 0,030 | /R x | 3,42000 | = | 0,10260 | |
| | | | | | Subtotal: | | | 0,88500 | 0,88500 |
| Materials | | | | | | | | | |
| | B0AP-07IU | u | Tornillos en calidad 10.9, pretensados, arandela y tuerca de acero, 130 mm de longitud | 0,1769 | x | 3,46000 | = | 0,61207 | |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 1,050 | x | 1,94000 | = | 2,03700 | |
| | | | | | Subtotal: | | | 2,64907 | 2,64907 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00318 | x | 63,36000 | = | 0,20148 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00006 | x | 3.605,38000 | = | 0,21632 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,0072 | x | 28,30000 | = | 0,20376 | |
| | | | | | Subtotal: | | | 0,20376 | 0,20376 |

| | | | |
|---|---|---|---|
| DESPESES AUXILIARS | 1,50 | % | 0,04272 |
| COST DIRECTE | | | 7,04635 |
| DESPESES INDIRECTES | 5,00 | % | 0,35232 |
| COST EXECUCIÓ MATERIAL | | | 7,39867 |



## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | PREU |
|---|---|---|---|---|---|
| P-20 | P448-DMDUE | kg | Substitució del reforçament de bigues metàl·liques amb xapes planes de 230x20 mm en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant, soldadura a la xapa existent, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | Rend.: 1,000 | 6,41 € |

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A01-FEPH | h | Ayudante montador | 0,050 | /R x | 19,00000 | = | 0,95000 | |
| | A0121000 | h | Oficial 1a | 0,050 | /R x | 25,36000 | = | 1,26800 | |
| | A012-FGC0 | dia | Protector de via | 0,0016 | /R x | 350,00000 | = | 0,56000 | |
| | | | | | Subtotal: | | | 2,77800 | 2,77800 |
| Maquinària | | | | | | | | | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,030 | /R x | 8,58000 | = | 0,25740 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,0016 | /R x | 260,00000 | = | 0,41600 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0016 | /R x | 30,00000 | = | 0,04800 | |
| | | | | | Subtotal: | | | 0,72140 | 0,72140 |
| Materials | | | | | | | | | |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 1,050 | x | 1,94000 | = | 2,03700 | |
| | | | | | Subtotal: | | | 2,03700 | 2,03700 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00005 | x | 3.605,38000 | = | 0,18027 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00275 | x | 63,36000 | = | 0,17424 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,00619 | x | 28,30000 | = | 0,17518 | |
| | | | | | Subtotal: | | | 0,17518 | 0,17518 |

| | | | |
|---|---|---|---|
| DESPESES AUXILIARS | 1,50 | % | 0,04167 |
| COST DIRECTE | | | 6,10776 |
| DESPESES INDIRECTES | 5,00 | % | 0,30539 |
| COST EXECUCIÓ MATERIAL | | | 6,41315 |

| | | | | | |
|---|---|---|---|---|---|
| P-21 | P448-DMDUF | kg | Substitució del reforçament de bigues metàl·liques amb xapes cargolades planes de 290x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, per a reforç de bigues, cargols M22 en qualitat 10.9, pretensats, tendresa i arandela, incloent execució dels trepants en la xapa nova, part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | Rend.: 1,000 | 8,89 € |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Unitats | | Preu | | Parcial | Import |
| Ma d'obra | | | | | | | | | |
| | A0121000 | h | Oficial 1a | 0,050 | /R x | 25,36000 | = | 1,26800 | |
| | A012-FGC0 | dia | Protector de via | 0,0022 | /R x | 350,00000 | = | 0,77000 | |
| | A01-FEPH | h | Ayudante montador | 0,050 | /R x | 19,00000 | = | 0,95000 | |
| | | | | | Subtotal: | | | 2,98800 | 2,98800 |
| Maquinària | | | | | | | | | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,030 | /R x | 8,58000 | = | 0,25740 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,0022 | /R x | 260,00000 | = | 0,57200 | |
| | C20G-00DT | h | Máquina taladradora | 0,030 | /R x | 3,42000 | = | 0,10260 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0022 | /R x | 30,00000 | = | 0,06600 | |
| | | | | | Subtotal: | | | 0,99800 | 0,99800 |
| Materials | | | | | | | | | |
| | B0AP-07IU | u | Tornillos en calidad 10.9, pretensados, arandela y tuerca de acero, 130 mm de longitud | 0,4809 | x | 3,46000 | = | 1,66391 | |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 1,050 | x | 1,94000 | = | 2,03700 | |
| | | | | | Subtotal: | | | 3,70091 | 3,70091 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00382 | x | 63,36000 | = | 0,24204 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00007 | x | 3.605,38000 | = | 0,25238 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,0086 | x | 28,30000 | = | 0,24338 | |
| | | | | | Subtotal: | | | 0,24338 | 0,24338 |
| | | | | DESPESES AUXILIARS | | 1,50 | % | | 0,04482 |
| | | | | COST DIRECTE | | | | | 8,46953 |
| | | | | DESPESES INDIRECTES | | 5,00 | % | | 0,42348 |
| | | | | COST EXECUCIÓ MATERIAL | | | | | 8,89301 |

P-22 P448-DMDUN kg Reposició de xapa en l' ànima de bigues diafragma incloent tall de xapa existent, nova xapa de 10mm de gruix en acer S275J0 segons UNE-EN 10025-2, soldadura a xapa existent i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. Rend.: 1,000 6,40 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A012-FGC0 | dia | Protector de via | 0,00157 | /R x | 350,00000 | = | 0,54950 | |
| | A01-FEPH | h | Ayudante montador | 0,050 | /R x | 19,00000 | = | 0,95000 | |
| | A0121000 | h | Oficial 1a | 0,050 | /R x | 25,36000 | = | 1,26800 | |
| | | | | | Subtotal: | | | 2,76750 | 2,76750 |



## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| Maquinària | | | | | | | | | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,00158 | /R x | 260,00000 | = | 0,41080 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0016 | /R x | 30,00000 | = | 0,04800 | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,030 | /R x | 8,58000 | = | 0,25740 | |
| | | | | | Subtotal: | | | 0,71620 | 0,71620 |
| Materials | | | | | | | | | |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 1,050 | x | 1,94000 | = | 2,03700 | |
| | | | | | Subtotal: | | | 2,03700 | 2,03700 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00005 | x | 3.605,38000 | = | 0,18027 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00275 | x | 63,36000 | = | 0,17424 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,00619 | x | 28,30000 | = | 0,17518 | |
| | | | | | Subtotal: | | | 0,17518 | 0,17518 |
| | | | | DESPESES AUXILIARS | | 1,50 | % | | 0,04151 |
| | | | | COST DIRECTE | | | | | 6,09190 |
| | | | | DESPESES INDIRECTES | | 5,00 | % | | 0,30460 |
| | | | | COST EXECUCIÓ MATERIAL | | | | | 6,39650 |

P-23 P448-DMDU1C kg Substitució de arriostrament inferior, incloent perfils Lx90x90x10, xapes de conexió de 10 mm i reposició de fins a quatre xapes de connexió de 10 mm en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant i la part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. Rend.: 1,000 6,37 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A012-FGC0 | dia | Protector de via | 0,0016 | /R x | 350,00000 | = | 0,56000 | |
| | A01-FEPH | h | Ayudante montador | 0,050 | /R x | 19,00000 | = | 0,95000 | |
| | A0121000 | h | Oficial 1a | 0,050 | /R x | 25,36000 | = | 1,26800 | |
| | | | | | Subtotal: | | | 2,77800 | 2,77800 |
| Maquinària | | | | | | | | | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,030 | /R x | 8,58000 | = | 0,25740 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0016 | /R x | 30,00000 | = | 0,04800 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,0016 | /R x | 260,00000 | = | 0,41600 | |
| | | | | | Subtotal: | | | 0,72140 | 0,72140 |
| Materials | | | | | | | | | |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en | 1,050 | x | 1,94000 | = | 2,03700 | |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | PREU |
|---|---|---|---|---|---|---|---|---|
| | | | calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | | | | | |
| | | | | | Subtotal: | | 2,03700 | 2,03700 |
| Partides d'obra | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00275 | x 63,36000 | = | 0,17424 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00005 | x 3.605,38000 | = | 0,18027 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,00619 | x 28,30000 | = | 0,17518 | |
| | | | | | Subtotal: | | 0,17518 | 0,17518 |
| | | | | | COST DIRECTE | | | 6,06609 |
| | | | | | DESPESES INDIRECTES | 5,00 % | | 0,30330 |
| | | | | | COST EXECUCIÓ MATERIAL | | | 6,36939 |

P-24 P45R8-4UAW dm3 Restitució de volum en estructures de formigó amb morter polimèric de reparació tixotròpica i de retracció controlada, aplicat en capes de gruix <= 4 cm, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 18,68 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0121000 | h | Oficial 1a | 0,150 | /R x | 25,36000 | = | 3,80400 | |
| | | | | | | Subtotal: | | 3,80400 | 3,80400 |
| Materials | | | | | | | | | |
| | B079-06TD | kg | Mortero polimérico de cemento con resinas epoxi para imprimación anticorrosiva y puente de unión | 2,200 | x | 5,75000 | = | 12,65000 | |
| | | | | | | Subtotal: | | 12,65000 | 12,65000 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,010 | x | 63,36000 | = | 0,63360 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,020 | x | 28,30000 | = | 0,56600 | |
| | | | | | | Subtotal: | | 0,56600 | 0,56600 |
| | | | | | | DESPESES AUXILIARS | 3,50 % | | 0,13314 |
| | | | | | | COST DIRECTE | | | 17,78674 |
| | | | | | | DESPESES INDIRECTES | 5,00 % | | 0,88934 |
| | | | | | | COST EXECUCIÓ MATERIAL | | | 18,67608 |

P-25 P4GR-HASM m2 Reintegració de volums deteriorats d'element singular de pedra treballada amb formes geomètriques, amb empelts de pedra natural. Grau de dificultat baix, amb la intervenció del conservador-restaurador. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 580,92 €



## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0F-000U | h | Oficial 1a picapedrer | 7,000 | /R x | 27,76000 | = | 194,32000 | |
| | A0J-002A | h | Conservador- restaurador responsable de la intervenció | 0,140 | /R x | 34,00000 | = | 4,76000 | |
| | A0J-0029 | h | Conservador-restaurador | 8,400 | /R x | 30,45000 | = | 255,78000 | |
| | | | | | | Subtotal: | | 454,86000 | 454,86000 |
| Maquinària | | | | | | | | | |
| | C20G-00DT | h | Máquina taladradora | 0,700 | /R x | 3,42000 | = | 2,39400 | |
| | | | | | | Subtotal: | | 2,39400 | 2,39400 |
| Materials | | | | | | | | | |
| | B0G3-1GB4 | m3 | Pedra calcària/arenítica Vinaixa en blocs escollits, deixat de serra, per a dovelles, traceries, capitells i treballs escultòrics | 0,200 | x | 173,76000 | = | 34,75200 | |
| | B011-05MF | l | Aigua desionitzada no polaritzada | 21,000 | x | 0,31000 | = | 6,51000 | |
| | | | | | | Subtotal: | | 41,26200 | 41,26200 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,300 | x | 63,36000 | = | 19,00800 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,700 | x | 28,30000 | = | 19,81000 | |
| | | | | | | Subtotal: | | 19,81000 | 19,81000 |
| | | | | | | DESPESES AUXILIARS | 3,50 % | | 15,92010 |
| | | | | | | COST DIRECTE | | | 553,25410 |
| | | | | | | DESPESES INDIRECTES | 5,00 % | | 27,66271 |
| | | | | | | COST EXECUCIÓ MATERIAL | | | 580,91681 |

P-26 P811-3FFLN m2 Arrebossat a bona vista sobre parament horitzontal exterior, a més de 3,00 m d'alçària, amb morter mixt 1:2:10, remolinat, Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 36,99 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0D-0007 | h | Peón | 0,746 | /R x | 18,03000 | = | 13,45038 | |
| | A0F-000T | h | Oficial 1a albañil | 0,660 | /R x | 20,40000 | = | 13,46400 | |
| | | | | | | Subtotal: | | 26,91438 | 26,91438 |
| Materials | | | | | | | | | |
| | B07F-0LT6 | m3 | Morter mixt de ciment pòrtland amb filler calcari CEM II/B-L, calç i sorra, amb 200 kg/m3 de ciment, amb una proporció en volum 1:2:10 i 2,5 N/mm2 de resistència a compressió, elaborat a l'obra | 0,015 | x | 193,80989 | = | 2,90715 | |
| | | | | | | Subtotal: | | 2,90715 | 2,90715 |
| Partides d'obra | | | | | | | | | |
| | P2142-4RM | m2 | Repicat d'arrebossat de morter de ciment, amb mitjans manuals i càrrega manual de runa sobre camió o contenidor | 0,200 | x | 10,98027 | = | 2,19605 | |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,020 | x | 63,36000 | = | 1,26720 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,045 | x | 28,30000 | = | 1,27350 | |
| | | | | | Subtotal: | | | 1,27350 | 1,27350 |
| | | | DESPESES AUXILIARS | | 2,50 | % | | | 0,67286 |
| | | | COST DIRECTE | | | | | | 35,23114 |
| | | | DESPESES INDIRECTES | | 5,00 | % | | | 1,76156 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 36,99270 |

P-27 P870-4UBBN m2 Consolidació d'element singular de pedra natural, amb aplicació de consolidant de silicat d'etil, aplicat amb polvoritzador en tres capes. inclòs part proporcional de mitjans auxiliars requerits — Rend.: 1,000 — 17,40 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0F-000B | h | Oficial 1a | 0,150 | /R x | 28,61000 | = | 4,29150 | |
| | A0D-0007 | h | Peón | 0,100 | /R x | 18,03000 | = | 1,80300 | |
| | | | | | Subtotal: | | | 6,09450 | 6,09450 |
| Maquinària | | | | | | | | | |
| | C20A-00HA | h | Equip polvoritzador de motxilla amb bomba manual | 1,000 | /R x | 1,54000 | = | 1,54000 | |
| | | | | | Subtotal: | | | 1,54000 | 1,54000 |
| Materials | | | | | | | | | |
| | B8Z2-12Y5 | kg | Consolidant de silicat d'etil per a pedra natural | 0,333 | x | 22,69000 | = | 7,55577 | |
| | | | | | Subtotal: | | | 7,55577 | 7,55577 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,010 | x | 63,36000 | = | 0,63360 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,020 | x | 28,30000 | = | 0,56600 | |
| | | | | | Subtotal: | | | 0,56600 | 0,56600 |
| | | | DESPESES AUXILIARS | | 3,00 | % | | | 0,18284 |
| | | | COST DIRECTE | | | | | | 16,57271 |
| | | | DESPESES INDIRECTES | | 5,00 | % | | | 0,82864 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 17,40134 |

P-28 P874-4UBV m2 Neteja de parament de formigó, amb raig d'aigua a pressió, de 60-200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC, inclòs classificació residus, càrrega, transport i cànon d'abocament i manteniment de l'abocador — Rend.: 1,000 — 6,79 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0D-0007 | h | Peón | 0,100 | /R x | 18,03000 | = | 1,80300 | |
| | A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 2,53600 | |



## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Subtotal: | | | 4,33900 | 4,33900 |
| Maquinària | | | | | | | | | |
| | CZ172000 | h | Màquina de raig d'aigua a pressió | 0,100 | /R x | 3,62000 | = | 0,36200 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,00203 | /R x | 30,00000 | = | 0,06090 | |
| | | | | | Subtotal: | | | 0,42290 | 0,42290 |
| Materials | | | | | | | | | |
| | B0111000 | m3 | Aigua | 0,600 | x | 1,56000 | = | 0,93600 | |
| | | | | | Subtotal: | | | 0,93600 | 0,93600 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0035 | x | 63,36000 | = | 0,22176 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00006 | x | 3.605,38000 | = | 0,21632 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,008 | x | 28,30000 | = | 0,22640 | |
| | | | | | Subtotal: | | | 0,22640 | 0,22640 |
| | | | DESPESES AUXILIARS | | 2,50 | % | | | 0,10848 |
| | | | COST DIRECTE | | | | | | 6,47086 |
| | | | DESPESES INDIRECTES | | 5,00 | % | | | 0,32354 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 6,79440 |

P-29 P875-4SAH m2 Limpieza y preparación de la superfície de perfiles laminados de acero hasta un grado de preparación St 3 según la norma UNE-EN ISO 8501-1, con medios manuales y carga manual de escombros sobre contenedor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 20,70 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A012-FGC0 | dia | Protector de via | 0,005 | /R x | 350,00000 | = | 1,75000 | |
| | A0D-0007 | h | Peón | 0,800 | /R x | 18,03000 | = | 14,42400 | |
| | | | | | Subtotal: | | | 16,17400 | 16,17400 |
| Maquinària | | | | | | | | | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,005 | /R x | 260,00000 | = | 1,30000 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,005 | /R x | 30,00000 | = | 0,15000 | |
| | | | | | Subtotal: | | | 1,45000 | 1,45000 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0088 | x | 63,36000 | = | 0,55757 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,0002 | x | 3.605,38000 | = | 0,72108 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,020 | x | 28,30000 | = | 0,56600 | |
| | | | | | Subtotal: | | | 0,56600 | 0,56600 |

PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | PREU |
|---|---|---|---|---|---|---|
| | | | DESPESES AUXILIARS | 1,50 | % | 0,24261 |
| | | | COST DIRECTE | | | 19,71126 |
| | | | DESPESES INDIRECTES | 5,00 | % | 0,98556 |
| | | | COST EXECUCIÓ MATERIAL | | | 20,69682 |

P-30 P89H-4V77 m2 Pintat de parament vertical exterior de ciment, amb pintura al silicat amb acabat llis, amb una capa de fons i dues d'acabat, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 10,86 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A01-FEP9 | h | Ayudante pintor | 0,010 | /R x | 19,00000 | = | 0,19000 | |
| | A0F-000V | h | Oficial 1a pintor | 0,100 | /R x | 20,40000 | = | 2,04000 | |
| | | | Subtotal: | | | | | 2,23000 | 2,23000 |
| Materials | | | | | | | | | |
| | B8ZH-358R | kg | Pintura de fons al silicat, per a exteriors | 0,200 | x | 9,67000 | = | 1,93400 | |
| | B015-16HS | l | Diluent de pintura mineral al silicat, per a interiors i exteriors | 0,100 | x | 9,48000 | = | 0,94800 | |
| | B896-HYC4 | kg | Pintura al silicat, per a exteriors | 0,357 | x | 12,49000 | = | 4,45893 | |
| | | | Subtotal: | | | | | 7,34093 | 7,34093 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0058 | x | 63,36000 | = | 0,36749 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,013 | x | 28,30000 | = | 0,36790 | |
| | | | Subtotal: | | | | | 0,36790 | 0,36790 |
| | | | DESPESES AUXILIARS | 1,50 | % | | | | 0,03345 |
| | | | COST DIRECTE | | | | | | 10,33977 |
| | | | DESPESES INDIRECTES | 5,00 | % | | | | 0,51699 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 10,85676 |

P-31 P8B2-G2EZ m2 Pintat d'estructures d'acer amb sistemes de protecció amb grau de durabilitat H, per a classe d'exposició C5-I/M, segons UNE-EN ISO 12944-5, format per 3 capes, capa d'imprimació de, capa intermèdia de, i capa de acabat, amb un gruix total de protecció de 250 µm, aplicat de forma manual o amb pistola, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 27,49 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A01-FEP9 | h | Ayudante pintor | 0,070 | /R x | 19,00000 | = | 1,33000 | |
| | A012-FGC0 | dia | Protector de via | 0,007 | /R x | 350,00000 | = | 2,45000 | |
| | A0F-000V | h | Oficial 1a pintor | 0,700 | /R x | 20,40000 | = | 14,28000 | |





PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Subtotal: | | | 18,06000 | 18,06000 |
| Maquinària | | | | | | | | | |
| | CZ15-00E5 | dia | Grup electrògen | 0,00685 | /R x | 30,00000 | = | 0,20550 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,007 | /R x | 260,00000 | = | 1,82000 | |
| | | | | | Subtotal: | | | 2,02550 | 2,02550 |
| Materials | | | | | | | | | |
| | B898-2MHY | l | Pintura de poliuretano bicomponente, para sistemas de protección de del acero | 0,150 | x | 8,60000 | = | 1,29000 | |
| | B898-2MHX | l | Pintura epoxi bicomponente, para sistemas de protección de del acero | 0,300 | x | 7,45000 | = | 2,23500 | |
| | | | | | Subtotal: | | | 3,52500 | 3,52500 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,012 | x | 63,36000 | = | 0,76032 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00022 | x | 3.605,38000 | = | 0,79318 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,0264 | x | 28,30000 | = | 0,74712 | |
| | | | | | Subtotal: | | | 0,74712 | 0,74712 |
| | | | | | Subtotal: | | | 0,74712 | 0,74712 |
| | | | DESPESES AUXILIARS | 1,50 | % | | | | 0,27090 |
| | | | COST DIRECTE | | | | | | 26,18202 |
| | | | DESPESES INDIRECTES | 5,00 | % | | | | 1,30910 |
| | | | COST EXECUCIÓ MATERIAL | | | | | | 27,49112 |

P-32 PGD1-E3BCN Ud Muntatge de posada a terra simple. Inclou el transport dels materials a la ubicació del muntatge, desplaçaments, maquinària, eines i mitjans auxiliars necessaris per al muntatge. Totalment muntat. Treball: Nocturn . Banda de manteniment: No necessita interval (sense tall de tensió). Condicions d'execució: volum escàs. — Rend.: 1,000 — 861,28 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0F-000E | h | Oficial 1a electricista | 10,000 | /R x | 28,69000 | = | 286,90000 | |
| | A012-FGC0 | dia | Protector de via | 0,210 | /R x | 350,00000 | = | 73,50000 | |
| | A01-FEPD | h | Ajudant electricista | 10,000 | /R x | 24,61000 | = | 246,10000 | |
| | | | Subtotal: | | | | | 606,50000 | 606,50000 |
| Maquinària | | | | | | | | | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,21249 | /R x | 260,00000 | = | 55,24740 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,220 | /R x | 30,00000 | = | 6,60000 | |
| | | | Subtotal: | | | | | 61,84740 | 61,84740 |
| Materials | | | | | | | | | |
| | BGYD-0B2 | u | Part proporcional d'elements especials per a piquetes de connexió a terra | 10,000 | x | 5,07000 | = | 50,70000 | |
| | BGD5-06SS | u | Piqueta de connexió a terra d'acer i recobriment de coure, de 2500 mm de llargària, de 18,3 mm de diàmetre, de 300 µm | 1,000 | x | 28,92000 | = | 28,92000 | |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | PREU |
|---|---|---|---|---|---|---|---|---|
| | | | | Subtotal: | | | 79,62000 | 79,62000 |
| Partides d'obra | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,370 | x 63,36000 | = | 23,44320 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,007 | x 3.605,38000 | = | 25,23766 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,83451 | x 28,30000 | = | 23,61663 | |
| | | | | Subtotal: | | | 23,61663 | 23,61663 |
| | | | | | | | COST DIRECTE | 820,26489 |
| | | | | | | | DESPESES INDIRECTES 5,00 % | 41,01324 |
| | | | | | | | COST EXECUCIÓ MATERIAL | 861,27813 |

| | | | | | | |
|---|---|---|---|---|---|---|
| P-33 | PPCIVD01 | PA | Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i desviaments provisionals durant l'execució de les obres, segons indicació de la Direcció de l'Obra | Rend.: 1,000 | 11.417,57 | € |

| | | |
|---|---|---|
| COST DIRECTE | | 10.873,87619 |
| DESPESES INDIRECTES | 5,00 % | 543,69381 |
| COST EXECUCIÓ MATERIAL | | **11.417,5700** |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## JUSTIFICACIÓ DE PREUS



PARTIDES ALÇADES

| NÚM | CODI | UA | DESCRIPCIÓ | | | |
|---|---|---|---|---|---|---|
| | PPAUSAF1 | PA | Partida alçada a justificar segons actuacions necessàries i imprevisibles en fase de projecte. | Rend.: 1,000 | 15.000,00 | € |
| | | | | COST DIRECTE | 15.000,00000 | |
| | | | | COST EXECUCIÓ MATERIAL | **15.000,0000** | |
| | PPAUUSS1 | PA | Partida alçada del pressupost de l'Annex de Seguretat i Salut | Rend.: 1,000 | 5.998,40 | € |
| | | | | COST DIRECTE | 5.998,40000 | |
| | | | | COST EXECUCIÓ MATERIAL | **5.998,4000** | |
| | PPCIGRU1 | PA | Partida alçada a justificar de gestió de residus de construcció i demolició | Rend.: 1,000 | 2.500,00 | € |
| | | | | COST DIRECTE | 2.500,00000 | |
| | | | | COST EXECUCIÓ MATERIAL | **2.500,0000** | |
| | PPCIVCQ5 | PA | Partida alçada a justificar per a la realització de campanya d'inspecció especial i realització d'assajos a tot el pont, incloent inspecció visual d'unions soldades segons UNE 14044 i UNE-EN 13018, assaig mitjançant ultrasons segons UNE-EN ISO 23279 i UNE-EN ISO 17640 i la seva acceptació segons UNE-EN ISO 11666, assaig mitjançant partícules magnètiques i/o líquids penetrants segons UNE-EN ISO 17638 i UNE-EN ISO 3452-1 i la seva acceptació segons UNE-EN ISO 23277 i UNE-EN ISO 23278, assajos de mesurament de gruixos d'ala, ànimes, etc, assaigs en provetes d'acer (tracció, químic, impacte, micro, laminació, gruix d'oxidació, etc.), s'hi inclouen materials, maquinària d'elevació de carretera o d'àmbit de FGC d'obra especialista (fins i tot perfils específics de FGC), tall de tensió, monitoratge, il·luminació, aportació d'electricitat, en horari diürn o nocturn, tot segons la indicació de la Direcció de l'Obra. | Rend.: 1,000 | 6.000,00 | € |
| | | | | COST DIRECTE | 6.000,00000 | |
| | | | | COST EXECUCIÓ MATERIAL | **6.000,0000** | |

## JUSTIFICACIÓ DE PREUS



ALTRES

| CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|
| B1-MAOMAN1 | dia | Altres Mitjans Auxiliars | 28,30000 | € |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | PREU |
|---|---|---|---|---|---|---|---|---|
| P-24 | P448-DMDU1C | kg | Substitució de arriostrament inferior, incloent perfils Lx90x90x10, xapes de conexió de 10 mm i reposició de fins a quatre xapes de connexió de 10 mm en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant i la part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | Rend.: | 1,000 | | | 6,37 € |

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A01-FEPH | h | Ayudante montador | 0,050 | /R x | 19,00000 | = | 0,95000 | |
| | A012-FGC0 | dia | Protector de via | 0,0016 | /R x | 350,00000 | = | 0,56000 | |
| | A0121000 | h | Oficial 1a | 0,050 | /R x | 25,36000 | = | 1,26800 | |
| | | | | | Subtotal: | | | 2,77800 | 2,77800 |
| Maquinària | | | | | | | | | |
| | CZ15-00E5 | dia | Grup electrògen | 0,0016 | /R x | 30,00000 | = | 0,04800 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,0016 | /R x | 260,00000 | = | 0,41600 | |
| | CZ15-00E4 | h | Grupo electrógeno de 20 a 30 kVA | 0,030 | /R x | 8,58000 | = | 0,25740 | |
| | | | | | Subtotal: | | | 0,72140 | 0,72140 |
| Materials | | | | | | | | | |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 1,050 | x | 1,94000 | = | 2,03700 | |
| | | | | | Subtotal: | | | 2,03700 | 2,03700 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,00275 | x | 63,36000 | = | 0,17424 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00005 | x | 3.605,38000 | = | 0,18027 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,00619 | x | 28,30000 | = | 0,17518 | |
| | | | | | Subtotal: | | | 0,17518 | 0,17518 |

| | | |
|---|---|---|
| COST DIRECTE | | 6,06609 |
| DESPESES INDIRECTES | 5,00 % | 0,30330 |
| COST EXECUCIÓ MATERIAL | | 6,36939 |

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | PREU |
|---|---|---|---|---|---|---|---|---|
| P-25 | P45R8-4UAW | dm3 | Restitució de volum en estructures de formigó amb morter polimèric de reparació tixotròpica i de retracció controlada, aplicat en capes de gruix <= 4 cm, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | Rend.: | 1,000 | | | 18,68 € |

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0121000 | h | Oficial 1a | 0,150 | /R x | 25,36000 | = | 3,80400 | |



## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | PREU |
|---|---|---|---|---|---|---|---|---|
| | | | | | Subtotal: | | | 3,80400 | 3,80400 |
| Materials | | | | | | | | | |
| | B079-06TD | kg | Mortero polimérico de cemento con resinas epoxi para imprimación anticorrosiva y puente de unión | 2,200 | x | 5,75000 | = | 12,65000 | |
| | | | | | Subtotal: | | | 12,65000 | 12,65000 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,010 | x | 63,36000 | = | 0,63360 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,020 | x | 28,30000 | = | 0,56600 | |
| | | | | | Subtotal: | | | 0,56600 | 0,56600 |

| | | |
|---|---|---|
| DESPESES AUXILIARS | 3,50 % | 0,13314 |
| COST DIRECTE | | 17,78674 |
| DESPESES INDIRECTES | 5,00 % | 0,88934 |
| COST EXECUCIÓ MATERIAL | | 18,67608 |

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | PREU |
|---|---|---|---|---|---|---|---|---|
| P-26 | P4GR-HASM | m2 | Reintegració de volums deteriorats d'element singular de pedra treballada amb formes geomètriques, amb empelts de pedra natural. Grau de dificultat baix, amb la intervenció del conservador-restaurador. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | Rend.: | 1,000 | | | 580,92 € |

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0J-0029 | h | Conservador-restaurador | 8,400 | /R x | 30,45000 | = | 255,78000 | |
| | A0J-002A | h | Conservador- restaurador responsable de la intervenció | 0,140 | /R x | 34,00000 | = | 4,76000 | |
| | A0F-000U | h | Oficial 1a picapedrer | 7,000 | /R x | 27,76000 | = | 194,32000 | |
| | | | | | Subtotal: | | | 454,86000 | 454,86000 |
| Maquinària | | | | | | | | | |
| | C20G-00DT | h | Máquina taladradora | 0,700 | /R x | 3,42000 | = | 2,39400 | |
| | | | | | Subtotal: | | | 2,39400 | 2,39400 |
| Materials | | | | | | | | | |
| | B011-05MF | l | Aigua desionitzada no polaritzada | 21,000 | x | 0,31000 | = | 6,51000 | |
| | B0G3-1GB4 | m3 | Pedra calcària/arenítica Vinaixa en blocs escollits, deixat de serra, per a dovelles, traceries, capitells i treballs escultòrics | 0,200 | x | 173,76000 | = | 34,75200 | |
| | | | | | Subtotal: | | | 41,26200 | 41,26200 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,300 | x | 63,36000 | = | 19,00800 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,700 | x | 28,30000 | = | 19,81000 | |
| | | | | | Subtotal: | | | 19,81000 | 19,81000 |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | PREU |
|---|---|---|---|---|---|---|
| | | | DESPESES AUXILIARS | 3,50 | % | 15,92010 |
| | | | COST DIRECTE | | | 553,25410 |
| | | | DESPESES INDIRECTES | 5,00 | % | 27,66271 |
| | | | COST EXECUCIÓ MATERIAL | | | 580,91681 |

P-27 P811-3FFLN m2 Arrebossat a bona vista sobre parament horitzontal exterior, a més de 3,00 m d'alçària, amb morter mixt 1:2:10, remolinat, Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 36,99 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0F-000T | h | Oficial 1a albañil | 0,660 | /R x | 20,40000 | = | 13,46400 | |
| | A0D-0007 | h | Peón | 0,746 | /R x | 18,03000 | = | 13,45038 | |
| | | | Subtotal: | | | | | 26,91438 | 26,91438 |
| Materials | | | | | | | | | |
| | B07F-0LT6 | m3 | Morter mixt de ciment pòrtland amb filler calcari CEM II/B-L, calç i sorra, amb 200 kg/m3 de ciment, amb una proporció en volum 1:2:10 i 2,5 N/mm2 de resistència a compressió, elaborat a l'obra | 0,015 | x | 193,80989 | = | 2,90715 | |
| | | | Subtotal: | | | | | 2,90715 | 2,90715 |
| Partides d'obra | | | | | | | | | |
| | P2142-4RM | m2 | Repicat d'arrebossat de morter de ciment, amb mitjans manuals i càrrega manual de runa sobre camió o contenidor | 0,200 | x | 10,98027 | = | 2,19605 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,020 | x | 63,36000 | = | 1,26720 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,045 | x | 28,30000 | = | 1,27350 | |
| | | | Subtotal: | | | | | 1,27350 | 1,27350 |

| | | | |
|---|---|---|---|
| DESPESES AUXILIARS | 2,50 | % | 0,67286 |
| COST DIRECTE | | | 35,23114 |
| DESPESES INDIRECTES | 5,00 | % | 1,76156 |
| COST EXECUCIÓ MATERIAL | | | 36,99270 |

P-28 P874-4UBV m2 Neteja de parament de formigó, amb raig d'aigua a pressió, de 60-200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC, inclòs classificació residus, càrrega, transport i cànon d'abocament i manteniment de l'abocador — Rend.: 1,000 — 6,79 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0121000 | h | Oficial 1a | 0,100 | /R x | 25,36000 | = | 2,53600 | |
| | A0D-0007 | h | Peón | 0,100 | /R x | 18,03000 | = | 1,80300 | |
| | | | Subtotal: | | | | | 4,33900 | 4,33900 |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| Maquinària | | | | | | | | | |
| | CZ15-00E5 | dia | Grup electrògen | 0,00203 | /R x | 30,00000 | = | 0,06090 | |
| | CZ172000 | h | Màquina de raig d'aigua a pressió | 0,100 | /R x | 3,62000 | = | 0,36200 | |
| | | | Subtotal: | | | | | 0,42290 | 0,42290 |
| Materials | | | | | | | | | |
| | B0111000 | m3 | Aigua | 0,600 | x | 1,56000 | = | 0,93600 | |
| | | | Subtotal: | | | | | 0,93600 | 0,93600 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00006 | x | 3.605,38000 | = | 0,21632 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0035 | x | 63,36000 | = | 0,22176 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,008 | x | 28,30000 | = | 0,22640 | |
| | | | Subtotal: | | | | | 0,22640 | 0,22640 |

| | | | |
|---|---|---|---|
| DESPESES AUXILIARS | 2,50 | % | 0,10848 |
| COST DIRECTE | | | 6,47086 |
| DESPESES INDIRECTES | 5,00 | % | 0,32354 |
| COST EXECUCIÓ MATERIAL | | | 6,79440 |

P-29 P875-4SAH m2 Limpieza y preparación de la superfície de perfiles laminados de acero hasta un grado de preparación St 3 según la norma UNE-EN ISO 8501-1, con medios manuales y carga manual de escombros sobre contenedor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 20,70 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0D-0007 | h | Peón | 0,800 | /R x | 18,03000 | = | 14,42400 | |
| | A012-FGC0 | dia | Protector de via | 0,005 | /R x | 350,00000 | = | 1,75000 | |
| | | | Subtotal: | | | | | 16,17400 | 16,17400 |
| Maquinària | | | | | | | | | |
| | CZ15-00E5 | dia | Grup electrògen | 0,005 | /R x | 30,00000 | = | 0,15000 | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,005 | /R x | 260,00000 | = | 1,30000 | |
| | | | Subtotal: | | | | | 1,45000 | 1,45000 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,0002 | x | 3.605,38000 | = | 0,72108 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0088 | x | 63,36000 | = | 0,55757 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,020 | x | 28,30000 | = | 0,56600 | |
| | | | Subtotal: | | | | | 0,56600 | 0,56600 |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | PREU |
|---|---|---|---|---|---|---|
| | | | DESPESES AUXILIARS | 1,50 | % | 0,24261 |
| | | | COST DIRECTE | | | 19,71126 |
| | | | DESPESES INDIRECTES | 5,00 | % | 0,98556 |
| | | | COST EXECUCIÓ MATERIAL | | | 20,69682 |

P-30 P89H-4V77 m2 Pintat de parament vertical exterior de ciment, amb pintura al silicat amb acabat llis, amb una capa de fons i dues d'acabat, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 10,86 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A0F-000V | h | Oficial 1a pintor | 0,100 | /R x | 20,40000 | = | 2,04000 | |
| | A01-FEP9 | h | Ayudante pintor | 0,010 | /R x | 19,00000 | = | 0,19000 | |
| | | | Subtotal: | | | | | 2,23000 | 2,23000 |
| Materials | | | | | | | | | |
| | B015-16HS | l | Diluent de pintura mineral al silicat, per a interiors i exteriors | 0,100 | x | 9,48000 | = | 0,94800 | |
| | B8ZH-358R | kg | Pintura de fons al silicat, per a exteriors | 0,200 | x | 9,67000 | = | 1,93400 | |
| | B896-HYC4 | kg | Pintura al silicat, per a exteriors | 0,357 | x | 12,49000 | = | 4,45893 | |
| | | | Subtotal: | | | | | 7,34093 | 7,34093 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,0058 | x | 63,36000 | = | 0,36749 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,013 | x | 28,30000 | = | 0,36790 | |
| | | | Subtotal: | | | | | 0,36790 | 0,36790 |

| | | | |
|---|---|---|---|
| DESPESES AUXILIARS | 1,50 | % | 0,03345 |
| COST DIRECTE | | | 10,33977 |
| DESPESES INDIRECTES | 5,00 | % | 0,51699 |
| COST EXECUCIÓ MATERIAL | | | 10,85676 |

P-31 P8B2-G2EZ m2 Pintat d'estructures d'acer amb sistemes de protecció amb grau de durabilitat H, per a classe d'exposició C5-I/M, segons UNE-EN ISO 12944-5, format per 3 capes, capa d'imprimació de, capa intermèdia de, i capa de acabat, amb un gruix total de protecció de 250 µm, aplicat de forma manual o amb pistola, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC — Rend.: 1,000 — 27,49 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A012-FGC0 | dia | Protector de via | 0,007 | /R x | 350,00000 | = | 2,45000 | |
| | A0F-000V | h | Oficial 1a pintor | 0,700 | /R x | 20,40000 | = | 14,28000 | |
| | A01-FEP9 | h | Ayudante pintor | 0,070 | /R x | 19,00000 | = | 1,33000 | |



## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | | PREU |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Subtotal: | | | 18,06000 | 18,06000 |
| Maquinària | | | | | | | | | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,007 | /R x | 260,00000 | = | 1,82000 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,00685 | /R x | 30,00000 | = | 0,20550 | |
| | | | | | Subtotal: | | | 2,02550 | 2,02550 |
| Materials | | | | | | | | | |
| | B898-2MHY | l | Pintura de poliuretano bicomponente, para sistemas de protección de del acero | 0,150 | x | 8,60000 | = | 1,29000 | |
| | B898-2MHX | l | Pintura epoxi bicomponente, para sistemas de protección de del acero | 0,300 | x | 7,45000 | = | 2,23500 | |
| | | | | | Subtotal: | | | 3,52500 | 3,52500 |
| Partides d'obra | | | | | | | | | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,00022 | x | 3.605,38000 | = | 0,79318 | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,012 | x | 63,36000 | = | 0,76032 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,0264 | x | 28,30000 | = | 0,74712 | |
| | | | | | Subtotal: | | | 0,74712 | 0,74712 |

| | | | |
|---|---|---|---|
| DESPESES AUXILIARS | 1,50 | % | 0,27090 |
| COST DIRECTE | | | 26,18202 |
| DESPESES INDIRECTES | 5,00 | % | 1,30910 |
| COST EXECUCIÓ MATERIAL | | | 27,49112 |

P-32 PGD1-E3BCN Ud Muntatge de posada a terra simple. Inclou el transport dels materials a la ubicació del muntatge, desplaçaments, maquinària, eines i mitjans auxiliars necessaris per al muntatge. Totalment muntat. Treball: Nocturn . Banda de manteniment: No necessita interval (sense tall de tensió). Condicions d'execució: volum escàs. — Rend.: 1,000 — 861,28 €

| | | | | Unitats | | Preu | | Parcial | Import |
|---|---|---|---|---|---|---|---|---|---|
| Ma d'obra | | | | | | | | | |
| | A012-FGC0 | dia | Protector de via | 0,210 | /R x | 350,00000 | = | 73,50000 | |
| | A01-FEPD | h | Ajudant electricista | 10,000 | /R x | 24,61000 | = | 246,10000 | |
| | A0F-000E | h | Oficial 1a electricista | 10,000 | /R x | 28,69000 | = | 286,90000 | |
| | | | | | Subtotal: | | | 606,50000 | 606,50000 |
| Maquinària | | | | | | | | | |
| | CZ18-MAO | dia | Plataforma elevadora | 0,21249 | /R x | 260,00000 | = | 55,24740 | |
| | CZ15-00E5 | dia | Grup electrògen | 0,220 | /R x | 30,00000 | = | 6,60000 | |
| | | | | | Subtotal: | | | 61,84740 | 61,84740 |
| Materials | | | | | | | | | |
| | BGD5-06SS | u | Piqueta de connexió a terra d'acer i recobriment de coure, de 2500 mm de llargària, de 18,3 mm de diàmetre, de 300 µm | 1,000 | x | 28,92000 | = | 28,92000 | |
| | BGYD-0B2 | u | Part proporcional d'elements especials per a piquetes de connexió a terra | 10,000 | x | 5,07000 | = | 50,70000 | |

## JUSTIFICACIÓ DE PREUS



PARTIDES D'OBRA

| NÚM | CODI | UA | DESCRIPCIÓ | | | | | PREU |
|---|---|---|---|---|---|---|---|---|
| | | | | Subtotal: | | | 79,62000 | 79,62000 |
| Partides d'obra | | | | | | | | |
| | P1MAO-MA | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,370 | x 63,36000 | = | 23,44320 | |
| | P1MAO-MA | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,007 | x 3.605,38000 | = | 25,23766 | |
| | B1-MAOMA | dia | Altres Mitjans Auxiliars | 0,83451 | x 28,30000 | = | 23,61663 | |
| | | | | Subtotal: | | | 23,61663 | 23,61663 |
| | | | | | | | COST DIRECTE | 820,26489 |
| | | | | | | | DESPESES INDIRECTES 5,00 % | 41,01324 |
| | | | | | | | COST EXECUCIÓ MATERIAL | 861,27813 |

| | | | | | | |
|---|---|---|---|---|---|---|
| P-33 | PPCIVD01 | PA | Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i desviaments provisionals durant l'execució de les obres, segons indicació de la Direcció de l'Obra | Rend.: 1,000 | 11.417,57 | € |

| | | |
|---|---|---|
| COST DIRECTE | | 10.873,87619 |
| DESPESES INDIRECTES | 5,00 % | 543,69381 |
| COST EXECUCIÓ MATERIAL | | **11.417,5700** |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## JUSTIFICACIÓ DE PREUS



PARTIDES ALÇADES

| NÚM | CODI | UA | DESCRIPCIÓ | | | |
|---|---|---|---|---|---|---|
| | PPAUSAF1 | PA | Partida alçada a justificar segons actuacions necessàries i imprevisibles en fase de projecte. | Rend.: 1,000 | 15.000,00 | € |
| | | | | COST DIRECTE | 15.000,00000 | |
| | | | | COST EXECUCIÓ MATERIAL | **15.000,0000** | |
| | PPAUUSS1 | PA | Partida alçada del pressupost de l'Annex de Seguretat i Salut | Rend.: 1,000 | 5.998,40 | € |
| | | | | COST DIRECTE | 5.998,40000 | |
| | | | | COST EXECUCIÓ MATERIAL | **5.998,4000** | |
| | PPCIGRU1 | PA | Partida alçada a justificar de gestió de residus de construcció i demolició | Rend.: 1,000 | 2.500,00 | € |
| | | | | COST DIRECTE | 2.500,00000 | |
| | | | | COST EXECUCIÓ MATERIAL | **2.500,0000** | |
| | PPCIVCQ5 | PA | Partida alçada a justificar per a la realització de campanya d'inspecció especial i realització d'assajos a tot el pont, incloent inspecció visual d'unions soldades segons UNE 14044 i UNE-EN 13018, assaig mitjançant ultrasons segons UNE-EN ISO 23279 i UNE-EN ISO 17640 i la seva acceptació segons UNE-EN ISO 11666, assaig mitjançant partícules magnètiques i/o líquids penetrants segons UNE-EN ISO 17638 i UNE-EN ISO 3452-1 i la seva acceptació segons UNE-EN ISO 23277 i UNE-EN ISO 23278, assajos de mesurament de gruixos d'ala, ànimes, etc, assaigs en provetes d'acer (tracció, químic, impacte, micro, laminació, gruix d'oxidació, etc.), s'hi inclouen materials, maquinària d'elevació de carretera o d'àmbit de FGC d'obra especialista (fins i tot perfils específics de FGC), tall de tensió, monitoratge, il·luminació, aportació d'electricitat, en horari diürn o nocturn, tot segons la indicació de la Direcció de l'Obra. | Rend.: 1,000 | 6.000,00 | € |
| | | | | COST DIRECTE | 6.000,00000 | |
| | | | | COST EXECUCIÓ MATERIAL | **6.000,0000** | |

## JUSTIFICACIÓ DE PREUS



ALTRES

| CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|
| B1-MAOMAN1 | dia | Altres Mitjans Auxiliars | 28,30000 | € |

# ANNEX NÚM. 16: PRESSUPOST PER A CONEIXEMENT DE L'ADMINISTRACIÓ

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 02/02/2024 | DJS | JJO | JJO |
| 1 | 11/03/2024 | DJS | JJO | JJO |
| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| | |
| | |
| | |
| | |

NOM FITXER : 240311 PMAN-FGC-PED-PCA-v01

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1.3 PRESSUPOST D'EXECUCIÓ PER CONTRACTE (IVA INCLÒS) ..... 1

1.4 PRESSUPOST PER AL CONEIXEMENT DE L'ADMINISTRACIÓ ..... 1

# 1 PRESSUPOST PER A CONEIXEMENT DE L'ADMINISTRACIÓ

## 1.1 EL PRESSUPOST DE EXECUCIÓ MATERIAL

El Pressupost d'Execució Material ascendeix a la quantitat de **CENT SETANTA-SIS MIL SET-CENTS TRENTA-SET EUROS AMB NORANTA-QUATRE CÈNTIMS (176.737,94 €).**

## 1.2 PRESSUPOST D'EXECUCIÓ PER CONTRACTE (SENSE IVA)

El Pressupost d'Execució per Contracte sense incloure l'IVA ascendeix a la quantitat de **DOS-CENTS DEU MIL TRESCENTS DIVUIT EUROS AMB QUINZE CÈNTIMS (210.318,15€).**

## 1.3 PRESSUPOST D'EXECUCIÓ PER CONTRACTE (IVA INCLÒS)

El Pressupost d'Execució per Contracte ascendeix a la quantitat de **DOS-CENTS CINQUANTA-QUATRE MIL QUATRECENTS VUITANTA-QUATRE EUROS AMB NORANTA-SIS CÈNTIMS (254.484,96€).**

## 1.4 PRESSUPOST PER AL CONEIXEMENT DE L'ADMINISTRACIÓ

El Pressupost per al coneixement de l'Administració puja a la quantitat de **DOS-CENTS DEU MIL TRESCENTS DIVUIT EUROS AMB QUINZE CÈNTIMS (210.318,15€).**

No es genera pressupost d'expropiacions ja que els terrenys afectats són ocupacions temporals en vials públics o de FGC.

No es genera pressupost d'assajos de contrast de qualitat ja que el pressupost no excedeix l'import equivalent a l'1.5% del pressupost general de l'obra i el qual s'ha repercutit proporcionalment als preus de pressupost.

# ANNEX NÚM. 17: PLA D'INSPECCIÓ I MANTENIMENT

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
|---|---|---|---|---|
| 0 | 26/01/2024 | IC | | |
| | | | | |
| | | | | |
| | | | | |

ACTUALITZACIONS

| Apartat | Descripció |
|---|---|
| | |
| | |
| | |
| | |

NOM FITXER : 240126 PMAN-FGC-PED-PLAINSPMMENT_V00.DOCX

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# 1 INTRODUCCIÓ

Al present annex es descriu el pla d'inspecció i manteniment del projecte "*Projecte de reparació del pont metàl·lic sobre la carretera de Vic de la línia Llobregat-Anoia de FGC*".

D'acord amb la normativa vigent (Codi Estructural article 24.3) és preceptiu redactar un pla d'inspecció i manteniment de les estructures projectades, reparades o reforçades. En els següents apartats s'han inclòs els plans de manteniment que prescriuen inspeccions principals de les estructures cada 5 anys indicant els punts crítics d'inspecció i els criteris a emprar en les inspeccions.

a) Descripció de l'estructura
b) Definició de l'ambient i de les vides útils
c) Definició dels punts crítics
d) Criteris d'inspecció
e) Definició dels mitjans d'accés
f) Criteris d'avaluació (llindars d'acceptació)
g) Manteniment bàsic
h) Manteniment especialitzat
i) Valoració d'operacions de manteniment i inspecció

En les següents descripcions s'indiquen els aspectes més importants, les que son convenients prestar atenció durant les taques d'inspecció i manteniment i que es basen en les següents normatives i recomanacions:

- Codi Estructural (R.D. 470/2021, de 29 de juny)
- "Guía para la redacción del Plan de Mantenimiento en Puentes", document de referència elaborat per la "Asociación Técnica de la Carretera" (ATC) i la "Asociación Científico-Técnica del Hormigón Estructural" (ACHE)

Aquest pla d'inspecció i manteniment inclou tant elements nous com elements existents rehabilitats, tenint el mateix contingut per ambdós àmbits. Tot i així, s'han tingut en compte les diferències obvies, com són: introducció d'un rang d'incertesa en l'estimació de la vida útil d'elements que es desconeix quan es van instal·lar, descripció de l'estructura limitada als plànols disponibles i mesures in situ i els llindars d'avaluació que cal adaptar als materials i a l'època de construcció de l'estructura.

# 2 DOCUMENTACIÓ DE L'ESTRUCTURA

Per a la realització del projecte, FGC ha facilitat els antecedents següents:

- Projecte original amb data de 25 de febrer de 1923 amb les diagrames d'esforços tallants i moments flectors que actua a l'estructura del pont metàl·lic.
- Projecte de rehabilitació del pont metàl·lic amb data de novembre 1991.
- Informe de la prova de càrrega LA_CB-SV_INF_IT_21_069 amb data de 19 de gener de 2022.
    - Anàlisi comparativa dels resultats teòrics dels càlculs i els obtinguts experimentalment a la prova de càrrega sobre el pont.
    - Inspecció del pont.

A més, durant la fase de projecte s'han generat els següents documents:

- Plànols de l'estructura.
- Memòria del projecte.
- Annex d'estructures i apèndixs de càlcul.

Durant la fase de construcció i control s'haurà de generar un arxiu de documentació sobre l'estructura amb el següent contingut mínim:

- Plànols "as-built" de l'estructura.
- Actes d'assajos de control de qualitat de materials i d'unitats d'obra.
- Llibre d'ordres i d'incidències esdevingudes durant la construcció de l'obra.
- Informe d'inspecció prèvia a la posada en servei.

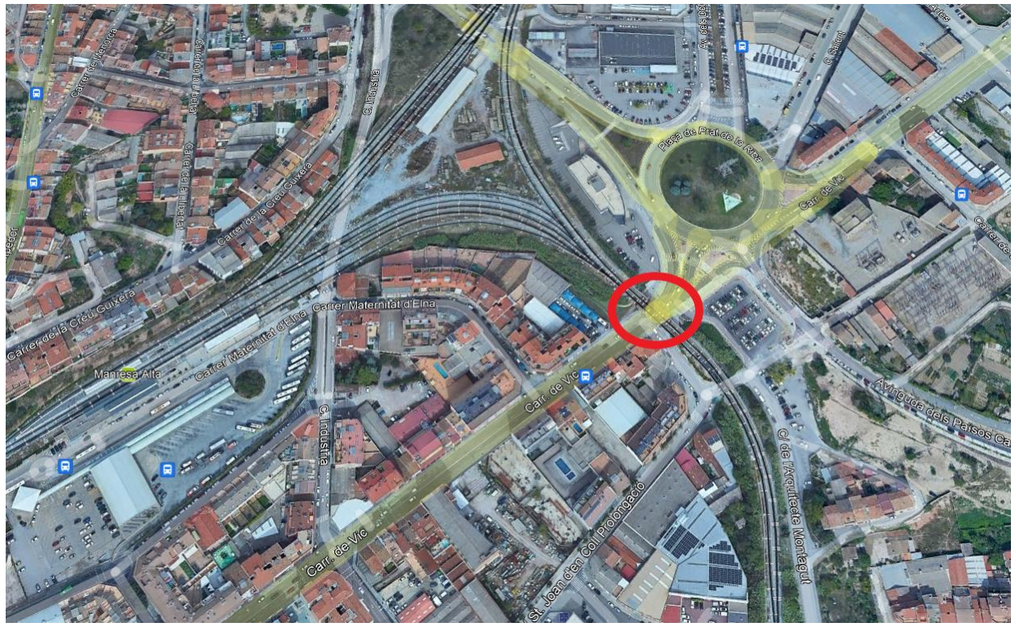
A partir de la posada en servei de l'estructura s'annexarà a la documentació anterior totes les actes d'inspecció rutinària, principal o especial que es realitzin a l'estructura, així com la documentació relativa a tota mena d'actuacions que es realitzin sobre l'estructura.

La documentació anterior serà arxivada pel propietari de l'estructura durant la seva vida en servei, havent de ser transmesa íntegrament en cas de transmissió de la propietat o gestió de l'estructura.

La documentació es conservarà obligatòriament en format digital i de forma optativa en paper. El propietari o gestor de l'estructura es tindrà cura de mantenir al dia i accessible tota la documentació relativa a l'estructura.

# 3 DESCRIPCIÓ DE L'ESTRUCTURA

L'estructura és el pont metàl·lic sobre la carretera de Vic en Manresa.


Carrer de Vic
Manresa Alta
Carrer Maternitat d'Elna
Carrer de la Indústria
Carrer de la Creu Cuixeta
Carrer de Sant Andreu
Carrer de Sant Ignasi
Carrer de Sant Joan
Carrer de Sant Miquel
Carrer de Sant Pere
Carrer de Sant Vicenç
Carrer de Sant Vicenç
Carrer de Sant Vicenç

cantell mínim de 0,72 m en els suports. Les unions amb les bigues principals són roblonades i es realitzen a través de les cartelles de rigidesa dels muntants.



*Imatge 2 Fotografia del pont*

Els bigues longitudinals originals han estat substituïts per bigues al calaix. La separació transversal entre eixos és de 1,060 m, sent 1,880 m la distància entre la biga longitudinals exterior i la biga principal, per a ambdues vies, finalment, la separació entre els bigues longitudinals interiors és de 2,92 m. Tenen una llum de 1,82 m i 0,303 m de cantell. S'uneixen a les biguetes mitjançant cargols d'alta resistència a través de casquets d'angular. La unió entre els diferents elements es realitza mitjançant reblons.

El pont disposa d'un arriostrament horitzontal contravent entre les dues bigues, amb modulació cada tres mòduls de biga, a nivell del seu cordó inferior, constituït per una gelosia a la Creu de Sant Andreu.

A més, recentment, s'ha disposat un arriostrament contravent nou entre els bigues longitudinals interiors de cada via, resolt també mitjançant una gelosia a Cruz de San Andrés, modulada igual que les biguetes del tauler.

Finalment, hi ha pòrtics de frenada disposats en els mòduls 2 i 8, resolts mitjançant mòduls a "K" entre el la biga longitudinal exterior i el cordó inferior de la biga principal adjacent, i per mòduls a Cruz de San Andrés entre els bigues longitudinals dels mòduls afectats.

Totes les unions són reblonades, excepte a les diagonals de l'arriostrament inferior reforçades. Les unions es fan a través de cartel·les, presentant excentricitat totes les diagonals.

El pont també disposa de dues passejades de servei interiors a les bigues principals que han estat producte de les feines de renovació. A més, s'han disposat pòrtics de suport de canonades a la zona d'entrevies, cobertes per una xapa estriada que dóna lloc a un tercer passeig.

La xapa de pis és metàl·lica estriada, i està reblonada als perfils que les sustenten. Existeix unes baranes als passeigs laterals.

Els estreps del pont presenten paraments frontals plans de maçoneria carejada amb carreus en cantonades i imposta de coronació. Els paraments laterals són murs envoltats de la mateixa tipologia que els frontals. Amb l'existència de dos passos inferiors, en ambdós estreps. Els murs guardabalast són de carreuat, a l'estrep d'entrada, i de formigó, al de sortida. Les coronacions de suports són de carreuat.

Els aparells de recolzament fixos es troben a l'estrep de sortida. La biga s'uneix a una peça metàl·lica alleugerida que descansa sobre la coronació dels suports. Els mòbils estan a l'estrep d'entrada i compten amb una peça esfèrica que permet el moviment i una base que recolza sobre la coronació. Les bigues estan unides amb quatre cargols a la peça superior dels aparells.

## 3.3 OBSTACLE SALVAT

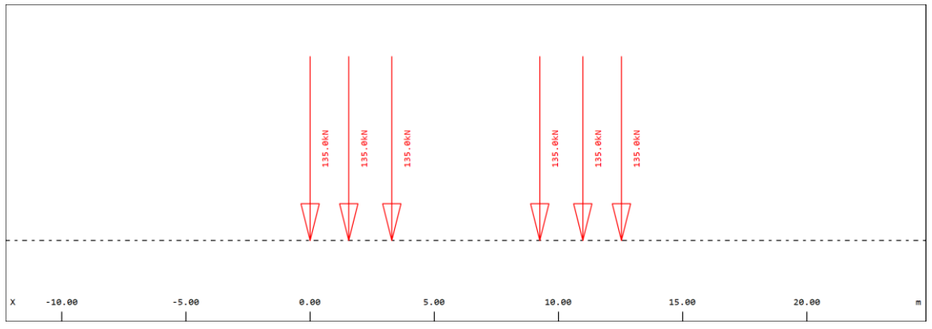
El pont travessa sobre la carretera de Vic a Manresa. Per sota de l'obertura principal passen dos carrils per sentit i voreres a cada costat. A més, també hi ha un encreuament per als vianants en les obertures d'aproximació.

## 3.4 CONFIGURACIÓ ESTRUCTURAL I FUNCIONAL

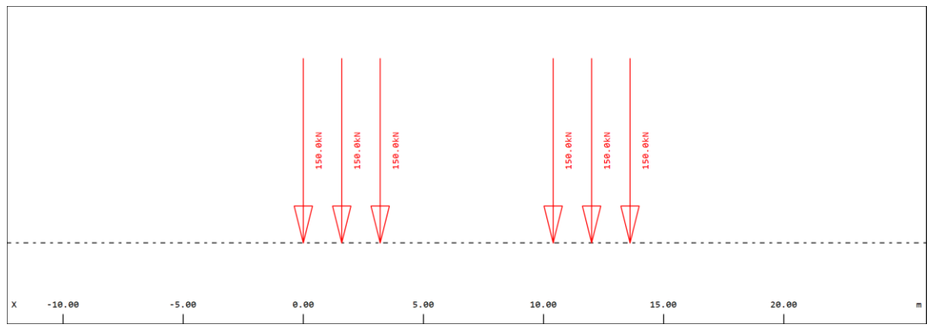
La tipologia del tauler és biga en gelosia metàl·lica amb tauler inferior. Els aparells de recolzament fixos es troben a l'estrep de sortida.

L'estructura s'ha verificat d'acord amb els Eurocodis. Tanmateix, les càrregues considerades es basen en el tràfic previst sobre la via i no l' indicat a la normativa. Per tant, s' aclareix aquest tràfic a continuació:

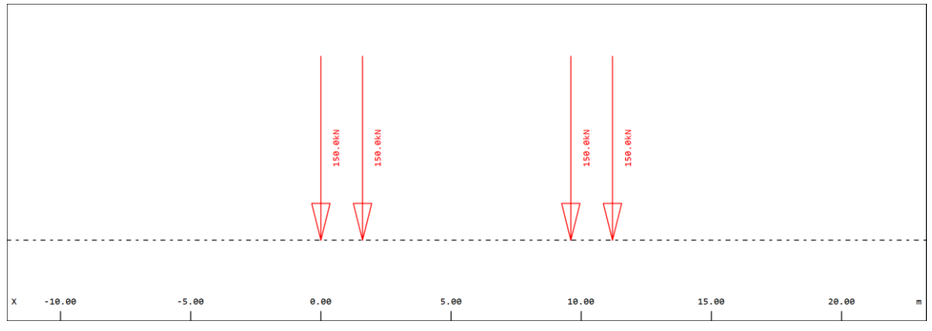
- Locomotora Sèrie 254
  - Pes per eix: 135 kN
  - Distribució del eixos: 1.556-1.733-5.958-1.733-1.556 m
  - Separació entre eixos de locomotores: 3.81 m.



- Locomotora Sèrie 257
    - Pes per eix: 148.4 kN
    - Distribució del eixos: 1.6-1.6-7.2-1.6-1.6 m
    - Separació entre eixos de locomotores: 3.20 m.




- Tremuja 62000
    - Pes per eix: 150 kN (Màxim segons fitxa tècnica, encara que el pes total màxim total és 44.7 t, la qual cosa no es considera del costat de la seguretat)
    - Distribució del eixos: 1.6-8.0-1.6 m
    - Separació entre eixos de locomotores: 2.43 m.




A més, els vehicles anteriors s'han combinat per tenir en compte els efectes al pont sumant diverses unitats. Les combinacions considerades han estat:

- Dues locomotores de la Sèrie 254.
- Dues locomotores de la Sèrie 257.
- Dues tremuges.
- Una locomotora de la Sèrie 254 arrossegant una tremuja.
- Una locomotora de la Sèrie 257 arrossegant una tremuja.

D'acord amb l'Eurocodi, els vehicles anteriors s'han de multiplicar per un coeficient d'impacte. S'ha considerat que la velocitat màxima és de 40 km/h.

Les accions de força de llaç, frenat i vent sí que s'han considerat conforme a la normativa.

D'acord amb la NCSP-07 l'estructura se situa en una zona on l'acceleració horitzontal del terreny és 0.04 g. Tenint en compte que es tracta una estructura existent, i per tant el període de retorn exigit és més baix, no és necessari considerar l'acció sísmica.

## 3.5 NORMATIVA I BIBLIOGRAFIA DE REFERÈNCIA

Per al càlcul de les accions i comprovacions estructurals s'han tingut en compte les següents normes i recomanacions:

- Codi Estructural (R.D. 470/2021, de 29 de juny)
- UNE-EN 1990: Eurocódigo 0
- UNE-EN 1991-1-1: Eurocódigo 1: Acciones en estructuras. Parte 1-1: Acciones generales.
- UNE-EN 1991-1-4: Eurocódigo 1: Acciones en estructuras. Parte 1-4: ACCIONES DE VIENTO.
- UNE-EN 1991-1-5: Eurocódigo 1: Acciones en estructuras. Parte 1-5: ACCIONES TÉRMICAS.
- UNE-EN 1991-1-6: Eurocódigo 1: Acciones en estructuras. Parte 1-6: ACCIONES DURANTE LA EJECUCIÓN.
- UNE-EN 1991-2: Eurocódigo 1: Acciones en estructuras. Parte 2: CARGAS DE TRÁFICO EN PUENTES.
- UNE-EN 1992-1: Eurocódigo 2: Proyecto de estructuras de hormigón. Parte 1: Reglas generales.
- UNE-EN 1992-2: Eurocódigo 2: Proyecto de estructuras de hormigón. Parte 2: Puentes de hormigón.
- UNE-EN 1993-1-1: Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-1: Reglas generales y reglas para edificios.
- UNE-EN 1993-1-5: Eurocódigo 3: Eroyecto de estructuras de acero. Parte 1-5: Placas cargadas en su plano.
- UNE-EN 1993-1-8: Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-8: Uniones.
- UNE-EN 1993-1-9: Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-9: Fatiga.
- UNE-EN 1993-1-10: Eurocódigo 3: proyecto de estructuras de acero. Parte 1-10: Tenacidad de fractura y resistència transversal.
- UNE-EN 1993-2: Eurocódigo 3: Proyecto de estructuras de acero. Parte 2: Puentes.
- UNE-EN 1994-1: Eurocódigo 4: Proyecto de estructuras mixtas de acero y hormigón. Parte 1: Reglas generales.
- UNE-EN 1994-2: Eurocódigo 4: Proyecto de estructuras mixtas de acero y hormigón. Parte 2: Puentes.
- Norma de Construcción Sismorresistente: Puentes (NCSP-07).
- Guía de cimentaciones en obras de carretera. Ministerio de Fomento. 2004.
- Guía para el proyecto y la ejecución de micropilotes en obras de carretera. 2005. Ministerio de Fomento.

- Atlas Nacional de España. Sección II. Grupo 9. Climatología. Ministerio de Fomento. Instituto Geográfico Nacional. 1992.

## 3.6 CONDICIONS CLIMÀTIQUES

D'acord amb el Servei Meteorològic de Catalunya les dades climàtiques per la comarca del Bages entre 1971 i 2000 són:

| | |
|---|---|
| Temperatura màxima absoluta (Cº) | 43.0 |
| Temperatura mínima absoluta (Cº) | -19.0 |
| Temperatura mitjana (Cº) | 14 |
| Amplitud tèrmica (Cº) | 62 |
| Precipitació mitjana (mm) | 546.9 |
| Número mitjà de dies de pluja | 71.1 |
| Humitat relativa mitjana diària al Juliol (%) | 33 |
| Humitat relativa mitjana diària al Gener (%) | 57 |

## 3.7 MATERIALS CONSTITUENTS

Amb caràcter general s'ha seguit allò indicat a les especificacions del Codi Estructural pel que fa a materials i coeficient parcials de seguretat dels mateixos.

### 3.7.1 Materials existents

**Acer Estructural**

El pont està compost d'acers de dos tipus:

- Acer assimilable a un S 235. Es va emprar en el projecte original de l'estructura.
- Acer assimilable a un S 275. S'ha emprat en els successius reforços que s'han realitzat en l'estructura.

**Cargols**

Grau A10T:

- Límit elàstic fyb = 900 MPa.
- Resistència a tracció fub = 1000 MPa.

### 3.7.2 Materials nous

En els treballs de reparació s'ha previst la utilització dels materials següents:

**Acer estructural**

Les noves xapes de reforç estructural seran del tipus:

- S 275 J0. fyk=275 MPa.
- S 355 J0. fyk=355 MPa.

**Cargols**

Grau 10.9:

- Límit elàstic fyb = 900 MPa.
- Resistència a tracció fub = 1000 MPa.

## 3.8 TRACTAMENTS DE PROTECCIÓ SUPERFICIAL

S'ha projectat la execució dels següents tractaments de protecció per a totes les superfícies del pont, tant les existents (reparades i no reparades) com les de nova construcció:

- Paraments de formigó:
  - Saneig amb ruixat a alta pressió amb granulat de silicat d'alumini i saneig manual.
  - Aplicació de inhibidor de corrosió amb dos capes de inhibidor de corrosió migratori de superfície base aminoalcohol, que utilitza una barreja de silicats reactius, agents activadors de superfície al mateix temps que inhibidors de corrosió migratoris, aplicat manualment amb brotxa o corró.
  - Aplicació de Revestiment anticarbonatació de formigó, amb tres capes de pintura de resines acríliques en dispersió aquosa de color blanc o gris, aplicades manualment o per projecció.
- Llosa de formigó/rampes/escales: S'aplicarà un tractament superficial que inclou neteja de la superfície, imprimació de la superfície amb dissolvent d'un component i l' aplicació de resina de poliuretà de dos components amb una dotació mínima d'1,6 kg/m2. Tot i que la funció principal d'aquest tractament és el d'atorgar un caràcter antilliscant a les superfícies de pas, també protegirà al formigó.
- Baranes metàl·liques i reixeta: En ser d'acer galvanitzat no cal preveure cap tractament de protecció.
- Acer estructural:

- Sistema de protecció de les superfícies metàl·liques segons UNE-ISO-12944-7 per a un ambient tipus "C5" de agressivitat "Molt alta" y per a una durabilitat "H" (Més de 15 anys).
- Les característiques del sistema de pintat són:
  - Preparació de superfície: St-3.
  - Aplicació de revestiment epoxi de dos components tipus Amerlock2 o equivalent en un gruix mínim de 125mm de pel·lícula seca.
  - Acabat amb pintura de poliuretà alifàtic de dos components en un gruix mínim de 125mm de pel·lícula seca.

### 3.9 SISTEMA DE DRENATGE

S'han previst drens californians a les voltes dels buits d'aproximació. Concretament, se'n disposaran dues a les bases de cada volta, excepte a la banda Manresa de l'estrep de sortida.

### 3.10 EQUIPAMENT

El pont disposa de l'equipament ferroviari següent:

- Dues vies amb travesses, carrils y bigues contracarrils.
- Passejos de servei.
- Canalitzacions centrals.
- Reixeta inferior.

## 4 DEFINICIÓ DE L'AMBIENT I DE LES VIDES ÚTILS

### 4.1 CLASSES D'EXPOSICIÓ DELS ELEMENTS

A continuació s'enumeren les classes generals d'exposició adoptades per a les diferents parts de les estructures:

**Acer**

Segons la taula 80.1.a del Codi Estructural, tindrà una classe d'exposició relativa a la corrosió atmosfèrica en "Àrees costaneres amb elevada salinitat i àrees Industrials amb elevada humitat i atmosfera agressiva" designació "C5". Si bé no compleix amb les indicacions de la normativa, l'avançat estat de degradació que presenta el pont derivat del trànsit de potassa aconsella adoptar aquesta classe d'exposició.

### 4.2 VIDA ÚTIL CONSIDERADA

La vida útil d'un element que constitueix el pont és el període de temps en el qual dit element compleix la seva funció sense que les seves prestacions caiguin per sota de certs llindars d'acceptació que es defineixen a l'apartat 8. Naturalment, les vides útils son diferents per a cada element del pont.

La vida útil dels elements estructurals de nova construcció és de 100 anys, en coherència amb el Codi Estructural en tractar-se de "Estructuras de edificios monumentales, puentes y otras estructuras de ingeniería civil".

Per als elements rehabilitats, reparats o remullats s' esperen les següents vides útils:

- Pintures i protecció anticorrosives a l'acer: 25 anys
- Aparells de recolzament: 20 anys
- Equips de drenatge i segellants de junts de dilatació: 10 anys
- Impermeabilització del formigó: 10 anys
- Morters: 10 anys

## 5 PERIODICITAT DE LES INSPECCIONS A REALIZAR

Es realitzarà tres tipus d'inspeccions sobre l'estructura de nova construcció:

- IB: Inspecció bàsica (estat 0), es realitzà al lliurament de l'estructura i cada 15 mesos
- IP: Inspecció principal. Per avaluar minuciosament l'estat visual de cada element dels murs, realitzada per personal especialitzat sense mitjans especials, generalment cada 5 anys.
- IE: Inspecció especial, de caràcter no periòdic, es realitzen per avaluar i / o corregir els danys detectats en una inspecció bàsica o principal quan la seva magnitud o importància ho exigeix, o com a conseqüència d'una situació singular (riuades, impactes de vehicles, sismes,

Addicionalment del que estableix el paràgraf anterior, s'estima convenient realitzar una certa vigilància mitjançant inspecció visual de l'estructura durant els primers mesos de la seva posada en servei.

A partir de la inspecció inicial, es continuarà realitzant inspeccions principals, en general cada 5 anys. Si en una inspecció principal es detecten danys en l'estructura que es creguin d'una evolució ràpida, es reduirà el període entre inspeccions principals a 2 anys.

Valorat l'estat de l'estructura, i si escau, la velocitat de deteriorament per comparació amb inspeccions prèvies, l'informe de la inspecció s'indicarà si:

- Es manté el pla d'inspecció cada 5 anys.
- Es redueix el període d'inspecció a 2 anys
- Es requereix un Inspecció especial que doni lloc a un projecte de reparació i / o reforç.

Les Inspeccions especials es realitzaran quan l'estat de l'Estructura ho requereixi, d'acord amb el resultat d'una inspecció Principal.

A més de les inspeccions indicades es realitzaran Inspeccions Rutinàries de l'estructura, almenys anualment.

El propietari de l'estructura, o en el seu defecte el gestor de la mateixa, serà el responsable de realitzar les inspeccions indicades, bé directament o en delegació

Necessàriament impliquen la inspecció detallada per personal i mitjans especialitzats, amb una anàlisi de l'estat de l'estructura per prescriure les accions necessàries que garanteixin la seguretat i durabilitat.

## 6 MEDIS AUXLIARS PER AL ACCÉS A LES DIVERSES ZONES DE L'ESTRUCTURA

Per a les inspeccions periòdiques de l'estructura únicament seran necessaris com a mitjans auxiliars:

- Escales de mà per accedir a les coronacions dels murs.
- Cistelles elevadores amb braç telescòpic per a la inspecció de paraments i elements del mur on l'escala no permeti l'accés.

A més dels mitjans anteriors es recomana anar proveïts de regla de mesura d'obertura de fissures, i mitjans d'il·luminació per zones en ombra.

Per a les inspeccions especials poden ser necessaris mitjans més específics com ara maquinària d'excavació / perforació per sondatges, instrumentalització per monitoritzar o seguir danys estructurals o deformacions.

L'accés a l'estructura es podrà realitzar des de la carretera de Vic.

## 7 PUNTS D'INSPECCIÓ. TÈCNIQUES I CRITERIS RECOMANATS

Les inspeccions bàsiques i principals s'hauran de realitzar conforme el SGPE (Sistema de Gestió de Ponts i Estructures de la Generalitat) i acompliran amb el contingut i format d'aquestes.

Es recomana realitzar la inspecció bàsica anualment i la inspecció principal cada 5 anys.

Tant en les inspeccions bàsiques com en les principals s'inspeccionaran els elements estructurals del pont:

- Estreps i murs.
- Estructura metàl·lica.

També s'inspeccionaran els elements no estructurals:

- Terreny de fonamentació als voltants de estreps.
- Paviments.
- Drenatges.
- Plantacions i talussos.
- Baranes.

Les Inspeccions especials són aquelles inspecciones integrals no periòdiques que requereixen la monitorització de la estructura i la avaluació qualificada per a poder obtenir un diagnòstic complet. Es realitzen en qualssevol moment de la vida en servei de l'estructura, en quan es detecti la seva necessitat.

A continuació es llisten els punts crítics de les estructures projectades de nova construcció a efectes d'inspecció, manteniment i els següents criteris d'inspecció:

- <u>Estructura metàl·lica:</u>
  - Tècniques: Inspecció visual tant de superfícies, cordons de soldadura, unions, zones sota juntes susceptibles a danys per filtració d'aigua i factors ambientals. Detecció de danys a la pintura de protecció. Detecció d'oxidacions, fissures i danys en general del material base. Detecció de pèrdua de caragols o roblons.
  - Criteris: Es realitzarà un inventari de danys de rellevància per element (estat pintura, danys a cordons de soldadura i a unions, fissures i trencaments d'elements, , pèrdua de recobriment, pèrdua de cargols, etc). Per a les inspeccions principals s'ha de quantificar la extensió i importància dels danys. Per a les inspeccions especials es completarà amb un mapatge i aixecament precís dels danys, especialment de les fissures, que podrà ser complementat en cas necessari amb assajos de soldadures amb partícules magnètiques i/o ultrasons, així com assajos d'adherència i gruixos de la pintura.

- Estreps i murs:

  - Tècniques: Inspecció visual de fonaments i als alçats. Observació contacte amb terreny. Inspecció al voltants de zona de junta per a detectar possibles moviments per assentaments/girs dels fonaments. Inspecció de possibles danys al talús per davant de l'estrep.
  - Criteris: Es realitzarà un inventari de danys de rellevància per element (trencaments, meteorització, trencament de jonqueres entre carreus, fissures en carreus, etc). Per a les inspeccions principals s'ha de quantificar la extensió i importància dels danys. Per a les inspeccions especials es completarà amb un mapatge i aixecament precís dels danys. Es comprovarà si hi ha enfonsaments locals o acumulacions excessives. Es comprovarà si les fonamentacions queden vistes, es prendrà nota i es mesurarà el descalçament. Es prendrà nota de possibles desploms o falta de verticalitat.

- Recolzaments:

  - Tècniques: Inspecció visual de neoprens i mesetes. Inspecció de bigues metàl·liques transversals.
  - Criteris: Es comprovarà l'estat de conservació, possibles esquerdes a la zona de xapes metàl·liques. Detecció de possibles moviments a tauler. Detecció si el recolzament està essent reptat o escopit de la seva posició teòrica.

- Sistema de drenatge:

  - Tècniques: Inspecció visual de l'estat de conservació dels diferents elements, segellats i funcionalitat.
  - Criteris: Obturació de embornals, canals i tubs. Vandalisme del sistema de drenatge en peu d' estreps i piles. A la sortida de tubs dren es comprovarà la neteja dels tubs de sortida de drenatge. Detecció de tolls o taques per tolls a zones de pas que indicarien insuficiència de pendents.

- Instal·lacions

  - Tècniques: Inspecció visual..
  - Criteris: Estat de les instal·lacions. Estat dels ancoratges de sustentació. Danys per vandalisme.

## 8 CRITERIS D'AVALUACIÓ: LLINDARS D'ACCEPTACIÓ RECOMANATS

Seguidament es llisten els llindars d'acceptació recomanats per a les estructures indicades a efectes d'inspecció, manteniment i els següents criteris d'inspecció:

- Fonamentacions:

  - Alarma: Assentament superior a 1 centímetre.
  - Crític: Assentament superior a 2 centímetres. Els pilons quedin visibles

- Estreps:

  - Alarma: Taques i eflorescències. Fissures wk>0.3mm.
  - Crític: Desplaçaments i/o girs visuals del cap de l'estrep. Fissures wk>0.6mm. Despreniments de carreus.. Deformacions excessives. Exfoliacions.

- Recolzaments:

  - Crític: Detecció si el neoprè està essent reptat o escopit de la seva posició teòrica

- Estructura metàl·lica:

  - Alarma: Presències de zones amb lleu oxidació o pèrdua d'adherència de pintura. Danys/fissures a cordons de soldadura. Fissures en elements estructurals.
  - Crític: Pèrdua d'adherència de pintura amb oxidacions de metall base de gravetat mitjana. Fissures a cordons de soldadura que traspassen al metall base. Ruptures d'elements estructurals. Pèrdua de cargols o roblons.
  - 0.6mm. Armadures vistes sense recobriment. Deformacions excessives. Exfoliacions

- Sistemes de drenatge:

  - Alarma: Obstrucció lleu del drenatge, sense la formació de tolls. Superfícies de estreps es mullen per filtracions. Escrostonaments de arrebossat per filtracions
  - Crític: Obstrucció apreciable del drenatge.

- Instal·lacions de serveis:

  - Alarma: Corrosió puntual o moderada.
  - Crític: Corrosió general o avançada.

## 9 MANTENIMENT BÀSIC (ACTUACIONS PROGRAMADES O ORDINÀRIES)

Independentment del resultat de les inspeccions periòdiques (bàsiques i principals) es preveuen les següents actuacions de manteniment programades:

- Operacions de neteja del pont i amb cura d'eliminació d'objectes estranys, amb freqüència en funció del trànsit i condicions ambientals. Es realitzarà anualment i/o després d'una gran tempesta.
- Neteja de paraments amb raig d'aigua a pressió, i en el cas de detectar-se disgregacions superficials de formigó prèviament s'aplicarà saneig amb aire comprimit. Freqüència: Cada 5 anys.

- Retirada d'espècies vegetals arrelades a l'estructura. Freqüència: Cada 5 anys.
- Comprovació de la no obturació del sistema de drenatge. Retirada del material dipositat en superfícies. Es realitzarà anualment i/o després d'una tempesta.
- Manteniment de les superfícies de pas; retirada d'acumulació de materials i vegetació. Es realitzarà cada 2 anys i/o després d'una gran tempesta.

## 10 MANTENIMENT ESPECIALITZAT (ACTUACIONS NO PROGRAMADES O EXTRAORDINÀRIES)

A partir de resultat de les inspeccions bàsiques, principals i/o especials podrà ser necessari realitzar diverses actuacions de manteniment no programades o extraordinàries.

La valoració de les operacions de manteniment i inspecció es descriu a continuació, en base a les vides útils considerades i al cost de reparació en el moment actual del present projecte.

- Treballs a murs de cadirat:
    - Revisió de l'estat de l'estructura per si apareixen danys/patologies motivats fonamentalment per factors associats a la durabilitat:
        - Reparació d'escrostonaments en arrebossats.
        - Segellat i injecció de fissures en carreus.
        - Reparació de juntes.
    - Es realitzaran o planificaran quan es tingui constància de la seva aparició i es determini el grau d'urgència de la seva intervenció.
- Treballs a elements estructurals metàl·lics
    - Revisió de l'estat de l'estructura per si apareixen danys/patologies tant del tractament de protecció (pintura), unions soldades i material base (fissures, oxidacions):
        - Renovació de sistema de protecció
        - Reparació, reforç de metall base per fissures, esquerdes, trencaments
        - Refer cordons de soldadures amb danys, fissures,..
    - Es realitzaran o planificaran quan es tingui constància de la seva aparició i es determini el grau d'urgència de la seva intervenció. Es realitzarà el pintat de tota la superfície d'elements metàl·lics als 10 anys.
    -
- Sistema de drenatge:
    - Es desembussarà cada 2 anys o quan es detecti acumulació apreciable de materials que provoqui la formació tolls al paviment. Es repassaran els segellats amb massella de poliuretà cada 10 anys o quan es detectin danys o envelliment.
- Fonaments:
    - Durant les inspeccions principals es detectaran possibles erosions al voltant de estreps i la evidència de qualssevol moviment (lliscament, rotació, etc.) o assentament. Podrà ser necessari realitzar una inspecció especial ,inclús inspecció subaquàtica o una excavació de pous per tal de determinar la causa de la problemàtica i determinar l'abast de la intervenció a realitzar.

## 11 VALORACIÓ D'OPERACIONS D'INSPECCIÓ I MANTENIMENT

La valoració de les operacions de manteniment i inspecció es detalla a continuació, en base a les vides útils considerades i el cost de reparació en el moment actual que valora el present projecte.

| DESCRIPCIÓ | | AMIDAMENT | PREU | IMPORT |
|---|---|---|---|---|
| INSPECCIONS | | | | |
| Inspeccions bàsiques (Cada 15 mesos) | ud | 1 | 500.00 | 500.00 € |
| Inspecciones principals (Cada 5 anys) | ud | 1 | 1000.00 | 1,000.00 € |
| Inspecciones especials (Cada 20 anys) | ud | 1 | 2000.00 | 2,000.00 € |
| **Total en 100 anys** | | | | 68,000.00 € |
| NETEJA | | | | |
| Neteja de pont | $m^2$ | 158 | 0.16 | 25.50 € |
| Neteja de drenatge | ud | 1 | 100.00 | 100.00 € |
| **Periodicitat: cada 6 mesos** | | | | 125.50 € |
| **Total en 100 anys** | | | | 25,100.48 € |
| REPARACIÓ DE SOLDADURES | | | | |
| Reparación de cordó de soldadura EXC 3 EN 1090:2-2011 | m | 50 | 20.52 | 1,026.00 € |
| **Periodicitat: cada 25 anys** | | | | 1,026.00 € |
| **Total en 100 anys** | | | | 4,104.00 € |
| PINTAT D'ESTRUCTURA METÀL·LICA | | | | |
| Retirada del tramex i biga contracarril i reposició | ud | 1 | 7637.54 | 7,637.54 € |
| Nete./prep.sup.perf.lam.acer, Sa 2 1/2 Raig de sorra | $m^2$ | 844 | 7.96 | 6,719.83 € |
| Renovació del sistema de protecció classe "C5" i durabilitat molt alta (>25 anys) segons UNE-ISO-12944-7 | $m^2$ | 844 | 19.37 | 16,352.15 € |
| **Periodicitat: cada 25 anys** | | | | 30,709.53 € |
| **Total en 100 anys** | | | | 122,838.10 € |
| MANTENIMENT D'ESTREPS | | | | |
| Neteja de parament de formigó amb raig agua | $m^2$ | 164 | 5.75 | 944.73 € |
| Neteja de parament de pedra amb raig agua | $m^2$ | 273 | 6.07 | 1,657.11 € |
| Rejuntat de junts param.vert obra fàbrica | m | 50 | 13.52 | 676.00 € |
| Reintegració volumns deteriorats elem. Pedra | $m^2$ | 1 | 514.44 | 514.44 € |
| Cons.el.pedra amb consolidant de silicat d'etil | $m^2$ | 50 | 13.36 | 668.00 € |
| Pintant vert. Ext. Ciment, pintura silicat | $m^2$ | 149 | 9.60 | 1,433.28 € |
| **Periodicitat: cada 15 anys** | | | | 5,893.56 € |
| **Total en 100 anys** | | | | 39,290.37 € |
| MANTENIMENT DE RECOLZAMENTS | | | | |
| Manteniment de recolzaments (Cada 15 anys) | ud | 4 | 260.00 | 1,040.00 € |
| **Total en 100 anys** | | | | 6,933.33 € |
| **TOTAL EN 100 ANYS** | | | | 266,266.28 € |

COL·LEGI D'ENGINYERS DE CAMINS, CANALS I PORTS CATALUNYA

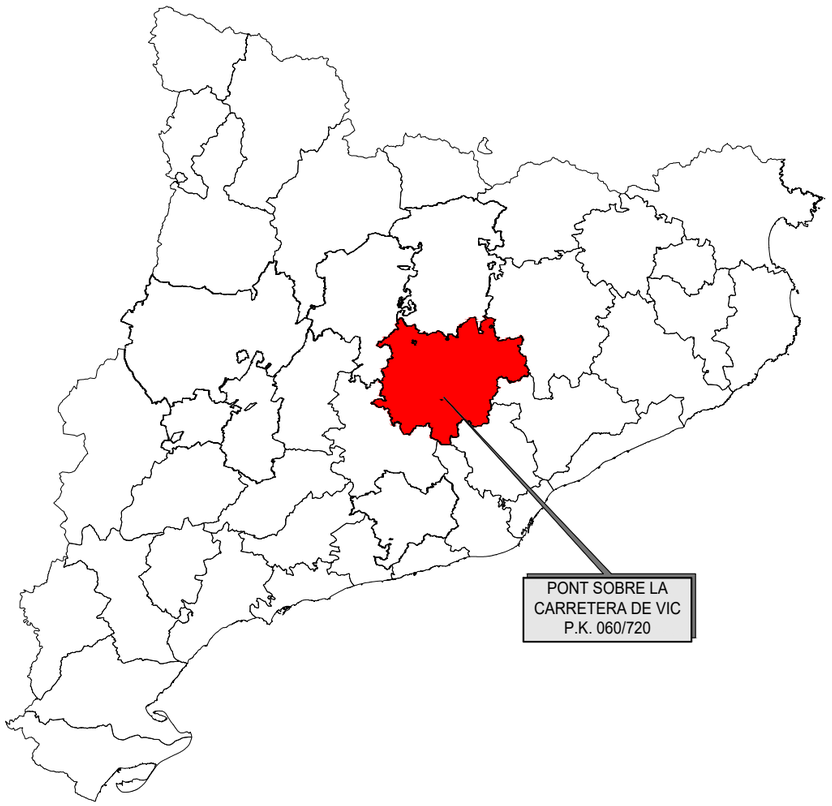
| Expedient | Data |
|---|---|
| 2024/01262/01 | 10/04/2024 |

V I S A T

# DOCUMENT NÚM. 2: PLÀNOLS

## SITUACIÓ DEL PONT METÀLIC - MANRESA

ESCALA S/E




| CAPÍTOL | PLÀNOL | FULL | TÍTOL | NOM FITXER |
|---|---|---|---|---|
| **01** | | | **PLÀNOLS ÍNDEX I SITUACIÓ** | |
| | **A** | 01 | ÍNDEX I SITUACIÓ | 01AF01 |
| **02** | | | **PLÀNOLS SITUACIÓ ACTUAL** | |
| | **A** | 01 | PLANTA CARTOGRAFIA | 02AF01 |
| | | 02 | PLANTA ORTOFOTO | 02AF02 |
| **03** | | | **DEFINICIÓ DEL PONT EXISTENT** | |
| | **A** | 01 | PLANTA I ALÇAT | 03AF01 |
| | | 02 | BIGA PRINCIPAL | 03AF02 |
| | | 03 | BIGUES TRANSVERSALS | 03AF03 |
| | | 04 | ARRIOSTRAMENTS | 03AF04 |
| **04** | | | **IDENTIFICACIÓ DE DANYS** | |
| | **A** | | **REPORTATGE FOTOGRÀFIC** | |
| | | 01 | REPORTATGE FOTOGRÀFIC (I) | 04AF01 |
| | | 02 | REPORTATGE FOTOGRÀFIC (II) | 04AF02 |
| | **B** | | **DANYS IDENTIFICATS** | |
| | | 01 | ESQUEMA DE DANYS (I) | 04BF01 |
| | | 02 | ESQUEMA DE DANYS (II) | 04BF02 |
| | | 03 | ESQUEMA DE DANYS (III) | 04BF03 |
| **05** | | | **ACTUACIONS DE CONSOLIDACIÓ ESTRUCTURAL** | |
| | **A** | | **DEFINICIÓ GENERAL** | |
| | | 01 | PLANTA I ALÇAT | 05AF01 |
| | | 02 | SECCIÓ TRANSVERSAL | 05AF02 |
| | **B** | | **ACTUACIONS EN L'ESTRUCTURA METÀL·LICA** | |
| | | 01 | NOTES GENERALS | 05BF01 |
| | | 02 | REPARACIÓ DE BIGUES TRANSVERSALS | 05BF02 |
| | | 03 | REPARACIÓ DE BIGUES DIAFRAGMA (I) | 05BF03 |
| | | 04 | REPARACIÓ DE BIGUES DIAFRAGMA (II) | 05BF04 |
| | | 05 | REPARACIÓ DE FISSURA | 05BF05 |
| | | 06 | SUBSTITUCIÓ DE ARRIOSTRAMIENT INFERIOR | 05BF06 |
| | | 07 | ALTRES ACTUACIONS | 05BF07 |
| | **C** | | **ACTUACIONS EN MURS D'ESTREPS** | |
| | | 01 | ALÇATS DE MURS (I) | 05CF01 |
| | | 02 | ALÇATS DE MURS (II) I DETALLS DE REPARACIONS | 05CF02 |
| | | 03 | DETALLS DE REPARACIONS | 05CF03 |
| | | 04 | REPARACIÓ DE PARAMENTS DE FORMIGÓ (I) | 05CF04 |
| | | 05 | REPARACIÓ DE PARAMENTS DE FORMIGÓ (II) | 05CF05 |
| **06** | | | **SENYALITZACIÓ, ABALISAMENT I DEFENSES** | |
| | **A** | 01 | EXEMPLES DE SENYALITZACIÓ (I) | 06AF01 |
| | | 02 | EXEMPLES DE SENYALITZACIÓ (II) | 06AF02 |
| | **B** | 01 | FASE 1 DESVIAMENT PROVISIONAL | 06BF01 |
| | | 02 | FASE 2 DESVIAMENT PROVISIONAL | 06BF02 |
| | | 03 | FASE 3 DESVIAMENT PROVISIONAL | 06BF03 |
| **07** | | | **EXPROPIACIONS** | |
| | **A** | 01 | OCUPACIONS TEMPORALS | 07AF01 |
| **08** | | | **FASES DE CONSTRUCIÓ** | |
| | **A** | 01 | FASES DE CONSTRUCIÓ (I) | 08AF01 |
| | | 02 | FASES DE CONSTRUCIÓ (II) | 08AF02 |
| **A7** | | | **SEGURETAT I SALUT** | |
| | | 01 | INDEX I SITUACIÓ | A7F01 |
| | | 02 | ITINERARI D´EVACUACIÓ | A7F02 |
| | | 03 | IMPLANTACIÓ I SERVEIS | A7F03 |
| | | 04 | PLATAFORMES I ESCALES | A7F04 |
| | | 05 | EQUIPS DE PROTECCIÓ INDIVIDUAL (I) | A7F05 |
| | | 06 | EQUIPS DE PROTECCIÓ INDIVIDUAL (II) | A7F06 |
| | | 07 | EQUIPS DE PROTECCIÓ COL.LECTIVA. BASTIDA | A7F07 |
| | | 08 | EQUIPS DE PROTECCIÓ COL.LECTIVA. DISTÀNCIES DE SEGURETAT | A7F08 |
| | | 09 | EQUIPS DE PROTECCIÓ COL.LECTIVA. MEDIS AUXILIARS | A7F09 |
| | | 10 | EQIPS DE PROTECCIÓ COL.LECTIVA.BALISSAMENT I BARANES | A7F10 |
| | | 11 | EQUIPS DE PROTECCIÓ COL.LECTIVA . TOPALLS | A7F11 |
| | | 12 | EQIPS DE PROTECCIÓ COL.LECTIVA. XARXES | A7F12 |
| | | 13 | SOLDADURA | A7F13 |
| | | 14 | SENYALITZACIÓ D´OBRA | A7F14 |
| | | 15 | MÓDULS D´OBRA I SERVEIS | A7F15 |

COL·LEGI D'ENGINYERS DE CAMINS, CANALS I PORTS CATALUNYA

| Expedient | Data |
|---|---|
| 2024/01262/01 | 10/04/2024 |

**V I S A T**

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: EPEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: 1/125 (0 0 12.5 1 25cm 2m 1/125) ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720 — PLÀNOLS ÍNDEX I SITUACIÓ — ÍNDEX I SITUACIÓ

DATA: GENER 2024

PLÀNOL NÚM.: 01A

NOM FITXER: 01AF01.dwg

FULL 1 DE 1

CARTOGRAFIA
ESCALA 1/5000

T.M. MANRESA

PONT SOBRE LA CARRETERA
DE VIC P.K. 060/720

MANRESA

BARCELONA

402.500
403.000
403.500
404.000
4.621.000
4.620.500

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| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR
PEDELTA

AUTOR DEL PROJECTE
JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE
INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES
1/500
0 625 1250
ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL
PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
PLÀNOLS SITUACIÓ ACTUAL
PLANTA CARTOGRAFIA

DATA
GENER 2024

PLÀNOL NÚM.
02A

NOM FITXER
02AF01-F02.dwg

FULL 01 DE 02

CARTOGRAFIA
ESCALA 1/5000

T.M. MANRESA

PONT SOBRE LA CARRETERA
DE VIC P.K. 060/720

MANRESA

BARCELONA

402.500 403.000 403.500 404.000

4.621.000

4.620.500

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|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

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CLAU PROJECTE

ESCALES
1/500
0 625 1250
ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL
PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
PLÀNOLS SITUACIÓ ACTUAL
PLANTA ORTOFOTO

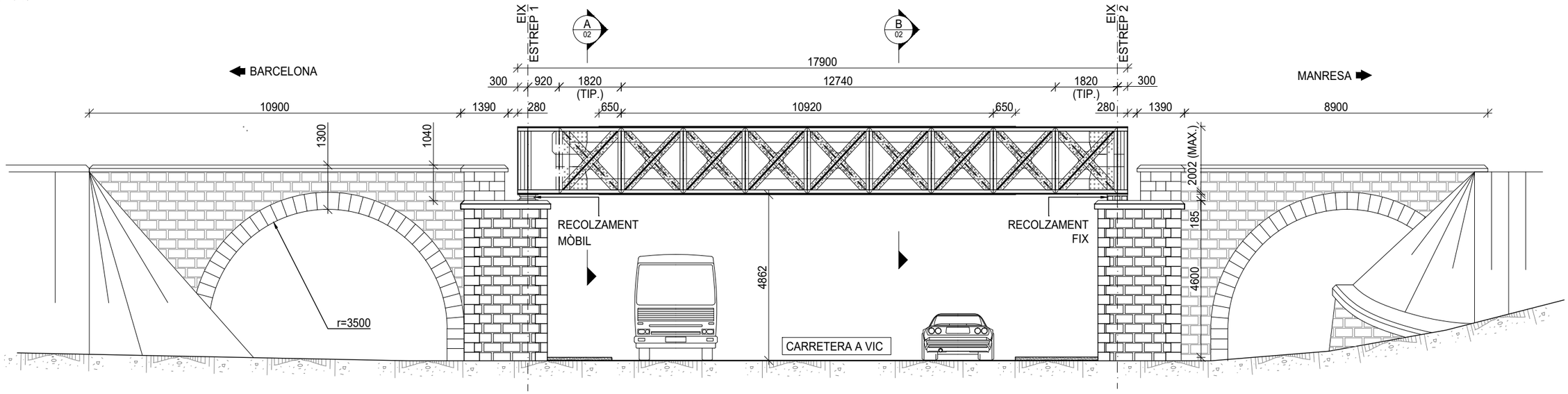
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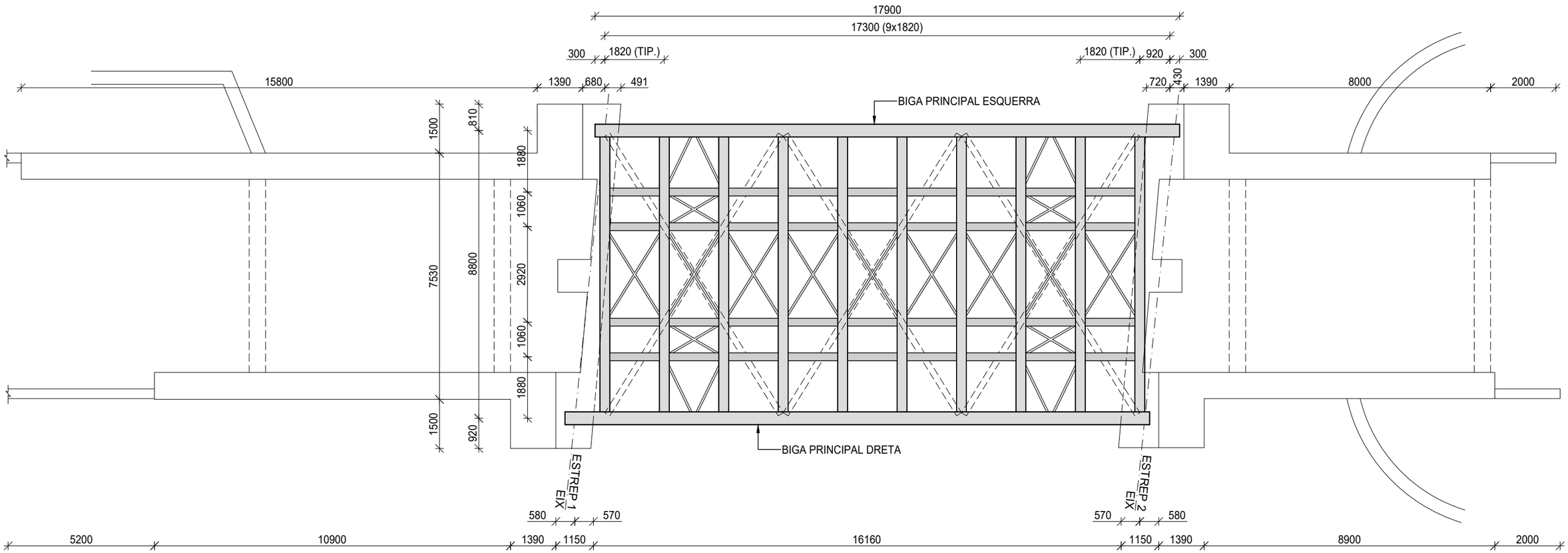
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FULL 02 DE 02

## ALÇAT ACTUAL
ESCALA 1/125




## PLANTA ACTUAL
ESCALA 1/125




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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR
PEDELTA

AUTOR DEL PROJECTE
JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE
INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES
1/125
ORIGINALS
0 1.25 2.5
GRÀFIQUES

NOM DEL PLÀNOL
PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
DEFINICIÓ GENERAL
PLANTA I ALÇAT

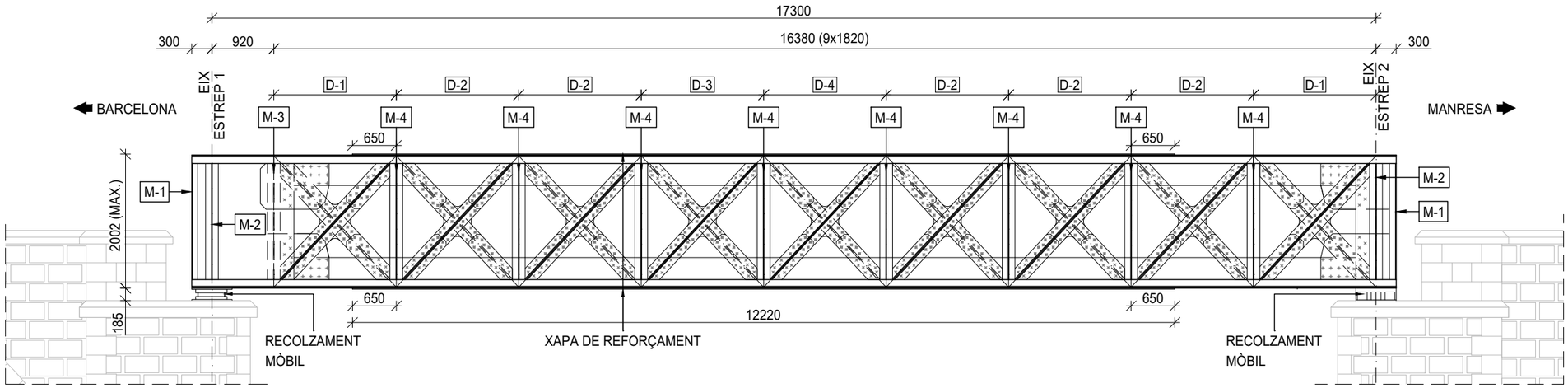
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PLÀNOL NÚM.
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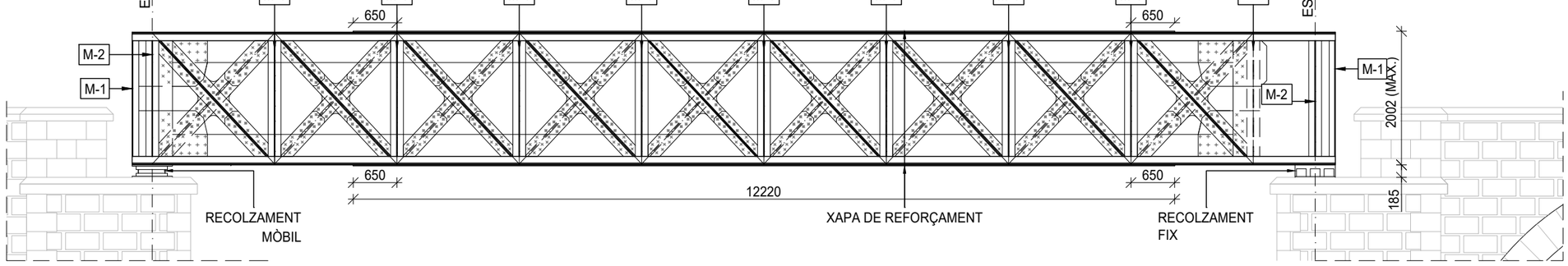
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FULL 01 DE 04

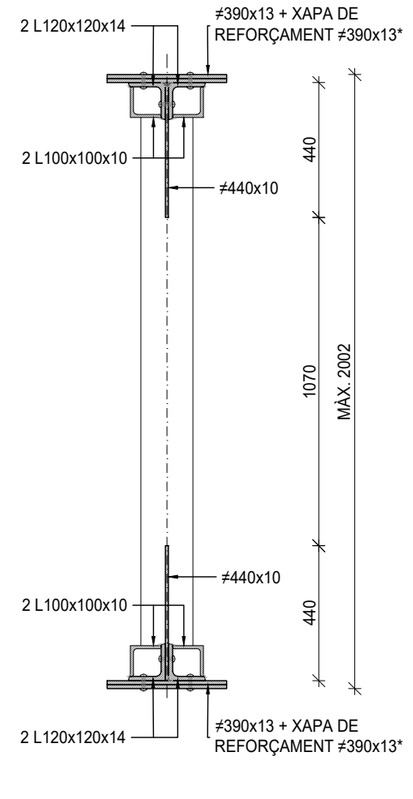
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ESCALA 1/75




## ALÇAT. BIGA PRINCIPAL ESQUERRA
ESCALA 1/75



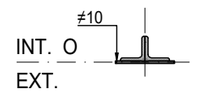

## BIGA PRINCIPAL
ESCALA 1/20




* COM S'INDICA EN L'ALÇADA

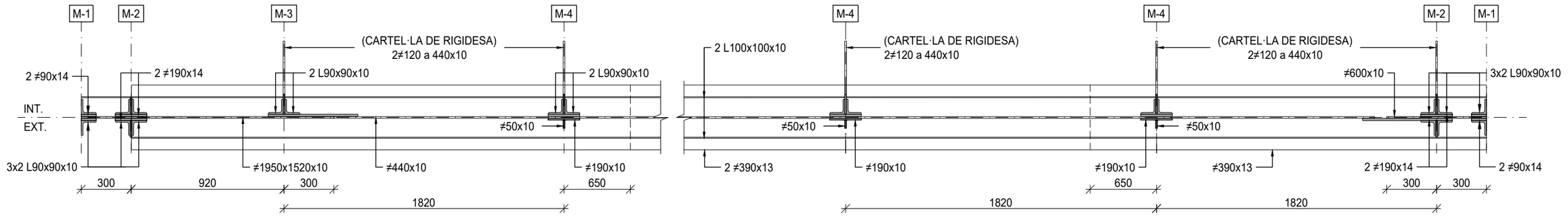
## DIAGONALS
ESCALA 1/25

| | CORDONS ( m m.) | MUNTANTS ( m m.) | DIAGONALS ( m m.) |
|---|---|---|---|
| ROBLONS | Ø 22 | Ø 22 | Ø 22 TR - 22 |
| CARTEL·LES | ≠10 | —— | ≠10 ≠12 ≠15 |




| | |
|---|---|
| D-1 | 2 L140x140x14 + + ≠280x10 |
| D-2 | 2 L120x120x15 + + ≠240x10 |
| D-3 | 2 L120x120x13 + + ≠240x10 |
| D-4 | 2 L120x120x12 + + ≠240x10 |

## PLANTA MUNTANTS
ESCALA 1/25




02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJA\ESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\03AF01-F04.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR
PEDELTA

AUTOR DEL PROJECTE
JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE
INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES
1/75
ORIGINALS
0 0.938 1.875
GRÀFIQUES

NOM DEL PLÀNOL
PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESTAT ACTUAL
BIGUES PRINCIPALS

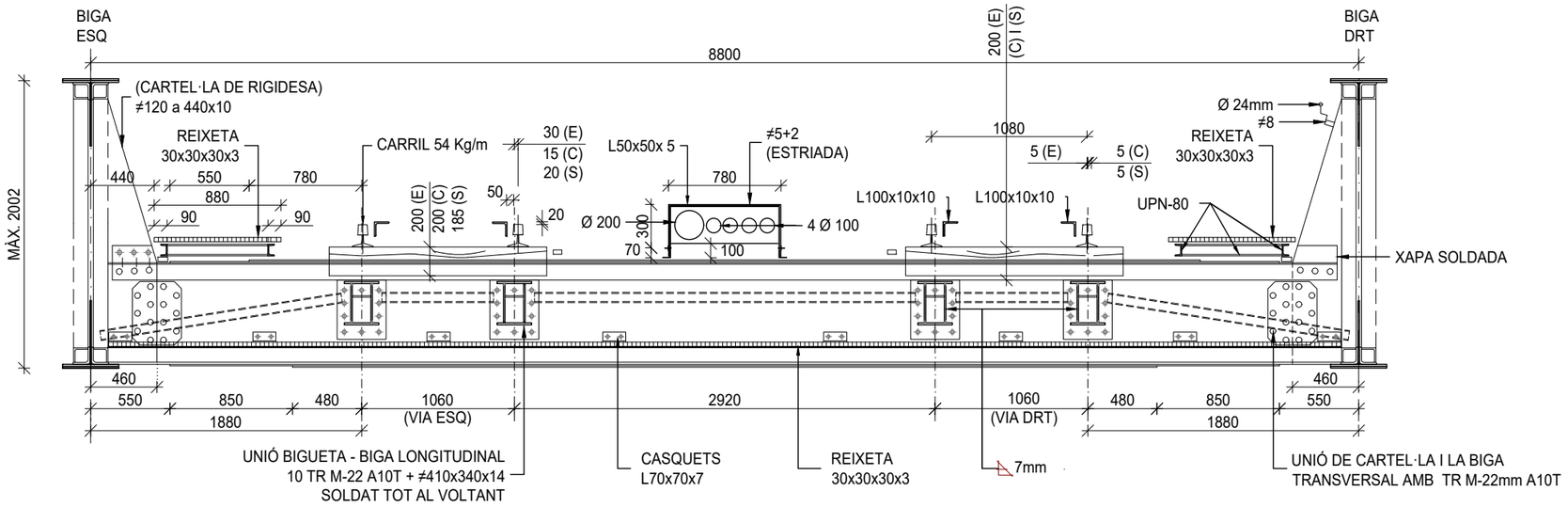
DATA
GENER 2024

PLÀNOL NÚM.
03A

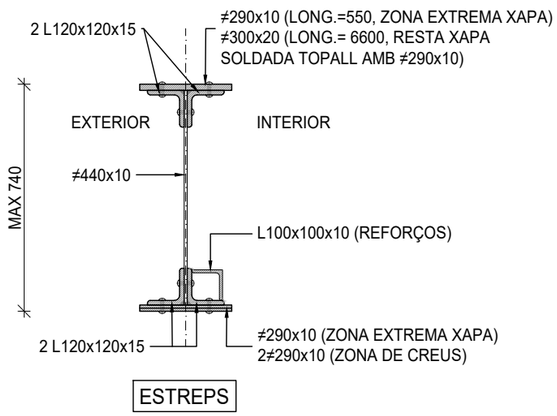
NOM FITXER
03AF01-F04.dwg

FULL 02 DE 04

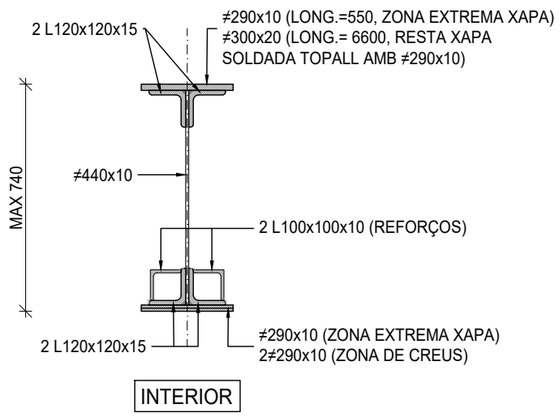
## SECCIÓ TRANSVERSAL
ESCALA 1/40




## BIGUETES
ESCALA 1/20




ESTREPS




INTERIOR

| | BIGUETES ( m m.) | BIGUES LONG. ( m m.) | ARRIOSTRA-MENTS ( m m.) |
|---|---|---|---|
| ROBLONS | TR - 22 | TR - 22 | Ø 24 |
| CARTEL·LES | —— | —— | ≠9 |

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\03AF01-F04.DWG

| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/40 ORIGINALS — 0 1.563 3.125 GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESTAT ACTUAL
BIGUES TRANSVERSALS

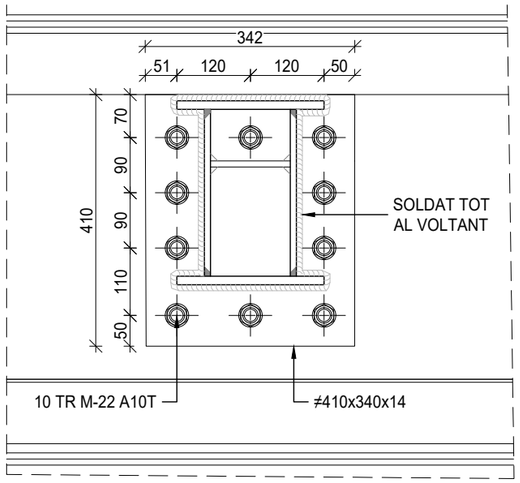
DATA: GENER 2024

PLÀNOL NÚM.: 03A

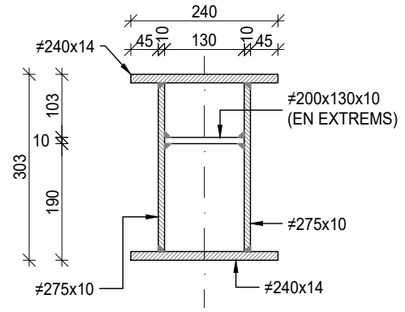
NOM FITXER: 03AF01-F04.dwg

FULL 03 DE 04

## UNIÓ BIGUETA - BIGA LONGITUDINAL
ESCALA 1/10

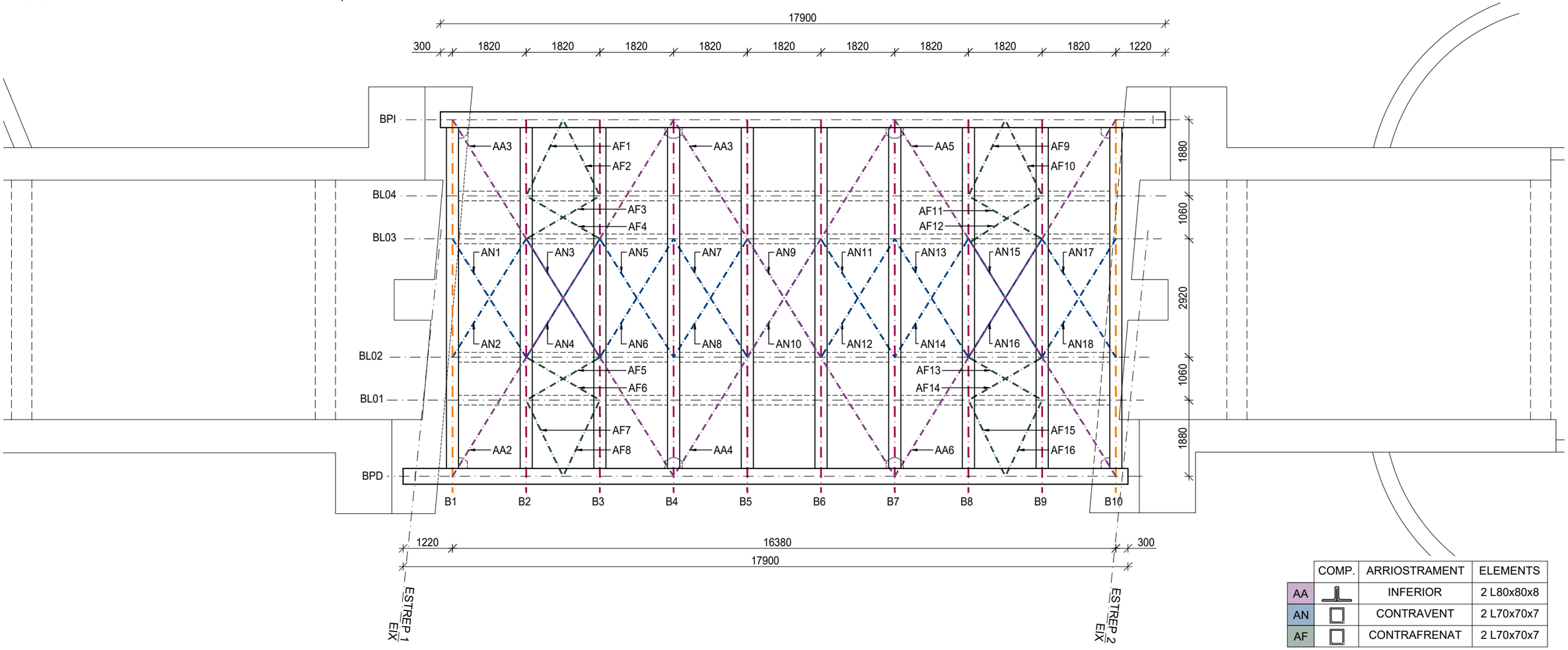



## BIGA LONGITUDINAL
ESCALA 1/10




| | BIGUETES ( m m.) | BIGUES LONG. ( m m.) | ARRIOSTRA-MENTS ( m m.) |
|---|---|---|---|
| ROBLONS | TR - 22 | TR - 22 | Ø 24 |
| CARTEL·LES | —— | —— | ≠9 |

## PLANTA. ESQUEMA D'ARRIOSTRAMENT
ESCALA 1/100




| | COMP. | ARRIOSTRAMENT | ELEMENTS |
|---|---|---|---|
| AA | | INFERIOR | 2 L80x80x8 |
| AN | | CONTRAVENT | 2 L70x70x7 |
| AF | | CONTRAFRENAT | 2 L70x70x7 |

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PM\AN-FGC\07BIM\01PH\104DRW\03AF01-F04.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR
PEDELTA

AUTOR DEL PROJECTE
JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE
INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES
1/100
0 1.25 2.5
ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL
PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESTAT ACTUAL
BIGA LONGITUDINAL I ARRIOSTRAMENT

DATA
GENER 2024

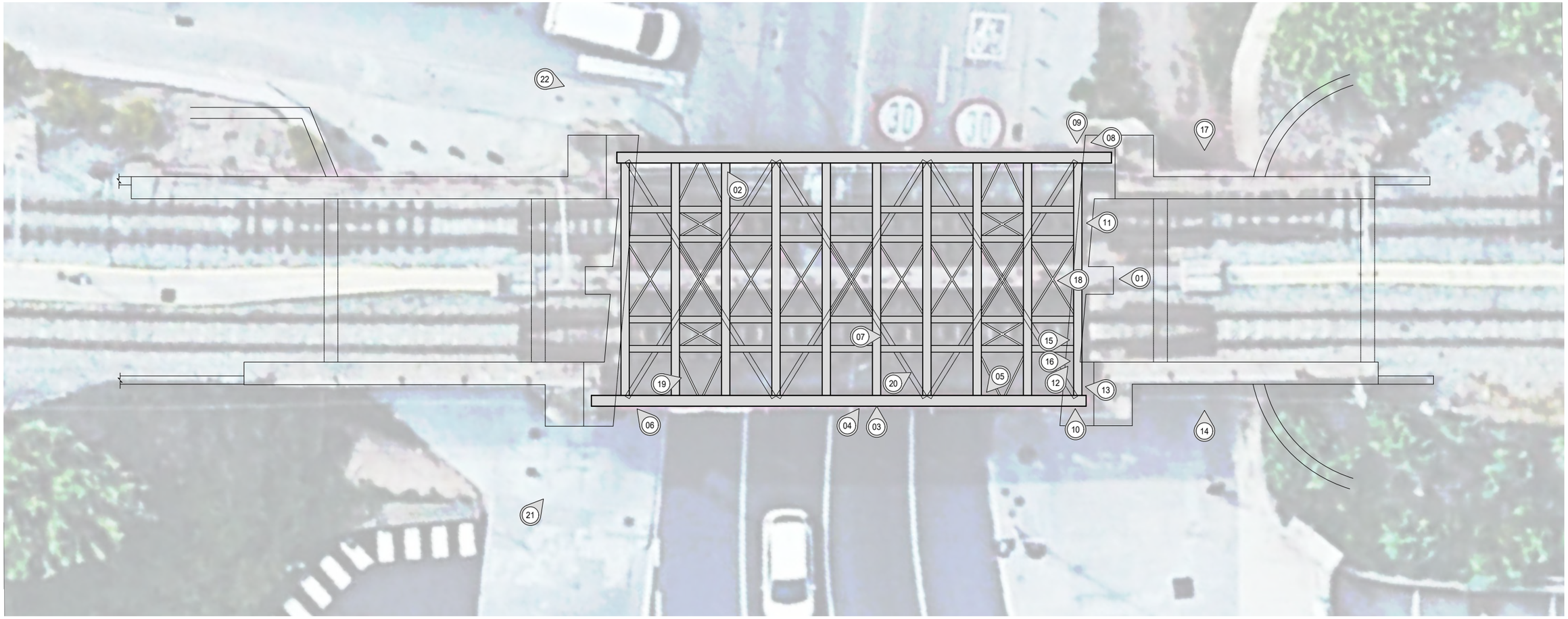
PLÀNOL NÚM.
03A

NOM FITXER
03AF01-F04.dwg

FULL 04 DE 04

## PONT SOBRE CARRETERA DE VIC

ESCALA 1:150



















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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS: GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
REPORTATGE FOTOGRÀFIC
REPORTATGE FOTOGRÀFIC (I)

DATA: GENER 2024

NOM FITXER: 04AF01-F02.dwg

PLÀNOL NÚM.: 04A

FULL 1 DE 2





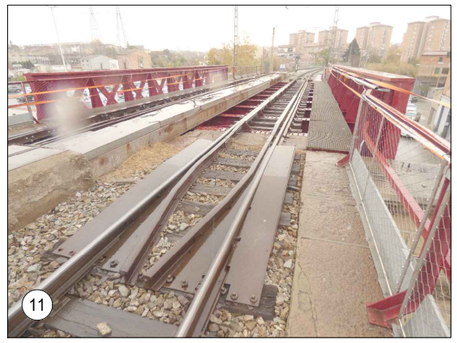


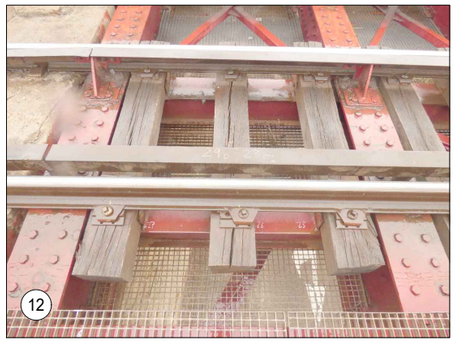


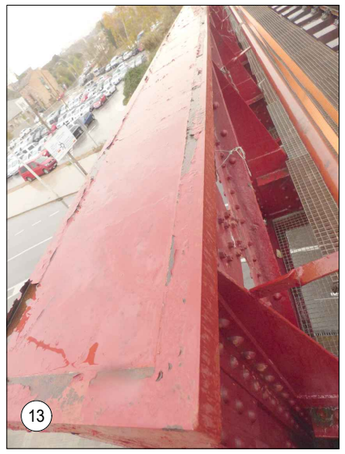






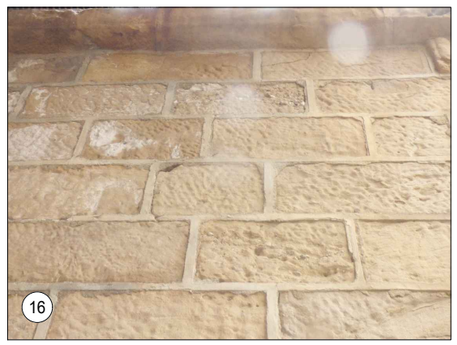



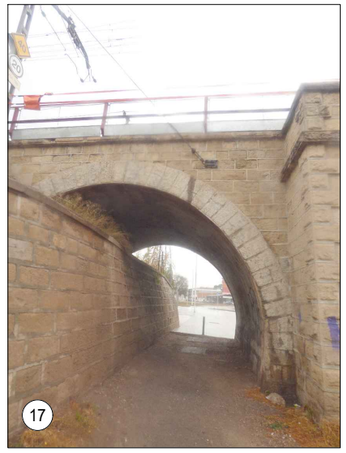

























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|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR
PEDELTA

AUTOR DEL PROJECTE
JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE
INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES
S/E
ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL
PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
REPORTATGE FOTOGRÀFIC
REPORTATGE FOTOGRÀFIC (II)

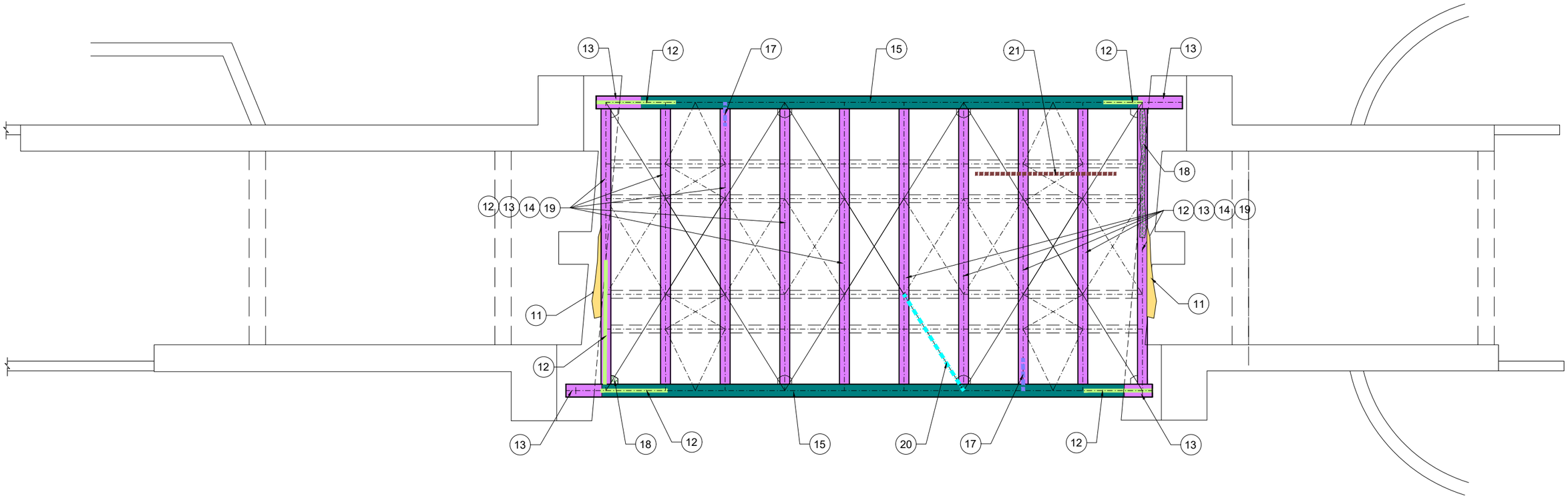
DATA
GENER 2024

PLÀNOL NÚM.
04A

NOM FITXER
04AF01-F02.dwg

FULL 2 DE 2

PLANTA DANYS
ESCALA 1/125




01 PINTADES
02 HUMITATS
03 EFLORESCÈNCIES
04 FISSURA EN CARREU
05 TRENCAMENT DE CARREU
06 METEORITZACIÓ EN CARREU
07 TRENCAMENT/SEPARACIÓ DE REJUNTAT
08 ENLAIRAMENT DE CARREU
09 FISSURES EN ARREBOSSAT
10 ENLAIRAMENTS EN ARREBOSSAT
11 PÈRDUA DE FORMIGÓ EN MUR GUARDABALAST
12 OXIDACIÓ
13 CORROSIÓ
14 PAQUETS D' HIDRÒXID
15 SALTATS DE PINTURA
16 FISSURA EN ELEMENT METÀL·LIC
17 FISSURES EN SOLDADURES
18 PICADES I PERFORACIONS EN XAPES METÀL·LIQUES
19 ROBLONS SALTATS
20 PERFILS DOBLATS
21 DEFORMACIÓ EN CONTRACARRIL
22 BRUTÍCIA I FALTA DE MANTENIMENT EN RECOLZAMENTS

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJA\ESP23B117PMAN-FGC\07BIM\01PH1\04DRW\04BF01-F03.DWG

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|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/125 (0 1 2 m) ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
DANYS IDENTIFICATS
ESQUEMA DE DANYS (I)

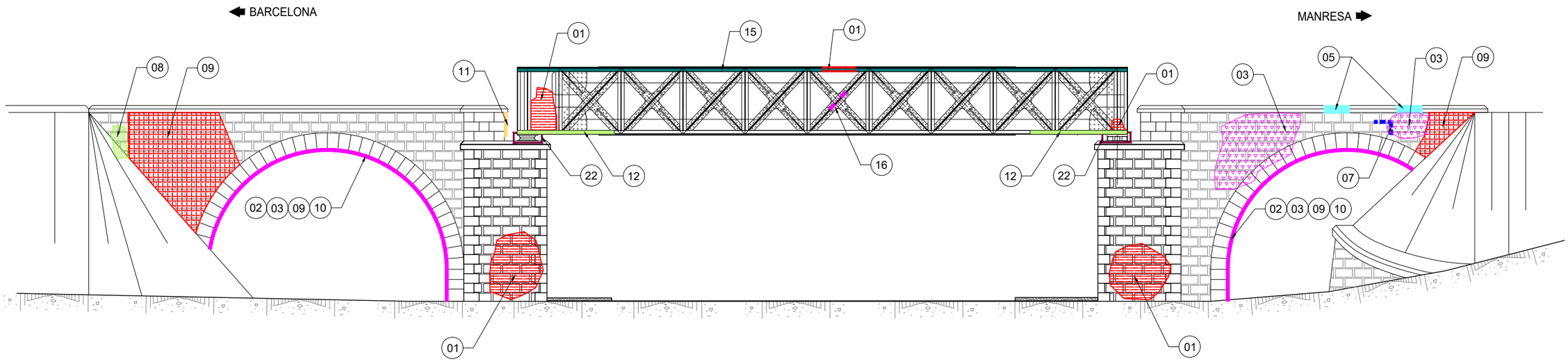
DATA: GENER 2024

PLÀNOL NÚM.: 04B

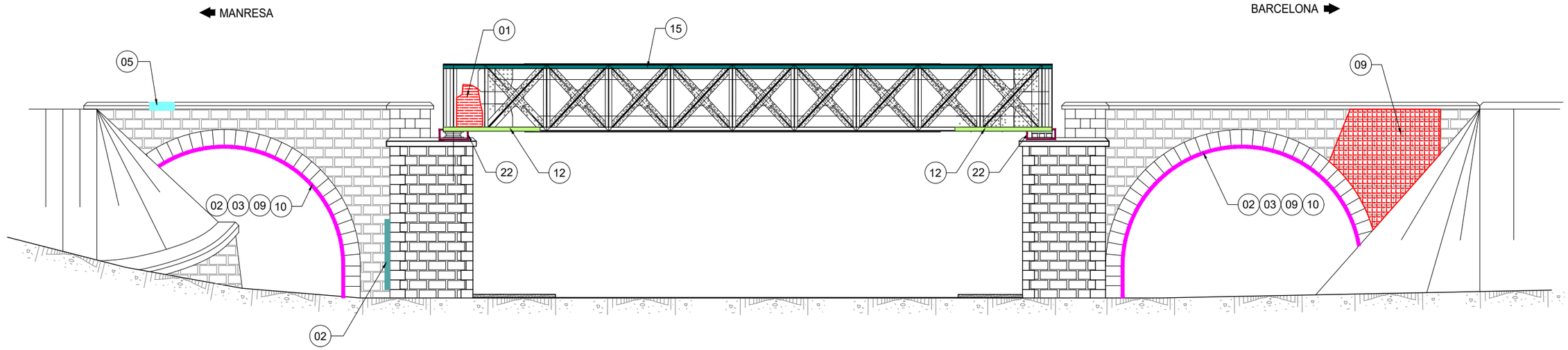
NOM FITXER: 04BF01-F03.dwg

FULL 01 DE 03

## ALÇAT COSTAT SANT FRUITÓS
ESCALA 1/125




## ALÇAT COSTAT MANRESA
ESCALA 1/125




01 PINTADES
02 HUMITATS
03 EFLORESCÈNCIES
04 FISSURA EN CARREU
05 TRENCAMENT DE CARREU
06 METEORITZACIÓ EN CARREU
07 TRENCAMENT/SEPARACIÓ DE REJUNTAT
08 ENLAIRAMENT DE CARREU
09 FISSURES EN ARREBOSSAT
10 ENLAIRAMENTS EN ARREBOSSAT
11 PÈRDUA DE FORMIGÓ EN MUR GUARDABALAST
12 OXIDACIÓ
13 CORROSIÓ
14 PAQUETS D' HIDRÒXID
15 SALTATS DE PINTURA
16 FISSURA EN ELEMENT METÀL·LIC
17 FISSURES EN SOLDADURES
18 PICADES I PERFORACIONS EN XAPES METÀL·LIQUES
19 ROBLONS SALTATS
20 PERFILS DOBLATS
21 DEFORMACIÓ EN CONTRACARRIL
22 BRUTÍCIA I FALTA DE MANTENIMENT EN RECOLZAMENTS

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\04BF01-F03.DWG

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|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/125 — 0 1 2 m — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
DANYS IDENTIFICATS
ESQUEMA DE DANYS (II)

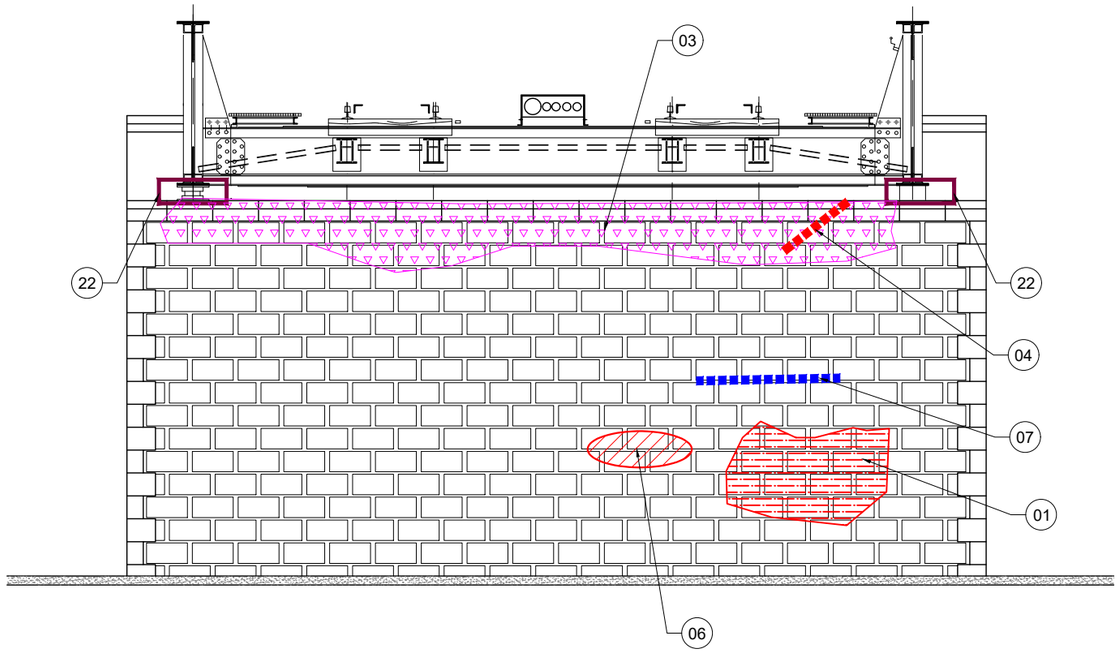
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PLÀNOL NÚM.: 04B

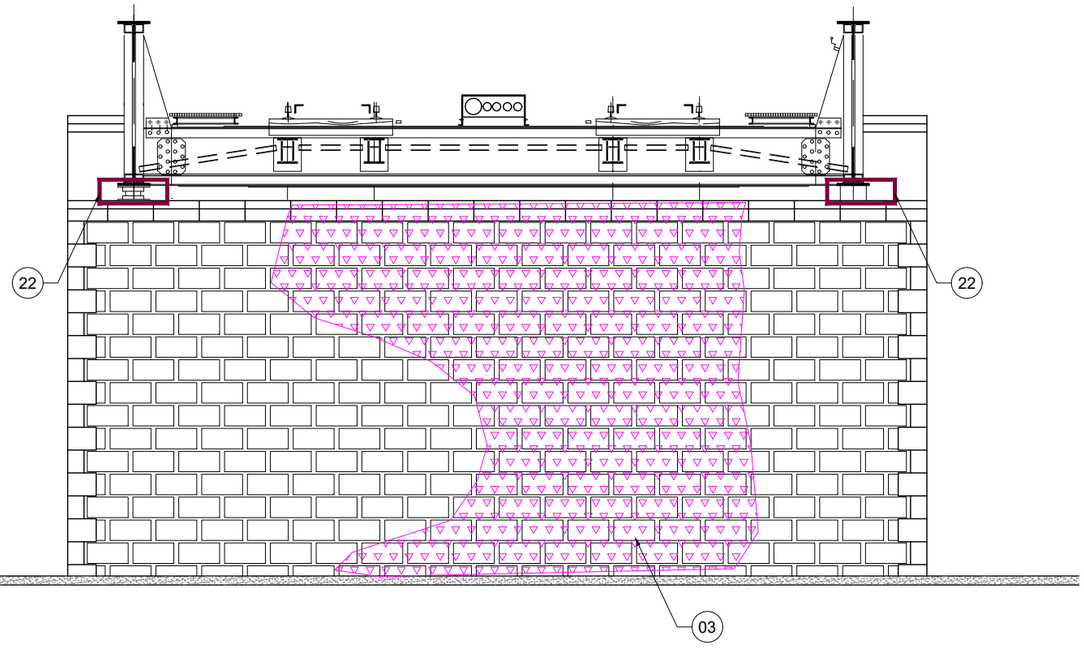
NOM FITXER: 04BF01-F03.dwg

FULL 02 DE 03

## ALÇAT D´ESTREP COSTAT MANRESA
ESCALA 1/125




## ALÇAT D´ESTREP COSTAT BARCELONA
ESCALA 1/125




01 PINTADES
02 HUMITATS
03 EFLORESCÈNCIES
04 FISSURA EN CARREU
05 TRENCAMENT DE CARREU
06 METEORITZACIÓ EN CARREU
07 TRENCAMENT/SEPARACIÓ DE REJUNTAT
08 ENLAIRAMENT DE CARREU
09 FISSURES EN ARREBOSSAT
10 ENLAIRAMENTS EN ARREBOSSAT
11 PÈRDUA DE FORMIGÓ EN MUR GUARDABALAST
12 OXIDACIÓ
13 CORROSIÓ
14 PAQUETS D' HIDRÒXID
15 SALTATS DE PINTURA
16 FISSURA EN ELEMENT METÀL·LIC
17 FISSURES EN SOLDADURES
18 PICADES I PERFORACIONS EN XAPES METÀL·LIQUES
19 ROBLONS SALTATS
20 PERFILS DOBLATS
21 DEFORMACIÓ EN CONTRACARRIL
22 BRUTÍCIA I FALTA DE MANTENIMENT EN RECOLZAMENTS

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\04BF01-F03.DWG

| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/125 (ORIGINALS) — 0 1 2 m (GRÀFIQUES)

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
DANYS IDENTIFICATS
ESQUEMA DE DANYS (II)

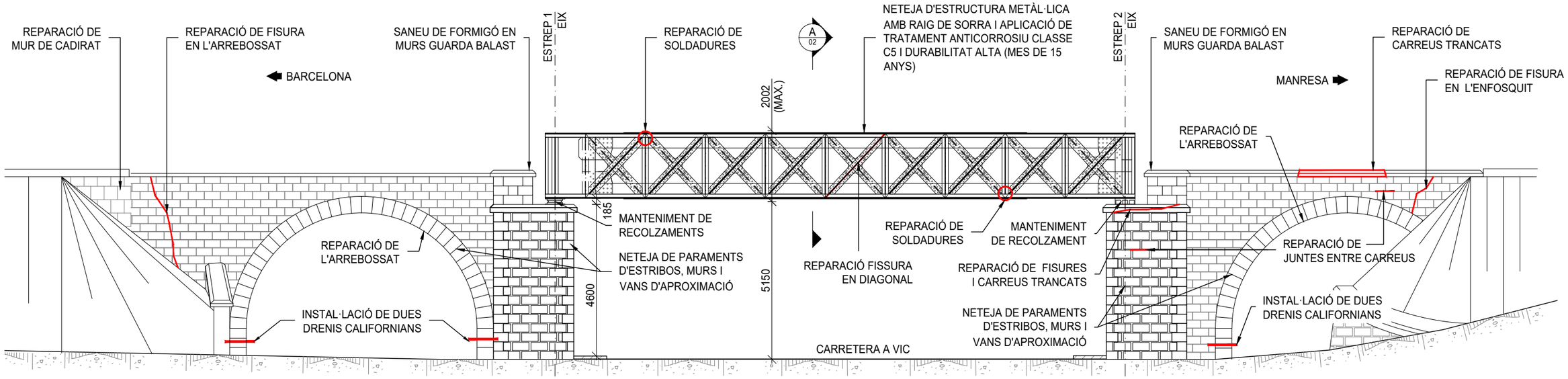
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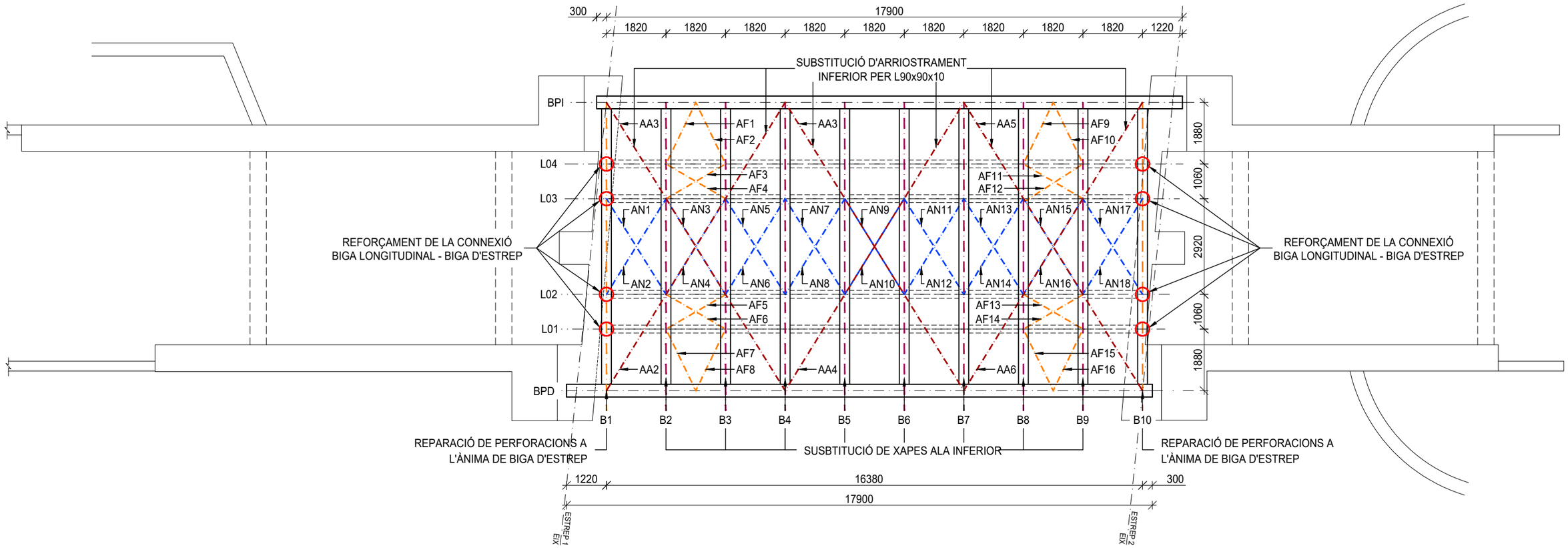
NOM FITXER: 04BF01-F03.dwg

FULL 03 DE 03

## ALÇAT ACTUAL
ESCALA 1/125




## PLANTA ACTUAL
ESCALA 1/125




02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AESP23B117PMAN-FGC\07BIM\01PH1\04DRW\05AF01-F02.DWG

| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

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CLAU PROJECTE:

ESCALES: 1/125 — 0 1.563 3.125 — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
PLANTA I ALÇAT

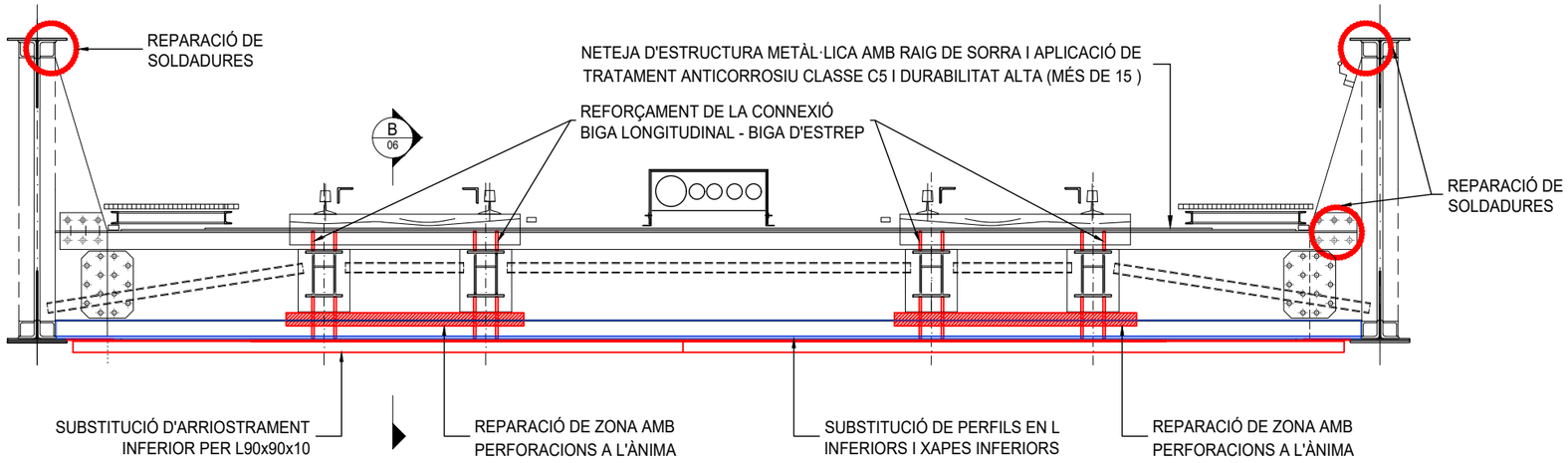
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PLÀNOL NÚM.: 05A

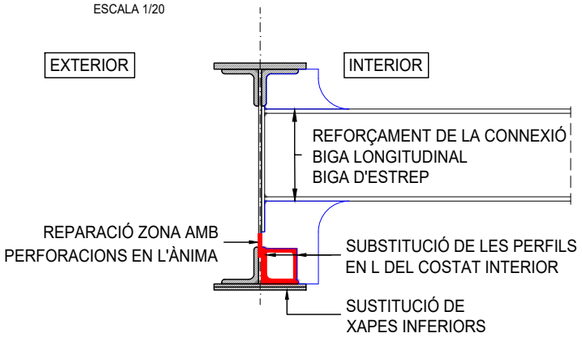
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FULL 01 DE 02

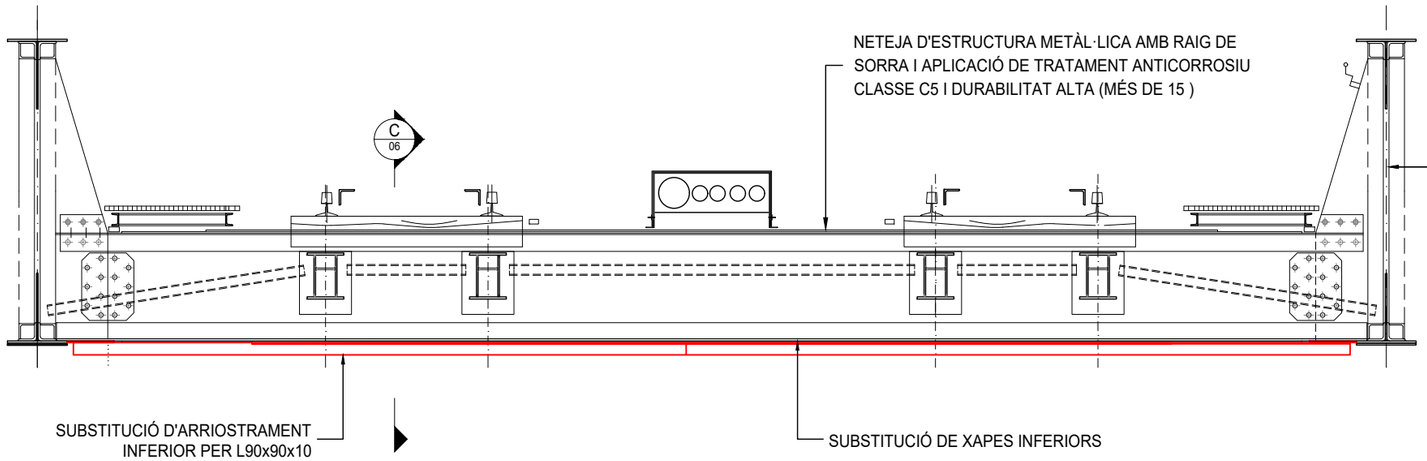
## ESQUEMA REPARACIÓ BIGA D'ESTREP
ESCALA 1/40



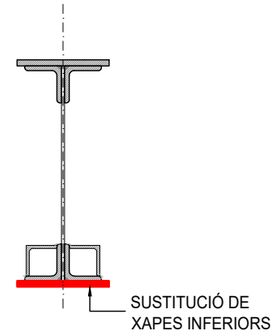

## SECCIÓ B
ESCALA 1/20




## ESQUEMA REPARACIÓ BIGUETES B1 A B9
ESCALA 1/40




## SECCIÓ C
ESCALA 1/20




C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\ESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\05AF01-F02.DWG
02/02/2024

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| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/40 — ORIGINALS — 0 1.563 3.125 — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
SECCIONS I DETAILL

DATA: GENER 2024

PLÀNOL NÚM.: 05A

NOM FITXER: 05AF01-F02.dwg

FULL 02 DE 02

# ESTRUCTURA METAL.LICA

1. ELS PERFILS ES REALITZARAN AMB LES MÍNIMES JUNTES TRANSVERSALS, QUE VINDRAN IMPOSADES PER CONDICIONANTS DE TRANSPORT A L'OBRA. LES JUNTES TINDRAN LA PREPARACIÓ DE VORES INDICADA.

2. DURANT L'EXECUCIÓ DE LES PECES S'HAURÀ DE CONTROLAR EXHAUSTIVAMENT L'ABSÈNCIA D'ENTALLES EN LES ZONES EXTREMES DELS TRAMS DISCONTINUS DE SOLDADURA.

3. LES SOLDADURES NO INDICADES ALS PLÀNOLS SERAN LES MÀXIMES PERMESES PEL CODI ESTRUCTURAL. TOTES LES SOLDADURES ES FARAN D'ACORD AMB L'ARTICLE 94 DEL CODI ESTRUCTURAL I AMB LES TOLERÀNCIES DE L'ANNEX 16 DEL CODI ESTRUCTURAL.

4. S'ESMERILARAN TOTES LES SOLDADURES TRANSVERSALS ENTRE PEFILS I XAPES EN LA DIRECCIÓ DEL FLUX DE TENSIONS.

5. S'ESMERILARAN TOTES LES SOLDADURES LONGITUDINALS DEL COSTATS SUPERIORS DELS PERFILS.

6. NO ES PERMET REALITZAR OPERACIONS DE SOLDADURA A TEMPERATURES INFERIORS A 0°.

7. EN GENERAL LES GROERES ES REALITZARAN AMB RADIS DE 15 mm, EXCEPTE LES INDICADES EN ELS PLÀNOLS AMB RADIS MENORS.

8. S'EXIGIRÁ UN CERTIFICAT DE CONTROL DE QUALITAT PER ULTRASONS DE LES PERFILS, PER GARANTIR L'ABSÈNCIA DE DEFECTES DURANT ELS PROCESSOS DE FABRICACIÓ.

9. ES CONTROLARAN PER ULTRASONS O RADIOGRAFIES LES SOLDADURES A POPALL D'ACORD AMB EL CODI ESTRUCTURAL ART. 103.2.2.6.

10. EL CONTROL DE QUALITAT ES FARÀ D'ACORD AMB L'ARTICLE 18 DEL CODI ESTRUCTURAL.

11. LES TOLERÀNCIES DE FABRICACIÓ I MUNTATGE SERAN ESTRICTES I ESTARAN D'ACORD AMB L'ANNEX 16 DEL CODI ESTRUCTURAL.

12. EL CONTROL D'EXECUCIÓ SERÀ INTENS SEGONS L'INDICAT EN EL CAPÍTOL 24 DEL CODI ESTRUCTURAL.

13. S'HAURÀ D'APORTAR GARANTIES ADDICIONALS PER A L'ACER SEGONS L'ARTICLE 18 DEL CODI ESTRUCTURAL. S'HAURÀ DE GARANTIR QUE EL LÍMIT ELÀSTIC DE L'ACER UTILITZAT EN OBRA PRESENTI UNA DISPERSIÓ D'ACORD AMB EL COEFICIENT PARCIAL REDUÏT SEGONS LA FIABILITAT ESTRUCTURAL.

14. ELS PERFILS SERAN CONFORMATS EN CALENT.

# TRACTAMENT ANTICORROSIU

1- S'APLICA A TOTS ELS ELEMENTS METÀL·LIQUES.

2- ESPECIFICACIÓ PER AL TRACTAMENT DE PROTECCIÓ ANTICORROSIVA.

a. TOTES LES PINTURES I PROCEDIMENTS HAURAN D'ESTAR HOMOLOGATS D'ACORD AMB LES NORMATIVES VIGENTS.
b. TOTES LES SUPERFICIES METÀL·LIQUES DEL TAULER DEL PONT ES TRACTARAN AMB PROTECCIÓ ANTICORROSIVA
c. ES REALITZARÀ UNA PROTECCIÓ ADIENT PER UN AMBIENT D'EXPOSICIÓ C-5 SEGONS LA NORMA ISO 12944-2 I PER UNA DURABILITAT MOLT ALTA (MÉS DE 25 ANYS) SEGONS LES ESPECIFICACIONS DE PINTAT QUE ES DETALLEN MÉS ENDAVANT
d. PRÈVIAMENT A L'APLICACIÓ DEL TRACTAMENT ANTICORROSIU ES REALITZARÀ UNA PREPARACIÓ DE LES SUPERFICIES D'HACER AL CARBONI SEGONS S'INDICA A CONTINUACIÓ:

3- PREPARACIÓ DE SUPERFICIES D'ACER AL CARBONI

a. LES SUPERFICIES METÀL·LIQUES A PINTAR ES REGALIMARAN AL GRAU ST3 (ISO-8501), DEIXANT UN PERFIL DE RUGOSITAT D'UNES 25-50 MICRES, I ELIMINACIÓ DE POLS I RESIDUS MITJANÇANT PROJECCIÓ D'AIRE COMPRIMIT.
b. L'AIRE DEL COMPRESSOR HA D'ESTAR SEC, LLURE D'AIGUA, OLI I CONTAMINACIÓ I AMB LA PRESSIÓ SUFICIENT PER ACONSEGUIR EL GRAU DE NETEJA QUE S'ESPEFICIFICA.
c. DESPRÉS DEL REGLIMAT, LA SUPERFICIE TÉ QUE QUEDAR SENSE DESCAMACIÓ, NETAD'OXID, GREIX, MARQUES DE PINTURA I SALS SOLUBLES.
d. S'HA D'ELIMINAR LA GRANALLA, BRUTICIA I POLS DE LA ZONA QUE VAGI A REVESTIR-SE MITJAÇANT UNA MOTENT ASPIRACIÓ, FENT ESPECIAL ATENCIÓ EN ZONES DE DIFICIL ACCÉS, COM ZONES AMB PICADURES, SOLDADURES, ETC. EL REGALIMAT QUEDARÀ FINALITZAT QUAN A L'APLICAR UNA CINTA ADHESIVA, AL DESENGANXAR-LA QUEDI NETA, SENSE POLS ADHERIDA.

4- PROTECCIÓ AMB PINTURA PER A SUPERFICIES EXTERIORS

a. LA PROTECCIÓ INDICADA EN AQUEST PUNT ÉS INDICATIVA. ES PODRÀ SUBSTITUIR AMB UNA ALTRA QUE COMPLEIXI AMB ELS MATEIXOS REQUERIMENTS DE DURABILITAT I CLASSE D'EXPOSICIÓ. AQUESTA DECISIÓ ESTARÀ SOTMESA A L'APROBACIÓ DE LA DIRECCIO FACULTATIVA.
b. ES PROPONE UNA PROTECCIÓ AMB UN ESPESSOR TOTAL DE 250 MICRES, PER A UNA DURABILITAT ALTA (MES DE 15 ANYS) FORMADA PER:
   -APLICACIÓ DE REVESTIMENT EPOXI DE DOS COMPONENTS TIPUS AMERLOCK2 O EQUIVALENT EN UN GRUIX MÍNIM DE 125MM DE PELÍCULA SECA.
   - ACABAT AMB PINTURA DE POLIURETÀ ALIFÀTIC DE DOS COMPONENTS EN UN GRUIX MINIM DE 125MM DE PELÍCULA SECA.
   - EL COLOR A UTILITZAR SERÀ DETERMINAT PER LA D.O.
c. LA PROTECCIÓ HAURÀ DE TENIR UNA GARANTIA DE 15 ANYS SEGONS LA ISO-4628.

| QUADRE D'ESPECIFICACIONS TÈCNIQUES DELS ACERS ESTRUCTURALS SEGONS UNE-EN 1993, UNE-EN 1994 I NORMES ASSOCIADES | | | | | |
|---|---|---|---|---|---|
| ELEMENT | TIPUS | NORMATIVA D'APLICACIÓ | LÍMIT ELÀSTIC | COEFICIENT PARCIAL EN ESTAT LÍMIT ÚLTIM | EQUIVALÈNCIA AMB CODI ESTRUCTURAL |
| XAPES DE REFORÇAMENT DE CONNEXIÓ | S355 J0 | UNE-EN 10025-2 | 355 (e ≤ 40 mm)<br>335 (40 mm < e ≤ 80 mm) | $\gamma_{M0}$=1.00<br>$\gamma_{M1}$=1.10<br>$\gamma_{M2}$=1.25 | S355 J0 |
| ALTRES ELEMENTS | S275 J0 | UNE-EN 10025-2 | 275 (e ≤ 40 mm)<br>255 (40 mm < e ≤ 80 mm) | | S275 J0 |
| NORMATIVA DE PROJECTE | UNE-EN 1990, UNE-EN 1991, UNE-EN 1993, UNE-EN 1994 I UNE-EN 1997 | | | | |
| CATEGORIA DE CORROSIVITAT | C5 SEGONS EN-ISO 1944-2:2018 I PPTP | | | | |
| DURABILITAT DEL SISTEMA DE PROTECCIÓ | MOLT ALTA (>25 ANYS) SEGONS EN-ISO 1944-1:2018 I PPTP | | | | |
| VIDA ÚTIL | 100 ANYS | | | | |
| CLASSE D'EXECUCIÓ | CLASSE D'EXECUCIÓ 4 SEGONS CODI ESTRUCTURAL - CLASSE D'EXECUCIÓ EXC4 SEGONS EN 1993-1-1:2005/A1:2014 ANNEX C I UNE-EN 1090-2:2011 | | | | |
| CONTROL D'EXECUCIÓ | INTENS, SEGONS CODI ESTRUCTURAL | | | | |

| CARGOLS | | |
|---|---|---|
| GRAU DEL CARGOLS | LÍMIT ELÀSTIC MÍNIM $f_{yb}$ | RESISTÈNCIA A TRACCIÓ $f_{ub}$ |
| 10.9 | 900 N/mm2 | 100 N/mm2 |

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ACTUACIÓ DE CONSOLIDACIÓ DE ESTRUCTURAL
ACTUACIONS EN L'ESTRUCTURA METÀL·LICA
NOTES GENERALS

DATA: GENER 2024

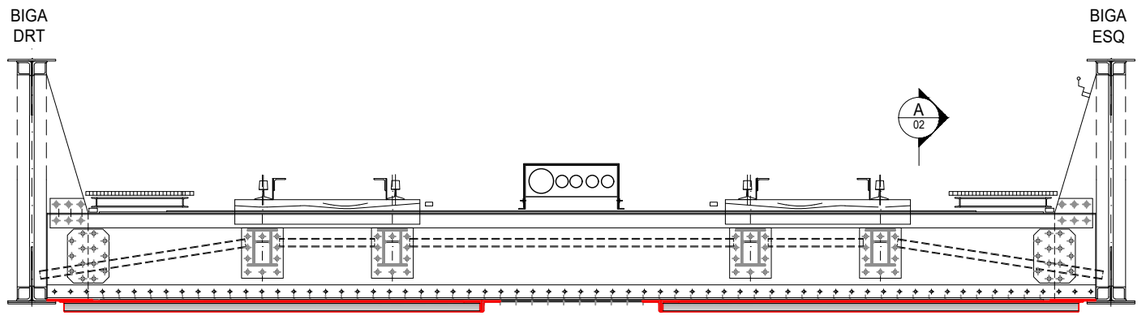
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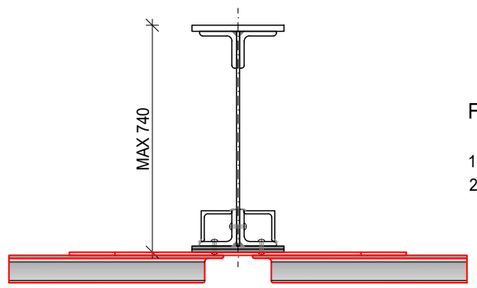
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FULL 01 DE 07

# REPARACIÓ DE BIGUES TRANSVERSALS

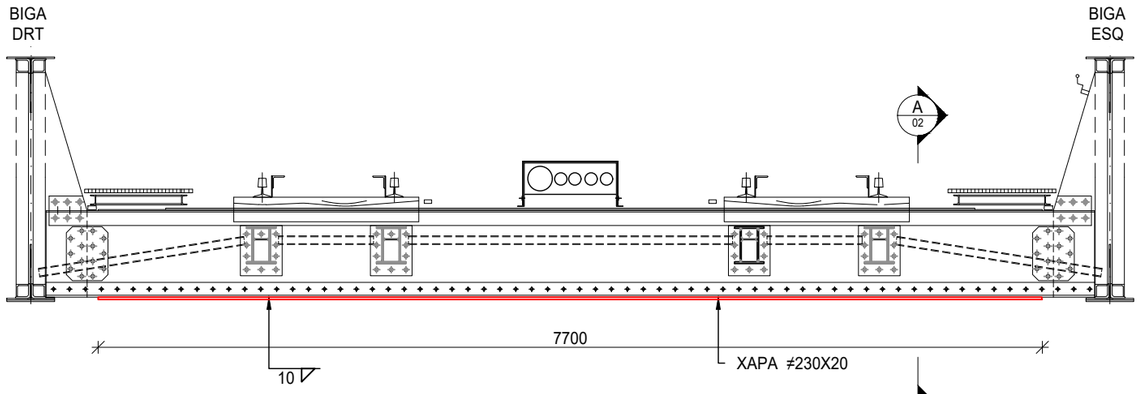
ESCALA 1/50; 1/20

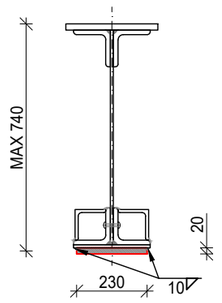



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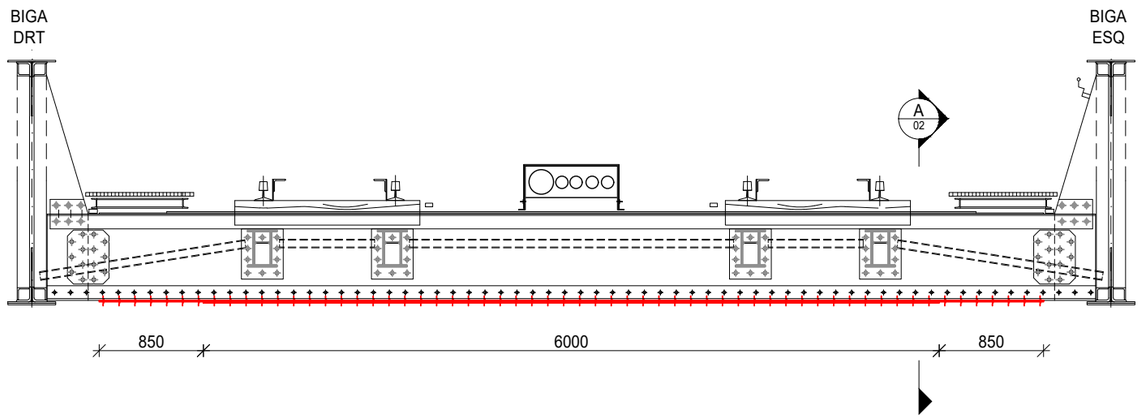
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2. ELIMINACIÓ DE L'ARRIOSTRAMENT INFERIOR.

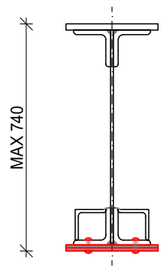



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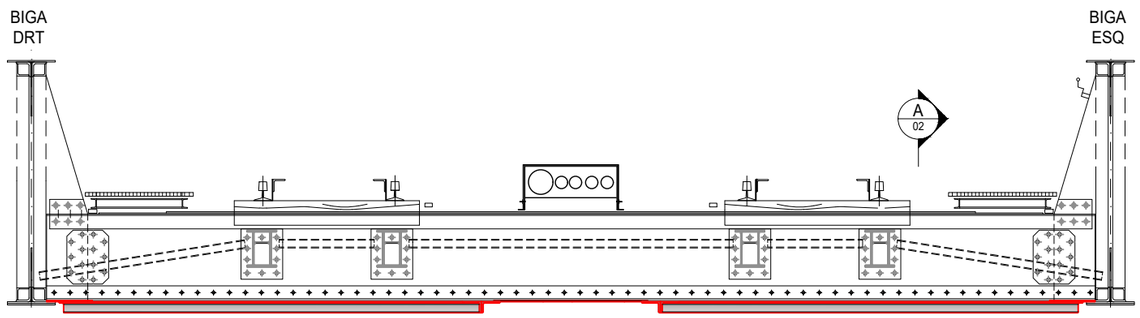
1. INSTAL·LACIÓ DE XAPA ≠230X20 AMB SOLDADURA DE SOLAPAMENT

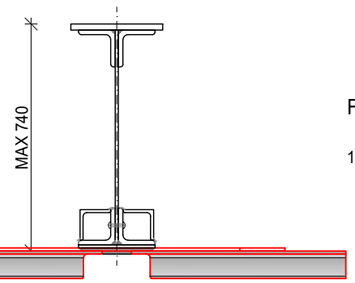



FASE: 2

1. SUPORT TEMPORAL DE XAPES TRANSVERSALS
2. RETIRADA DE XAPES INFERIORS TALLANT ELS ROBLONS.




FASE: 4

1. INSTAL·LACIÓ DE L'ARRIOSTRAMENT INFERIOR.

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/50 · 1/20 — ORIGINALS — 0 0.625 1.25 — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARETERA DE VIC P.K. 060/720
ACTUACIÓ DE CONSOLIDACIÓ DE ESTRUCTURAL
ACTUACIONS EN L'ESTRUCTURA METÀL·LICA
REPARACIÓ DE BIGUES TRANSVERSALS

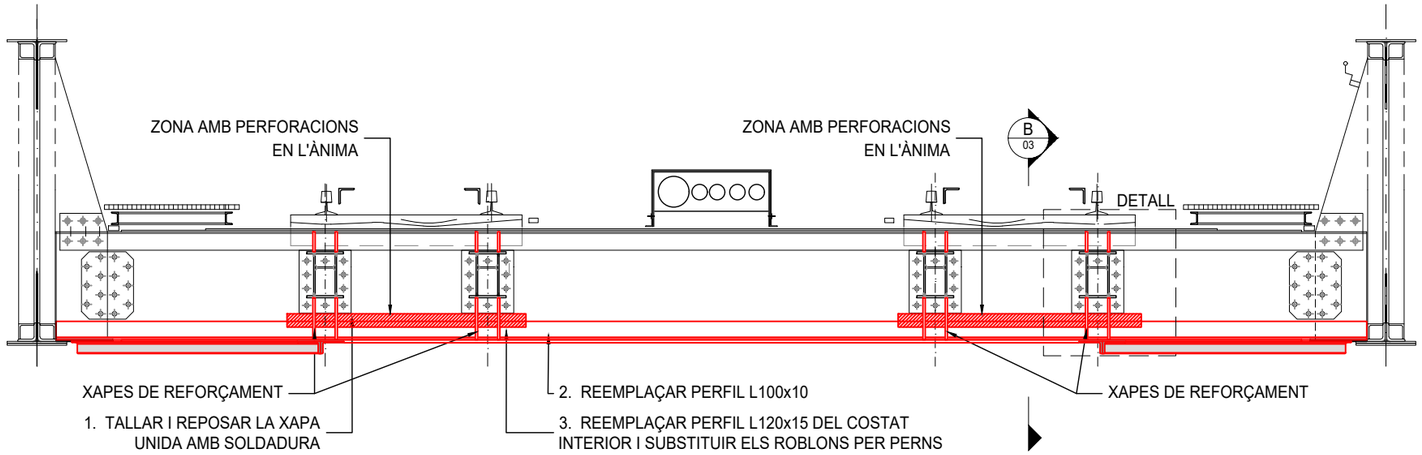
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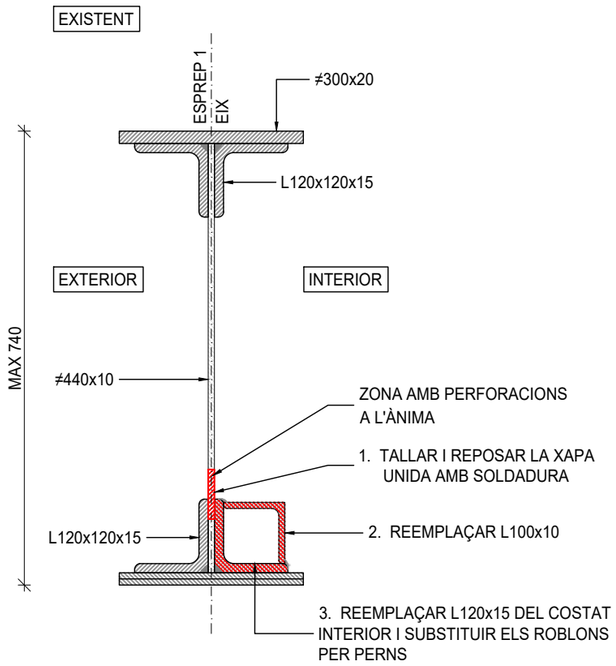
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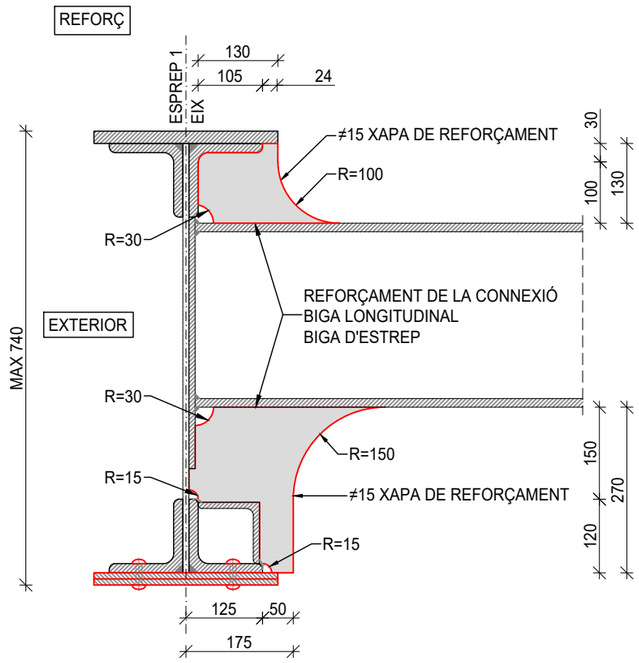
FULL 02 DE 07

## ESQUEMA REPARACIÓ BIGA D'ESTREP
ESCALA 1/40

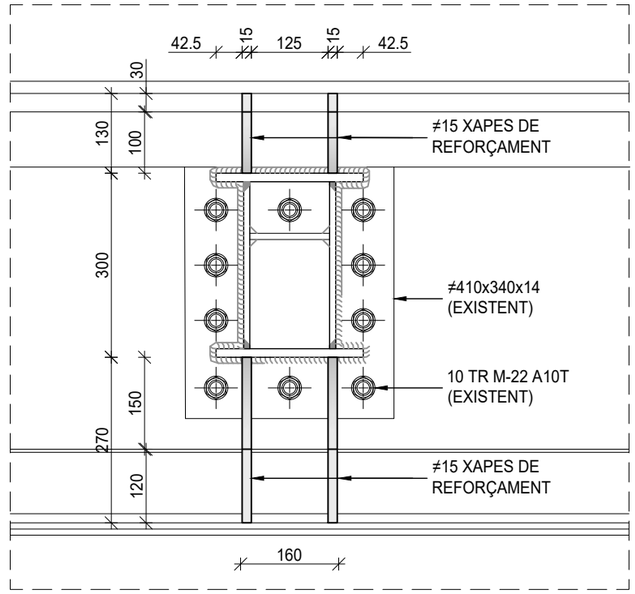



## SECCIO B
ESCALA 1/20




## DETALL
ESCALA 1/10




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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/50 (ORIGINALS) · 1/20 (GRÀFIQUES) · 0 0.625 1.25

NOM DEL PLÀNOL: PONT SOBRE LA CARETERA DE VIC P.K. 060/720
ACTUACIÓ DE CONSOLIDACIÓ DE ESTRUCTURAL
ACTUACIONS EN L'ESTRUCTURA METÀL·LICA
REPARACIÓ DE BIGUES D'ESTRP (I)

DATA: GENER 2024

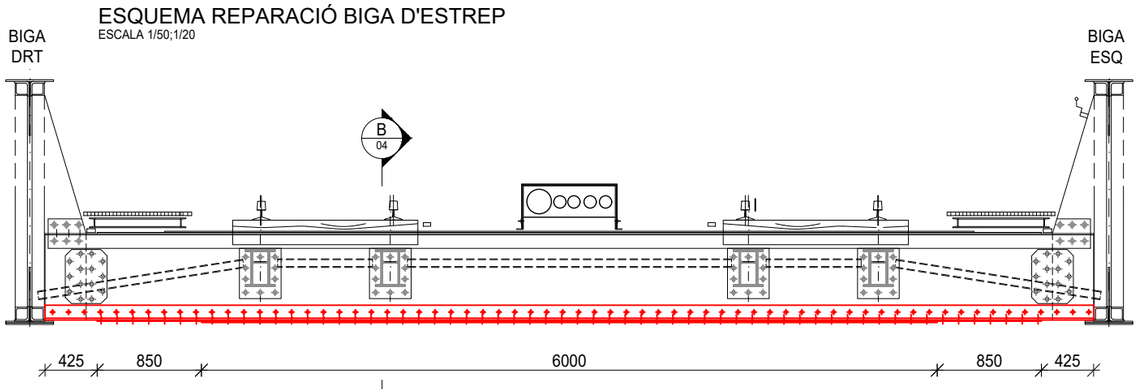
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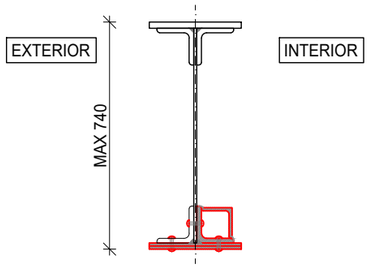
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FULL 03 DE 07

# ESQUEMA REPARACIÓ BIGA D'ESTREP

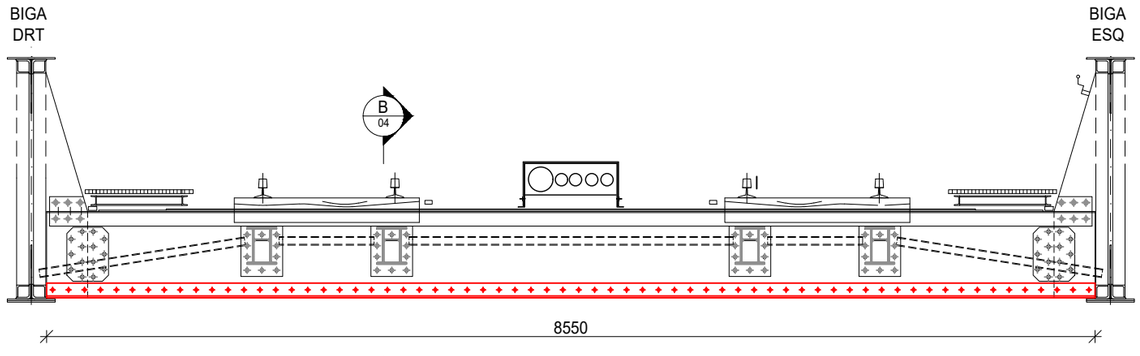
ESCALA 1/50;1/20

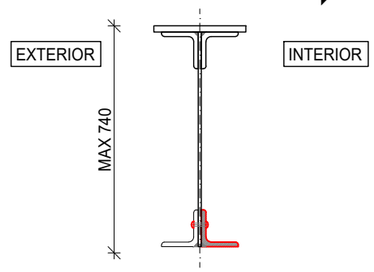



## FASE: 1

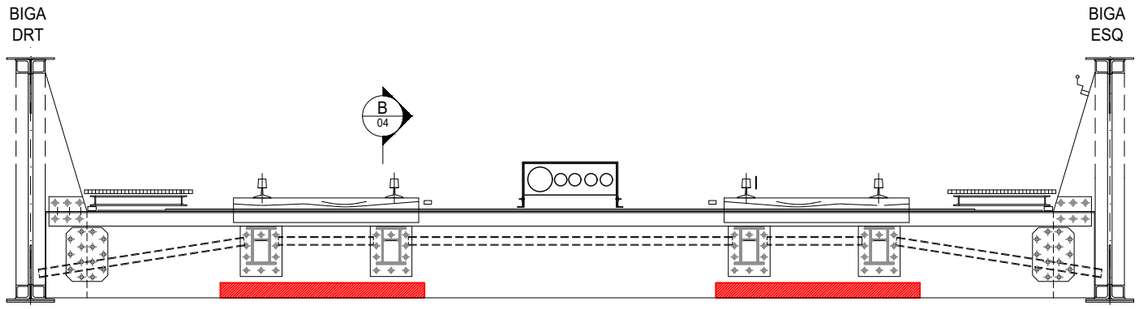
1. REALITZACIÓ D'ASSAJOS DE SOLDABILITAT EN L'ANIMA
2. RETIRADA DE ARIOSTRAMENTS
3. ELIMINACIÓ DEL PERFIL EN ANGLE L 100X100X10
4. RETIRADA DE XAPES INFERIORS TALLANT ELS ROBLONS.
5. ELIMINACIÓ DEL PERFIL EN ANGLE L 120X120X15 INTERIOR.

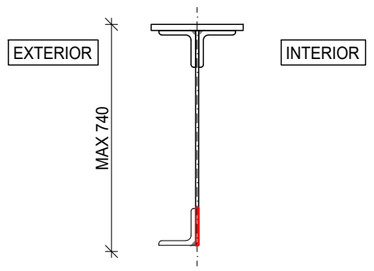



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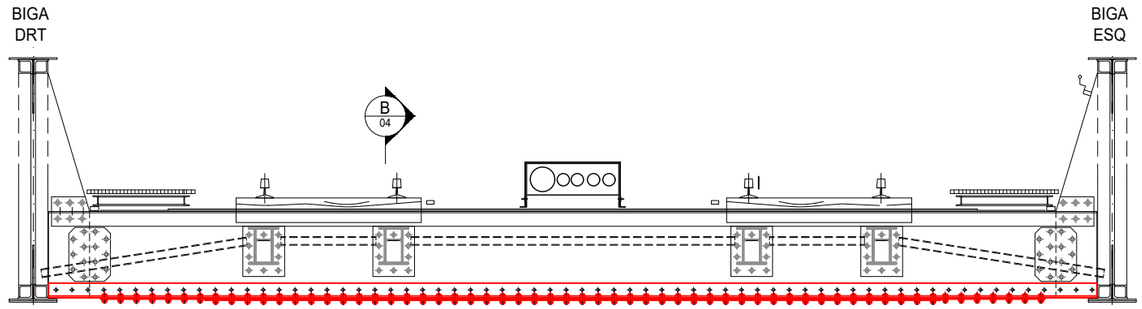
1. INSTAL·LACIÓ DEL NOU PERFIL EN ANGLE L 120X120X15 INTERIOR.
2. REPOSICIÓ DE ROBLONS AMB PERNS Ø 22 GRAU 10.9.

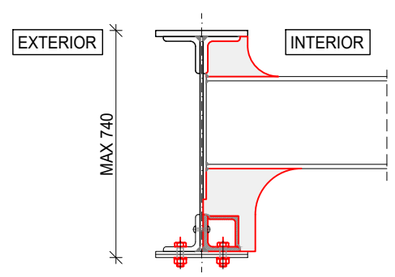



## FASE: 2

1. SANEIG DE LA ZONA AFECTADA PER LES PERFORACIONS MITJANÇANT CORT DE LA ZONA DANYADA I REPOSICIÓ MITJANÇANT SOLDADURA D'UNA XAPA DE GRUIX EQUIVALENT (≠10).




## FASE: 4

1. INSTAL·LACIÓ DE NOVES XAPES INFERIORS AMB PERNS Φ22.
2. INSTAL·LACIÓ DEL PERFIL EN ANGLE L 100X100X10.
3. INSTAL·LACIÓ DE REFORÇAMENT DE LA CONNEXIÓ BIGA LONGITUDINAL - BIGA D'ESTREP.
4. INSTAL·LACIÓ D'ARRIOSTRAMENTS.

NOTES

ES TALLARÀ AL TRÀNSIT LA VIA SOTA LA QUE S'ESTAN EXECUTANT LES FEINES DE REPARACIÓ, COL·LOCANT UNS ELEMENTS QUE PODEN SER UNES FUSTES O ALTRES RECOLZAMENTS PROVISIONALS, A SOTA DE LA BIGA TRANSVERSAL DE MANERA QUE QUEDI RECOLZADA A L'ESTREP A AQUETS ZONA. A LA ZONA DE L'ALTRA BIGA NO CAL COL·LOCAR CAP ELEMENT DE RECOLZAMENT PROVISIONAL. ES REPARARÀ PER FASES, ACTUANT A CADA FASE A SOTA DE CADASCUNA DE LES VIES I AMB ELS TRENS CICUL·LANT ÚNICAMENT PER L'ALTRA. LA LONGITUD DE LA ZONA A RECOLZAR SERÀ D'UNS 2 M CENTRADA AMB EIX DE VIA I ES REVISARÀ I VALIDARÀ AQUEST RECOLZAMENT AMB LA DIRECCIÓ FACULTATIVA ABANS D'INICIAR-SE LES OPERACIONS.

A LA RESTA DE REPARACIONS NO CAL FER TALLS O LIMITACIONS AL TRÀNSIT DE TRENS A CAP DE LES FASES DE REPARACIÓ.

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: EPEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/50 1/20 ORIGINALS; 0 0.625 1.25 GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARETERA DE VIC P.K. 060/720
ACTUACIÓ DE CONSOLIDACIÓ DE ESTRUCTURAL
ACTUACIONS EN L'ESTRUCTURA METÀL·LICA
REPARACIÓ DE BIGUES D'ESTREPS (II)

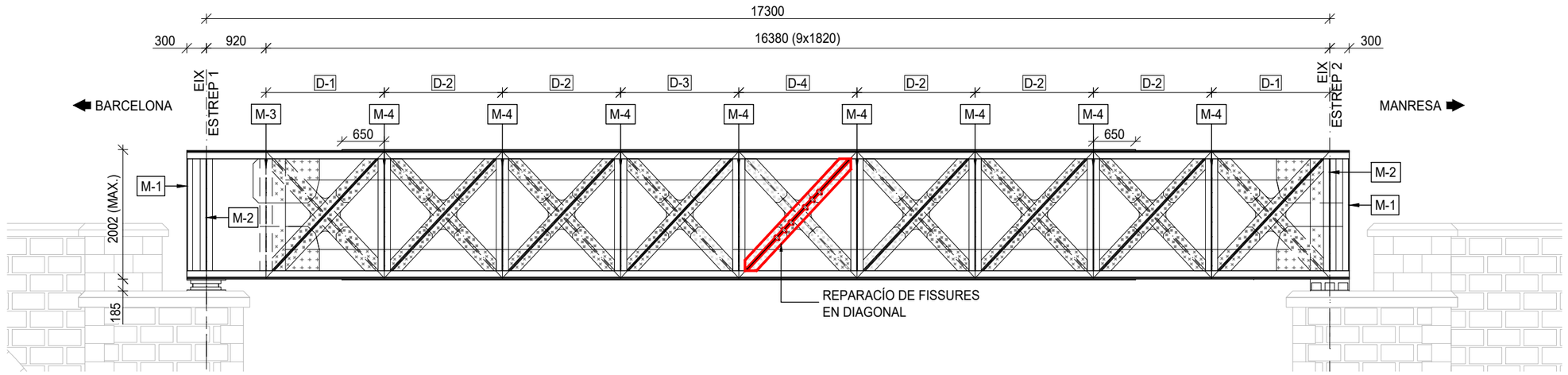
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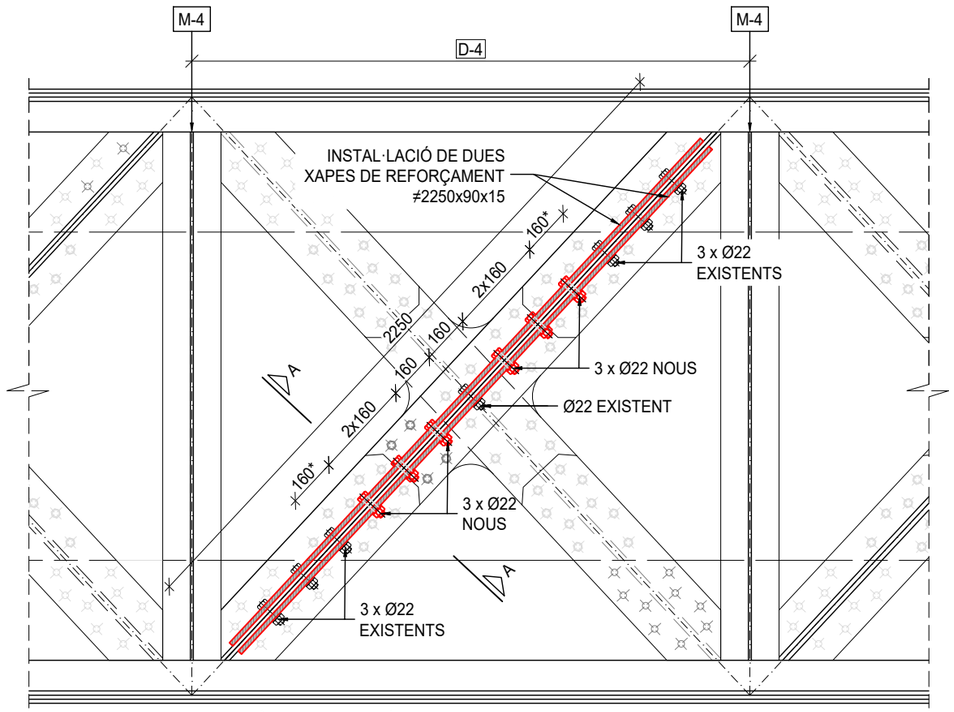
PLÀNOL NÚM.: 05B

FULL 04 DE 07

## ALÇAT. BIGA PRINCIPAL DRETA
ESCALA 1/75

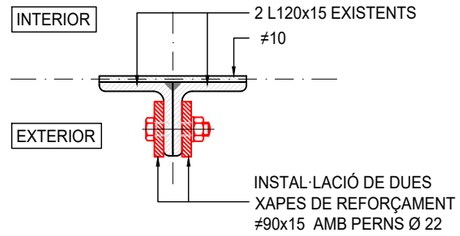



## ESQUEMA REPARACIÓ DIAGONAL TIPUS D-4
ESCALA 1/20




* SI AQUESTA DIMENSIÓ DIFEREIX EN MÉS DE 20mm S'HA DE REVISAR EL ESPAIAT DELS NOUS PERNS.

## SECCIÓ A
ESCALA 1/10




NOTES

1. EL CONTROL DE QUALITAT ES FARÀ D'ACORD AMB L'ARTICLE 18 DEL CODI ESTRUCTURAL.
2. LES TOLERÀNCIES DE FABRICACIÓ I MUNTAGE SERAN ESTRICTES I ESTARAN D'ACORD AMB L'ANNEX 16 DEL CODI ESTRUCTURAL.
3. ELS CARGOLS SERAN DE GRAU 10.9.
4. LES XAPES SERAN D'ACER S355 J0.
5. LES ROSQUES NO TRAVESSARAN ELS PLANS DE TALL.
6. LA UNIÓ CARGOLADA SERÀ CATEGORIA C CONFORME A L' INDICAT A L'APARTAT 3.4.1 DE L'ANNEX 26 DEL CODI ESTRUCTURAL.
7. L' ORIFICI HAURÀ DE SER DE DIÀMETRE ESTÀNDARD. NO ES PERMETRAN FORATS ESQUINÇATS NI FORATS A SOBREMESURA.
8. LA CLASSE DE SUPERFÍCIE DE FREGAMENT SERÀ A (μ=0.5) SEGONS CAPÍTOL 21 DEL CODI ESTRUCTURAL.
9. EL CONTROL D'EXECUCIÓ SERÁ INTENS SEGONS L'INDICAT EN EL CAPITOL 24 DEL CODI ESTRUCTURAL

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/75 (ORIGINALS) 1/20 (GRÀFIQUES) — 0 0.938 1.875

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ACTUACIÓ DE CONSOLIDACIÓ DE ESTRUCTURAL
ACTUACIONS EN L'ESTRUCTURA METÀL·LICA
REPARACIÓ DE FISSURA

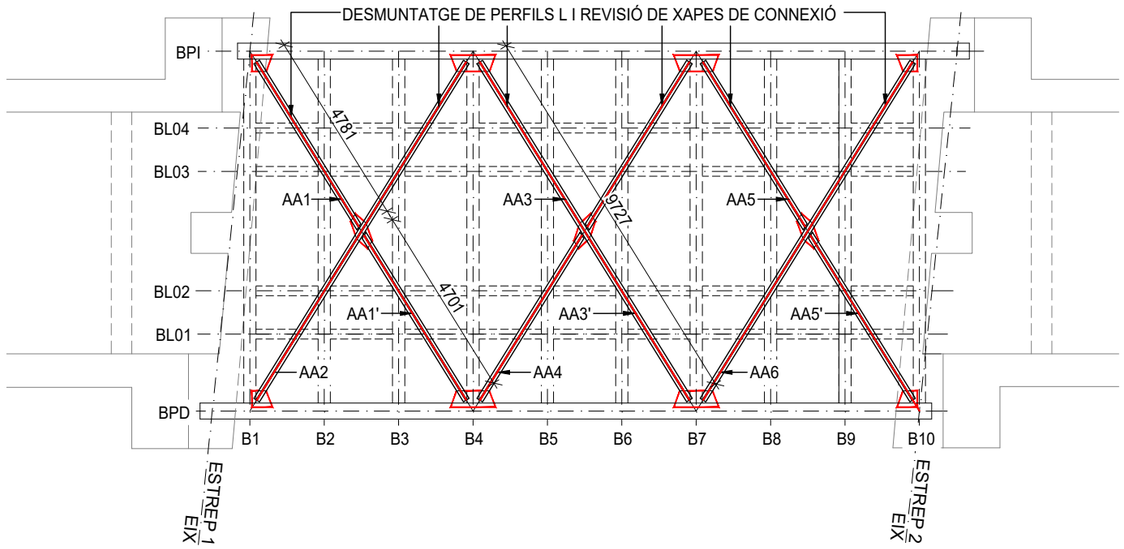
DATA: GENER 2024

PLÀNOL NÚM.: 05B

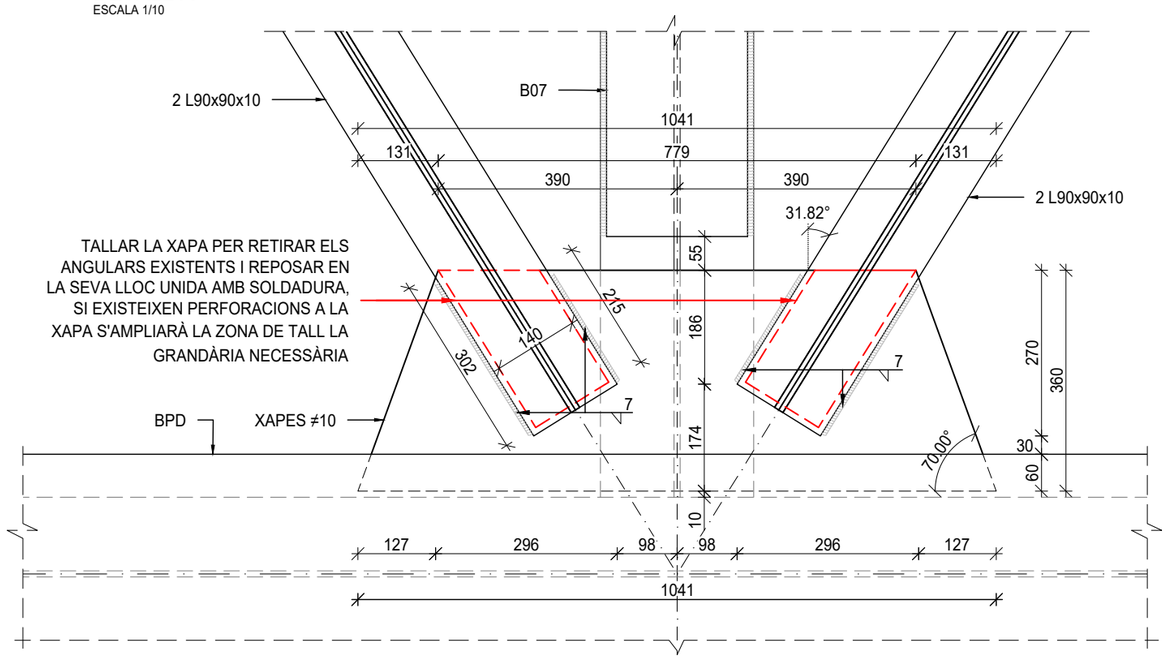
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FULL 05 DE 07

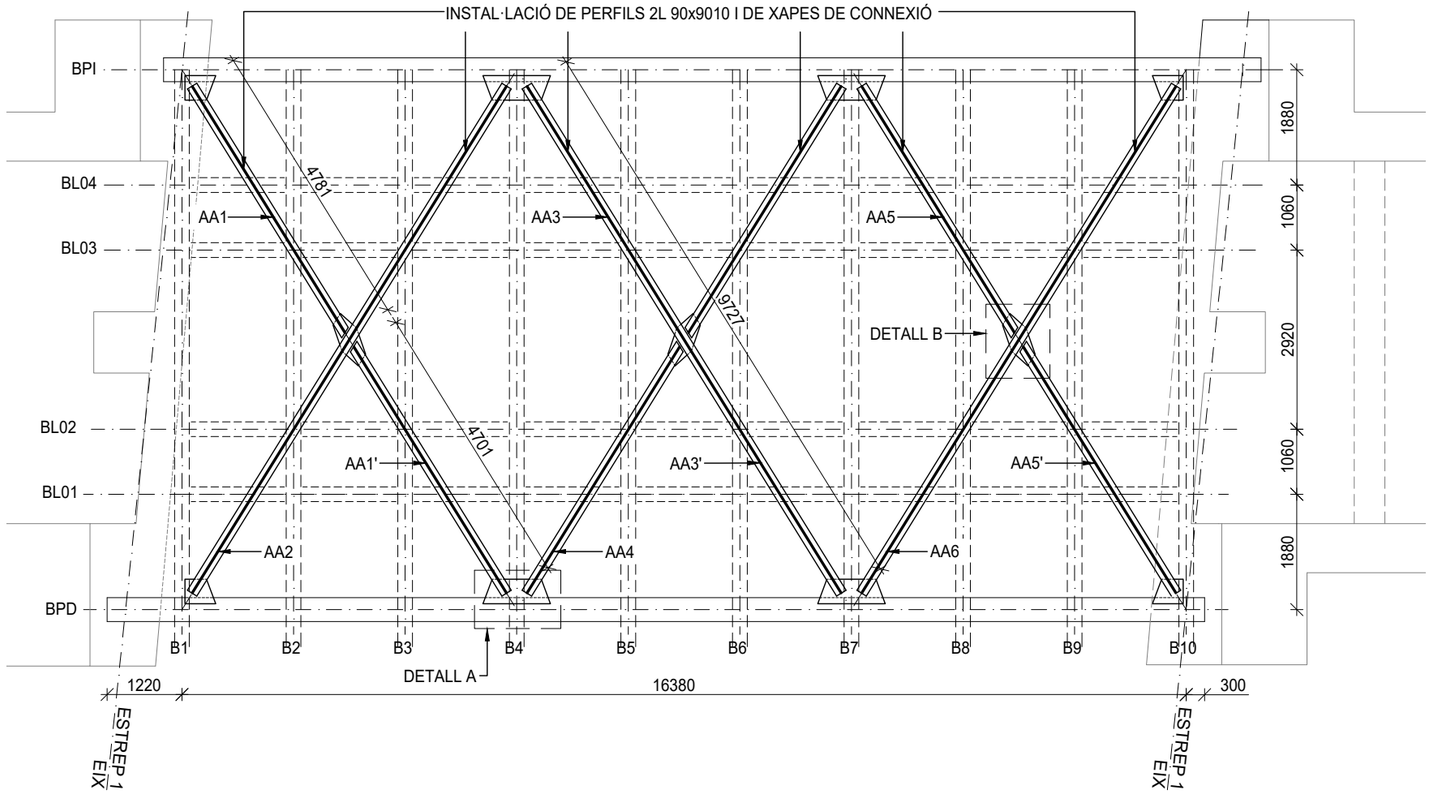
## REPARACIÓ DE D'ARRIOSTRAMENT INFERIOR
ESCALA 1/150



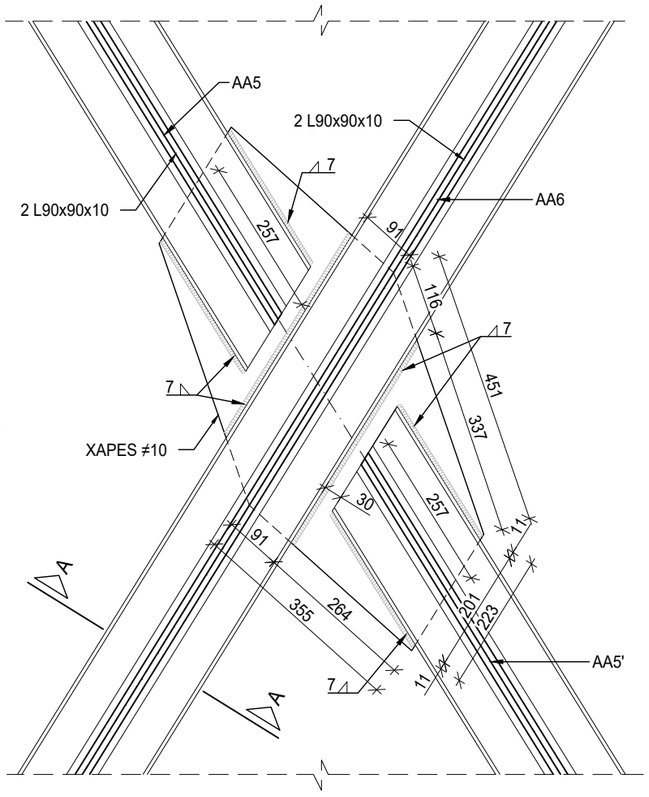

## DETALL A
ESCALA 1/10



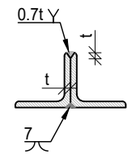

## ESQUEMA DE SUBSTITUCIÓ D'ARRIOSTRAMENT INFERIOR
ESCALA 1/100




## DETALL B
ESCALA 1/10




## SECCIÓ A




| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

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FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/100 (1/20) ORIGINALS — 0 1.25 2.5 GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ACTUACIÓ DE CONSOLIDACIÓ DE ESTRUCTURAL
ACTUACIONS EN L'ESTRUCTURA METÀL·LICA
SUBSTITUCIÓ DE ARRIOSTRAMIENT INFERIOR

DATA: GENER 2024

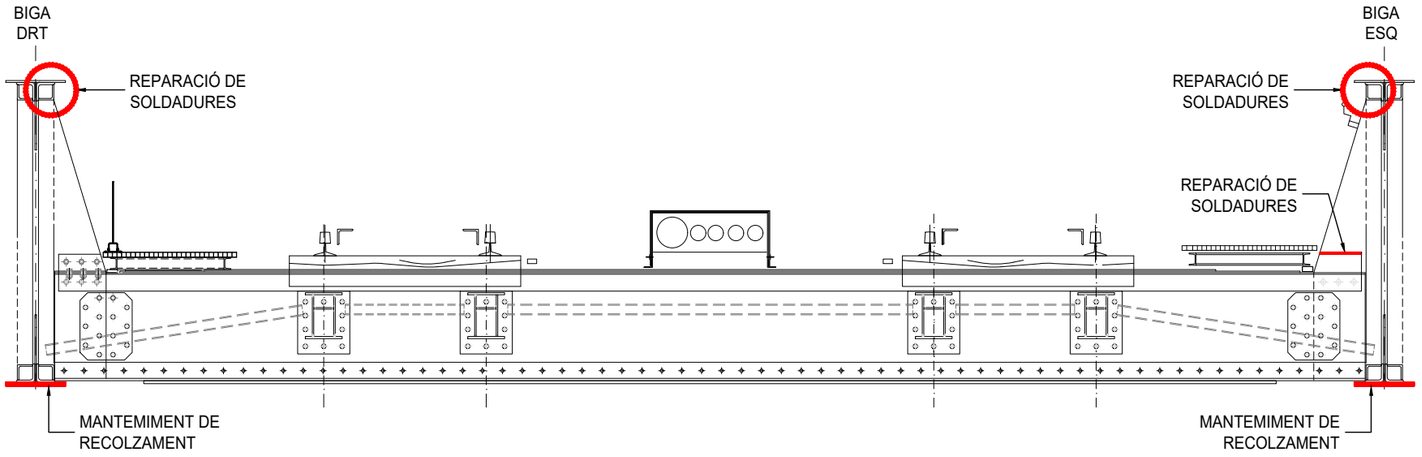
PLÀNOL NÚM.: 05B

NOM FITXER: 05BF05-F07.dwg

FULL 06 DE 07

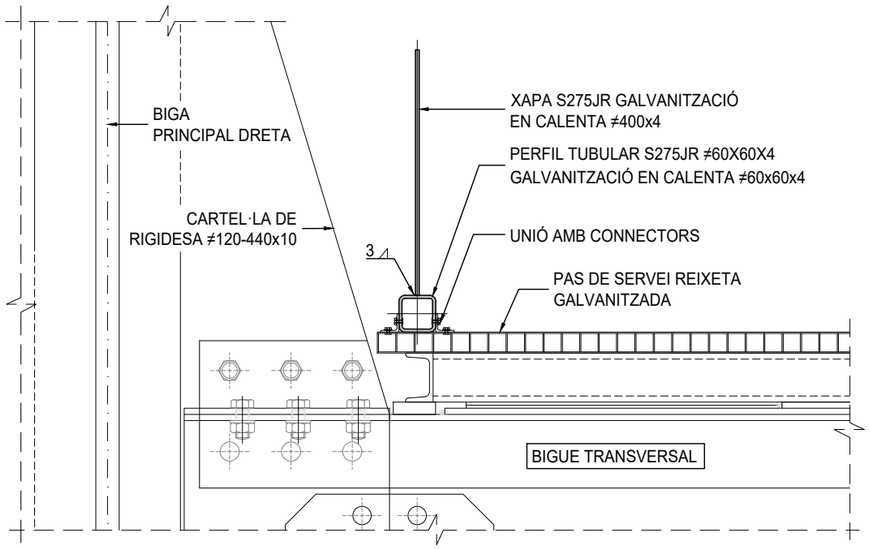
## ESQUEMA REPARACIÓ BIGUETES B1 A B9

ESCALA 1/40



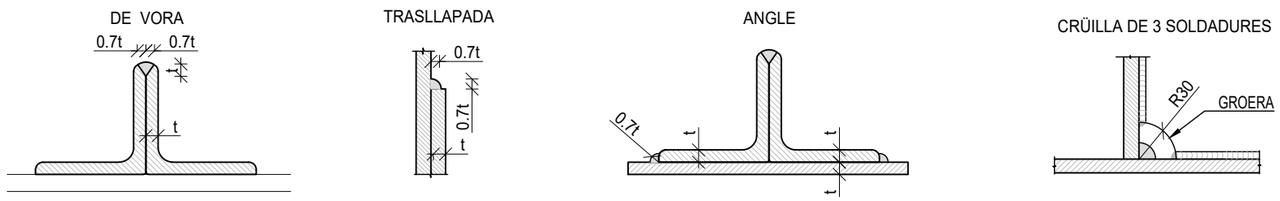

## INSTAL·LACIÓ DE RODAPEU

ESCALA 1/10




## DETALL DE SOLDADURES

ESCALA 1/5




NOTES

DESPRÉS DEL DECAPATGE I NETEJA DE TOTES LES SUPERFÍCIES METÀL·LIQUES, ES REALITZARÀ INSPECCIÓ DETALLADA A L'OBJECTE DE MAPEJAR TOTES LES SOLDADURES SUBJECTES A REPARACIÓ, SEGONS DETERMINI DIRECCIÓ D'OBRA.

PROCEDIMENT DE REPARACIÓ DE SOLDADURES

1. SEGONS CLASSE D' EXECUCIÓ EXC3 DE NORMA EN-1090: 2-2011
2. RETIRADA DE CORDÓ DE SOLDADURA EXISTENT FINS A DEIXAR EXPOSAT METALL BASE
3. PREPARACIÓ DE VORES D' ACORD AMB EL MÈTODE I PROCÉS DE SOLDADURA
4. NETEJA I RETIRADA DE POLS, MATÈRIA ORGÀNICA I ALTRES
5. ASSECAT DE SUPERFÍCIES
6. PER A CLASSE EXC3 NO S'APLICARÀ IMPRIMACIÓ EN CARES DE FUSIÓ, TRET QUE ELS TESTS DE PROCEDIMENT DE SOLDADURA SEGONS EN-ISO-15614-10 O EN ISO-15613 S' HAGUESSIN REALITZAT AMB L' ESMENTADA IMPRIMACIÓ
7. ES PROTEGIRÀ EL SOLDADOR I L'ÀREA DE TREBALL ENFRONT DELS EFECTES DE VENT, PLUJA I NEU. SI LA TEMPERATURA AMBIENT ÉS INFERIOR A 5ºC NO ES REALITZARÀ LA SOLDADURA O BÉ ES PROPORCIONARÀ CALEFACCIÓ PER TENIR UNA TEMPERATURA AMBIENT IGUAL O SUPERIOR A 5ºC.
8. S'ALINEARÀ I MANTINDRÀ FIXES LES XAPES A SOLDAR
9. EL PREESCALFAMENT DE LA XAPES ES REALITZARÀ SEGONS EN-ISO-13916 I 1011-2
10. LES SOLDADURES S'EXECUTARAN SEGONS L'ESPECIFICACIÓ ESTABLERTA DE WELDING PROCEDURE SPECIFICATION, O WPS
11. EL GRUIX DE LA SOLDADURA EN FILET NO SERÀ INFERIOR AL VALOR MÍNIM DE GOLA PER A CADA UNIÓ SOLDADA
12. EL CONTROL DE QUALITAT DE LES SOLDADURES (VISUAL, LIQUIDS PENETRANTS, PARTÍCULES MAGNÈTIQUES, ETC.) ES DEFINIRÀ EN EL PPI.
13. DESPRÉS DEL VIST-I-PLAU A LA UNIÓ SOLDADA, ES REALITZARÀ EN TRACTAMENT PROTECTOR SEGONS NORMA EN-UNE 12944 PER A UN AMBIENT TIPUS "C5" I UNA DURABILITAT "ALTA" MES DE 15 ANYS.

PROCEDIMENT DE MANTENIMENT DE RECOLZAMENTS

1. ES RETIRARAN LES FUNDES DE PROTECCIÓ EN ELS RECOLZAMENT MÒBILS.
2. ES NETEJARAN ELS APARELLS DE RECOLZAMENT MITJANÇANT EL PROCEDIMENT DE RAIG DE SORRA.
3. ES NETEJARÀ LA SORRA QUE POGUÉS QUEDAR EN ELS RECOLZAMENT ALTRES POSSIBLES RESTES DE POLS, MATÈRIA ORGÀNICA I ALTRES.
4. S'APLICARÀ UNA CAPA DE GREIX ENTRE LES CARES LLISQUINS DELS RECOLZAMENT.
5. S'APLICARÀ EL TRACTAMENT ANTICORROSIU INDICAT PER ALS ALTRES ELEMENTS METÀL·LICS.
6. ES RESTITUIRAN LES FUNDES DE PROTECCIÓ EN ELS RECOLZAMENT MÒBILS.

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| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/50 (ORIGINALS) 1/20 — 0 1.563 3.125 (GRÀFIQUES)

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ACTUACIÓ DE CONSOLIDACIÓ DE ESTRUCTURAL
ACTUACIONS EN L'ESTRUCTURA METÀL·LICA
ALTRES ACTUACIONS - DETALL DE SOLDADURES

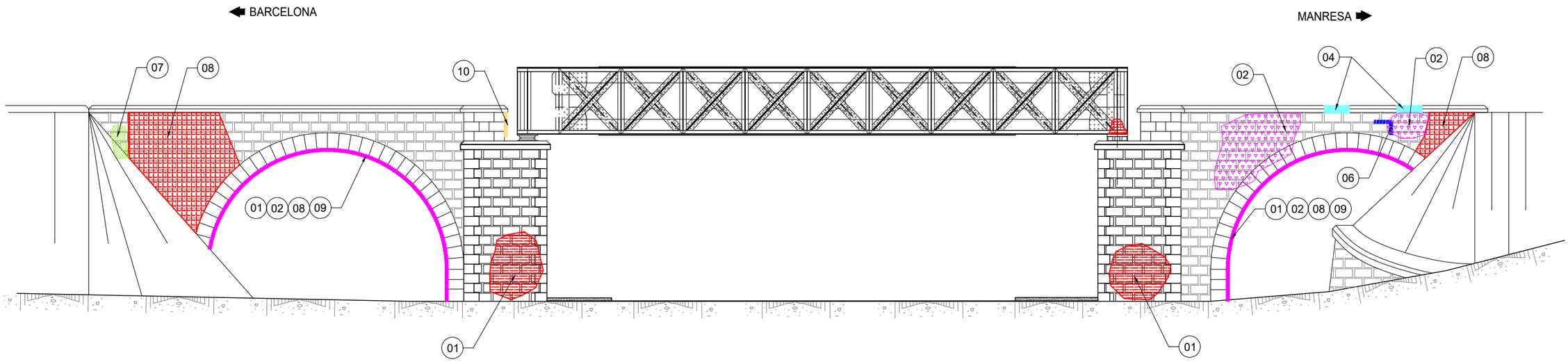
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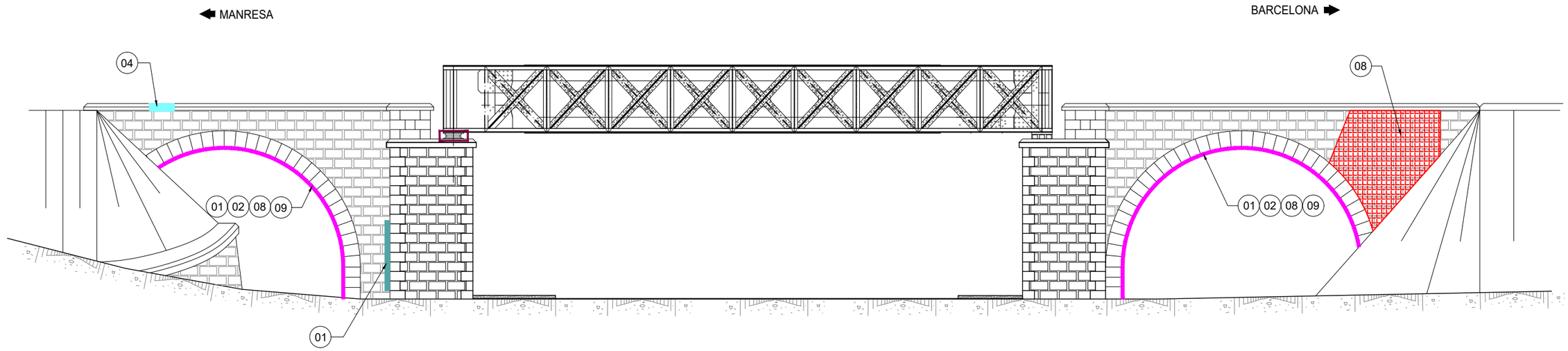
PLÀNOL NÚM.: 05B

FULL 07 DE 07

## ALÇAT COSTAT SANT FRUITÓS
ESCALA 1/125




## ALÇAT COSTAT MANRESA
ESCALA 1/125




01 HUMITATS
02 EFLORESCÈNCIES
03 FISSURA EN CARREU
04 TRENCAMENT DE CARREU
05 METEORITZACIÓ EN CARREU
06 TRENCAMENT/SEPARACIÓ DE REJUNTAT
07 ENLAIRAMENT DE CARREU
08 FISSURES EN ESQUERDEJAT
09 ENLAIRAMENTS EN ESQUERDEJAT
10 PÈRDUA DE FORMIGÓ EN MUR GUARDABALAST

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/125 — 0 1.563 3.125 — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
ALÇATS DE MURS (I)

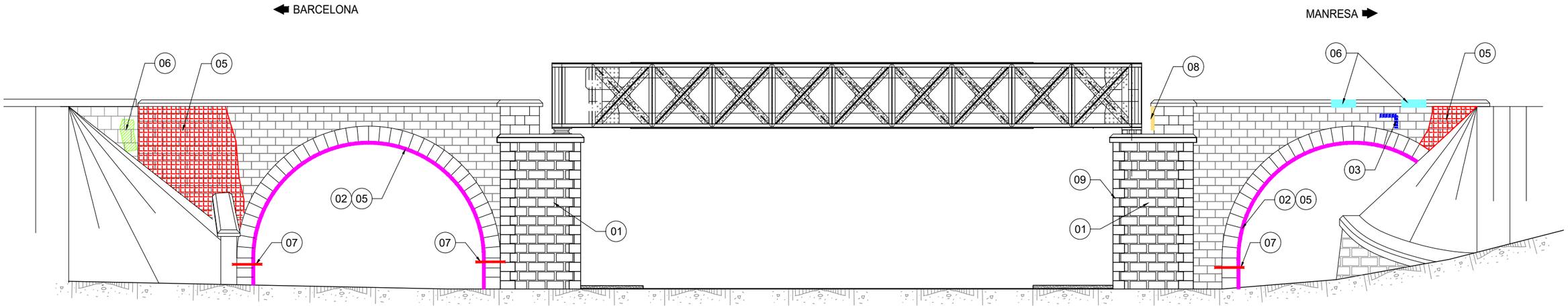
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PLÀNOL NÚM.: 05C

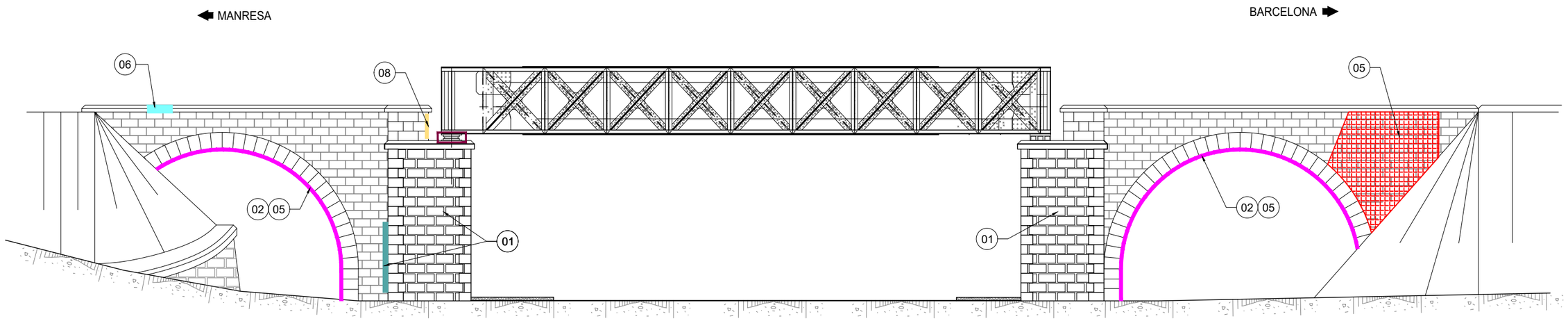
NOM FITXER: 05CF01-F04.dwg

FULL 01 DE 05

## ALÇAT COSTAT SANT FRUITÓS
ESCALA 1/125




## ALÇAT COSTAT MANRESA
ESCALA 1/125




01 NETEJA DE PARAMENTS DE PEDRA AMB RAIG D'AIGUA A PRESSIÓ, CONSOLIDACIÓ D'ELEMENTS DE PEDRA AMB APLICACIÓ DE 3 CAPES DE CONSOLIDANT DE SILICAT D'ETIL (VEURE PROCEDIMENT 3).

02 NETEJA DE PARAMENTS DE ARREBOSAT AMB RAIG D'AIGUA A PRESSIÓ.

03 REPARACIÓ DE REJUNTAT DE JUNTS (VEURE PROCEDIMENT 2).

04 REPARACIÓ DE FISSURES EN OBRA DE FÀBRICA.

05 REPARACIÓ D'ARREBOSSAT I PINTAT AMB PINTURA AL SILICAT.

06 REINTEGRACIÓ DE VOLUMS EN ELEMENTS DE PEDRA.

07 INSTAL·LACIÓ DE DRENATGES CALIFORNIANS. (VEURE PROCEDIMENT 4).

08 RESTITUCIÓ DE RECOBRIMENTS EN FORMIGÓ.

09 REPARACIÓ DE METEORITZACIÓ (VEURE PROCEDIMENT 1).

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| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/125 — 0 1.563 3.125 — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
ALÇATS DE MURS (I)

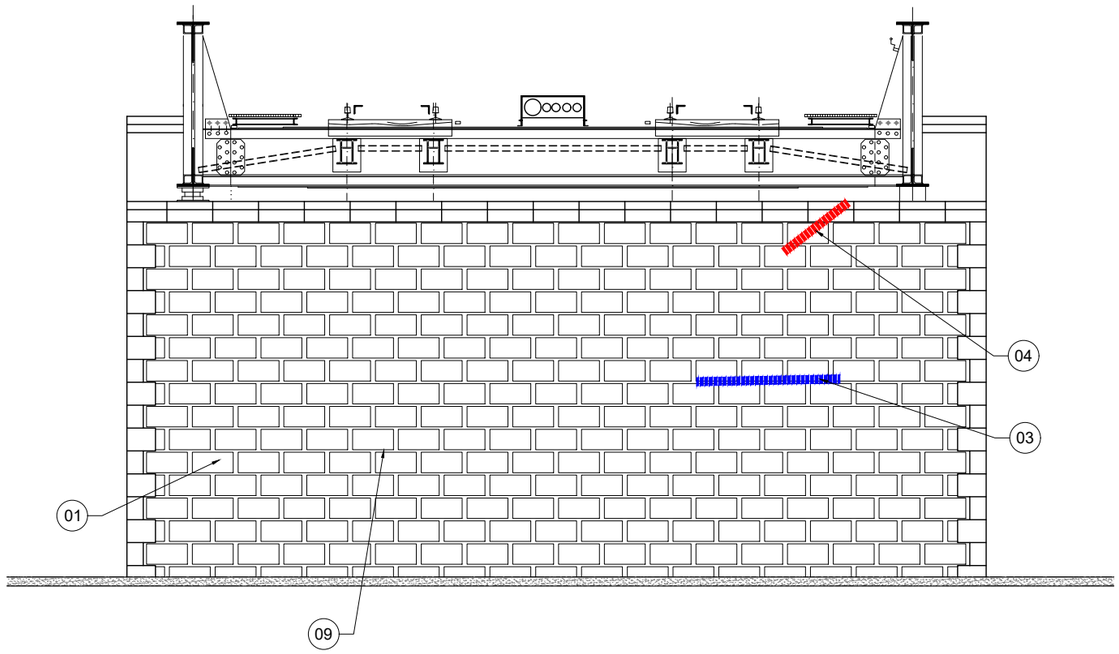
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PLÀNOL NÚM.: 05C

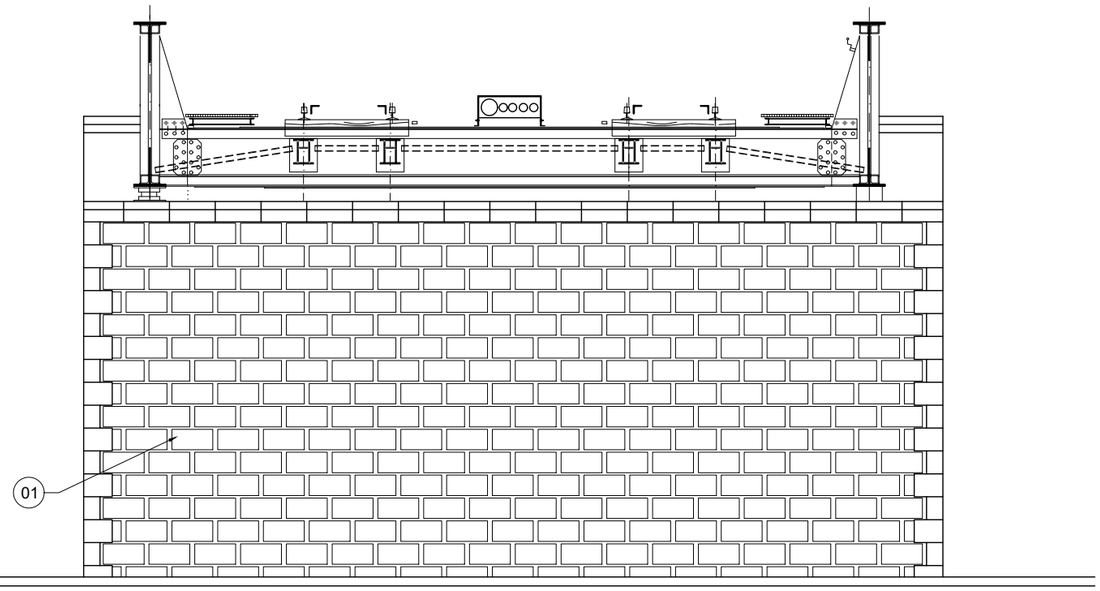
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FULL 01 DE 05

## ALÇAT D´ESTREP COSTAT MANRESA
ESCALA 1/75

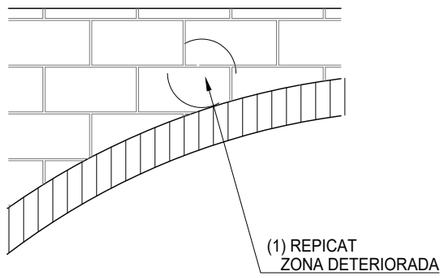



## ALÇAT D´ESTREP COSTAT BARCELONA
ESCALA 1/75

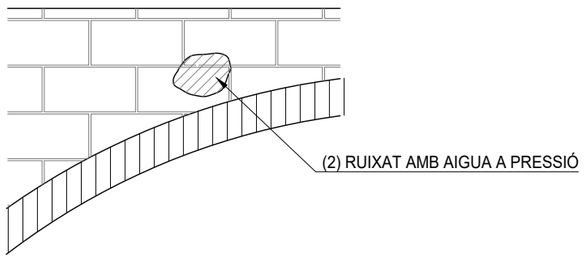



## 1. PROCEDIMENT PER A LA REPARACIÓ DE DANYS EN PONTS DE MAÇONERIA: METEORITZACIÓ DE PEÇA
ESCALA 1/100

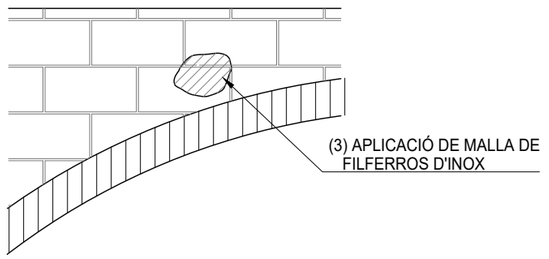
ESTAT INICIAL



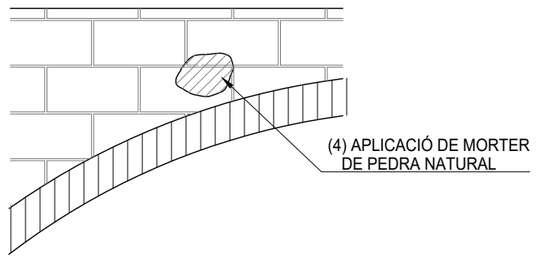

SANEIG I NETEJA




APLICACIÓ DE CONSOLIDANT




TRACTAMENT HIDROFUGANT




FASES

(1) Saneig mitjançant repicat manual de la zona afectada per a la eliminació de parts disgregables i soltes.

(2) Neteja de la superficie mitjançant projecció d'aigua a una pressió mínima de 60 a 200 atm.

(3) Aplicació de malla de filferros d'acer inoxidable de 100mm de pas de malla i de Ø=2mm.

(4) Aplicació de morter per a reconstrucció superficial de pedra natural, amb color d'imitació de la pedra original.

(01) NETEJA DE PARAMENTS DE PEDRA AMB RAIG D'AIGUA A PRESSIÓ, CONSOLIDACIÓ D'ELEMENTS DE PEDRA AMB APLICACIÓ DE 3 CAPES DE CONSOLIDANT DE SILICAT D'ETIL (VEURE PROCEDIMENT 3).

(02) NETEJA DE PARAMENTS DE ARREBOSAT AMB RAIG D'AIGUA A PRESSIÓ.

(03) REPARACIÓ DE REJUNTAT DE JUNTS (VEURE PROCEDIMENT 2).

(04) REPARACIÓ DE FISSURES EN OBRA DE FÀBRICA.

(05) REPARACIÓ D'ARREBOSSAT I PINTAT AMB PINTURA AL SILICAT.

(06) REINTEGRACIÓ DE VOLUMS EN ELEMENTS DE PEDRA.

(07) INSTAL·LACIÓ DE DRENATGES CALIFORNIANS. (VEURE PROCEDIMENT 4).

(08) RESTITUCIÓ DE RECOBRIMENTS E

(09) REPARACIÓ DE METEORITZACIÓ ( PROCEDIMENT 1).

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: 1/100 (0 1.25 2.5) ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
ALÇATS DE MURS (II) - DETALLS REPARACIONS DE REPARAMEN (I)

DATA: GENER 2024

PLÀNOL NÚM.: 05C

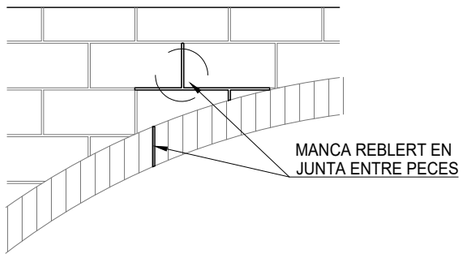
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FULL 02 DE 05

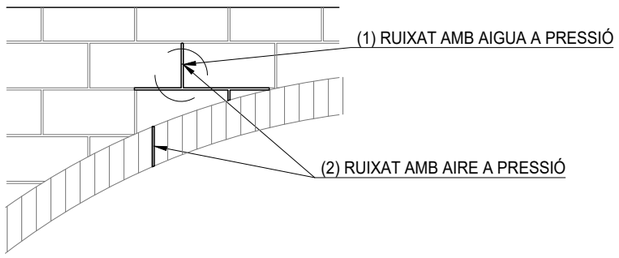
## 2. PROCEDIMENT PER A LA REPARACIÓ DE DANYS EN PONTS DE MAÇONERIA: FALTA MATERIAL DE JUNTA ENTRE PECES

ESCALA 1/100

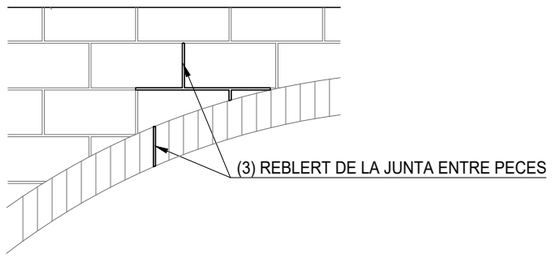
ESTAT INICIAL




SANEIG I NETEJA




TRACTAMENT DE JUNTA




FASES

(1) Saneig mitjançant projecció d'aigua a pressió mínima de 100 atm per a l'eliminació de les parts disgregables i soltes.

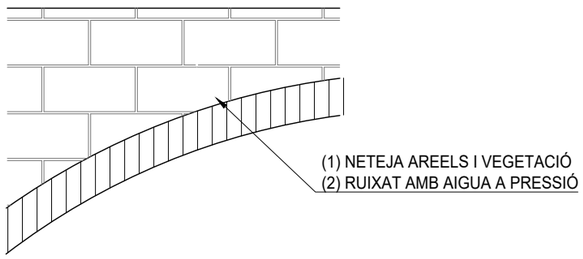
(2) Neteja de la superficie mitjançant projecció d'aigua a una pressió mínima de 100 atm.

(3) Reblert de la junta entre peces amb morter de ciment de cal hidràulica, i resines epoxi.

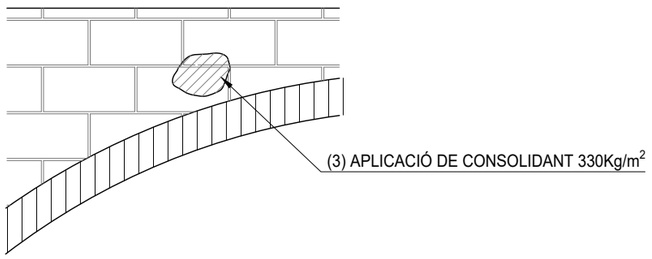
## 3. PROCEDIMENT PER A LA REPARACIÓ DE DANYS EN PONTS DE MAÇONERIA: NETEJA I APLICACIÓ DE CONSOLIDANT

ESCALA 1/100

SANEIG I NETEJA




APLICACIÓ DE CONSOLIDANT




FASES

(1) Retirada arrels i vegetació, tractament herbicida, fungicida-alguicida.

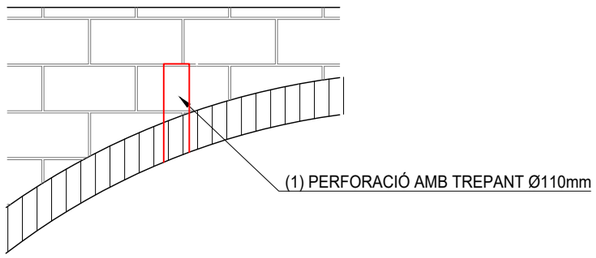
(2) Saneig i neteja amb ruixat d'aigua a pressió mínima de 100 atm.

(3) Aplicació de consolidant consistent en silicat d'etil aplicat amb pinzell en tres capes.

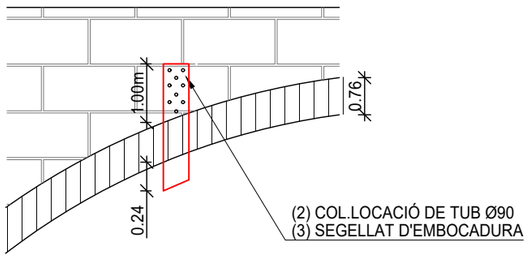
## 4. PROCEDIMENT PER A LA INSTAL·LACIÓ DE DRENATGE

ESCALA 1/100

PERFORACIÓ AMB TREPANT




COL.LOCACIÓ DE TUB




FASES

(1) Perforació amb trepant Ø100mm, amb una profunditat de 1,76m, entrant 1m al reblert.

(2) Col.locació de tub ranurat Ø90mm, longitud total 2m, embolicat amb geotextil.

(3) Segellat d'embocadura.

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\05CF01-F05.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: 1/100 — ORIGINALS — 0 1.25 2.5 — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
DETALLS REPARACIONS DE REPARAMEN (II)

DATA: GENER 2024

PLÀNOL NÚM.: 05C

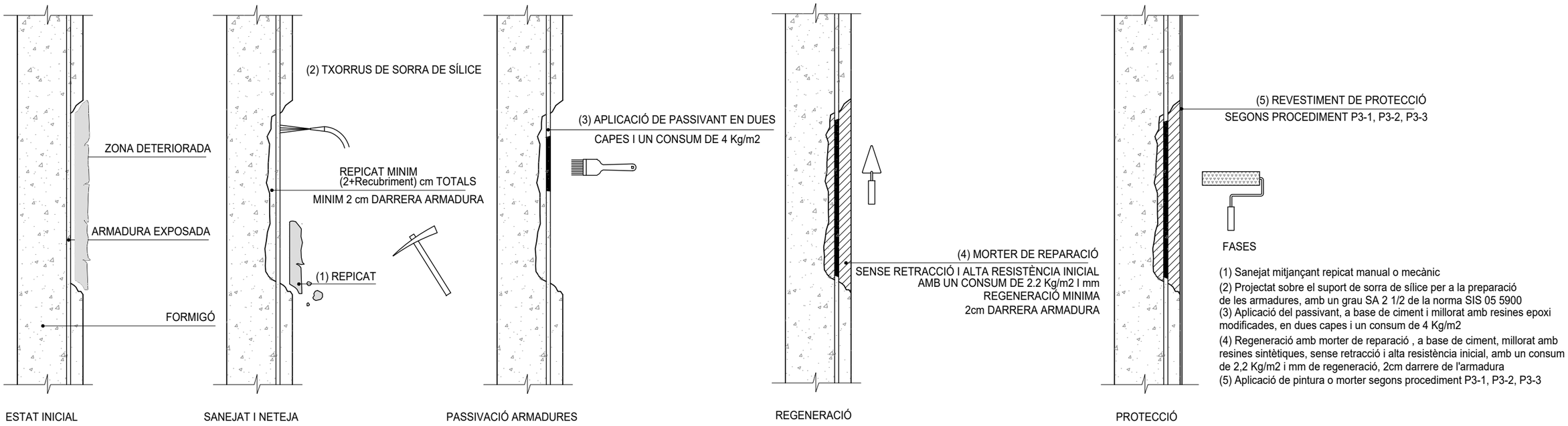
NOM FITXER: 05CF01-F05.dwg

FULL 03 DE 05

# REPARACIÓ DE FORMIGÓ. ACTIVITATS INICIALS

ESCALA 1/100

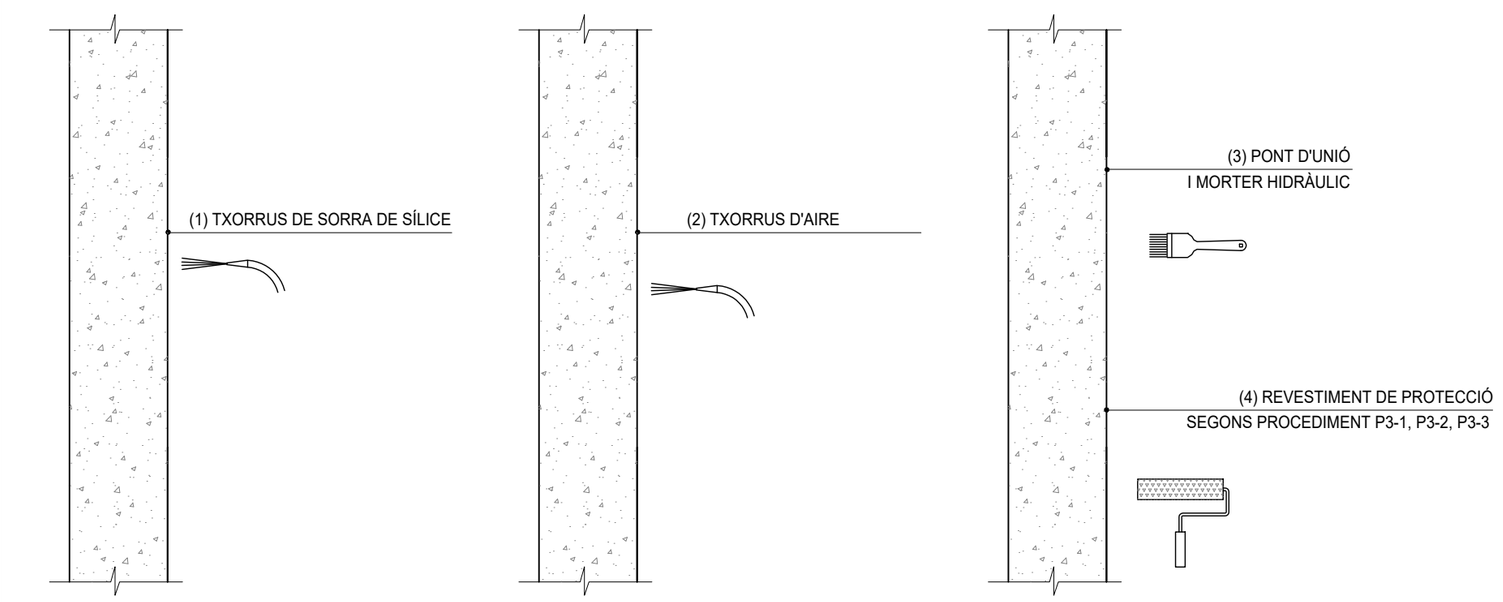
## 1. PROCEDIMENT PER A LA REPARACIÓ DELS ESCROSTONAMENTS AMB ARMADURA EXPOSADA EN PARAMENTS DE FORMIGÓ




FASES

(1) Sanejat mitjançant repicat manual o mecànic
(2) Projectat sobre el suport de sorra de sílice per a la preparació de les armadures, amb un grau SA 2 1/2 de la norma SIS 05 5900
(3) Aplicació del passivant, a base de ciment i millorat amb resines epoxi modificades, en dues capes i un consum de 4 Kg/m2
(4) Regeneració amb morter de reparació , a base de ciment, millorat amb resines sintètiques, sense retracció i alta resistència inicial, amb un consum de 2,2 Kg/m2 i mm de regeneració, 2cm darrere de l'armadura
(5) Aplicació de pintura o morter segons procediment P3-1, P3-2, P3-3

## 2. PROCEDIMENT PER A LA REPARACIÓ DELS SEGÜENTS DANYS EN PARAMENTS DE FORMIGÓ: REGULARITZACIÓ DE PARAMENTS HORITZONTALS AMB MORTER




FASES

(1) Neteja i eliminació total de partícules soltes damunt del tauler. Es farà mitjançant decapatge mecànic amb maquinària que permeti l'aspiració de les partícules soltes, raig de sorra o dels mitjans naturals que determini la Direcció d'Obra
(2) Neteja de la superfície amb aire a pressió just abans de l'aplicació de la pintura acrílica
(3) Aplicació de morter hidràulic de resistència alta i sense retracció amb un consum de 21 kg/m2.cm Prèviament a la col-locació del morter de regularització s'estendrà un adhesiu per assegurar la unió del morter de regularització amb el tauler de formigó amb un consum de 1,5 kg/m2
(4) Aplicació de pintura o morter segons procediment P3-1, P3-2, P3-3

02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\05CF01-F05.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: 1/100 (ORIGINALS) — 0 1.25 2.5 (GRÀFIQUES)

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
REPARACIONS DE REPARAMENT DE FORMIGÓ (I)

DATA: GENER 2024

NOM FITXER: 05CF01-F05.dwg

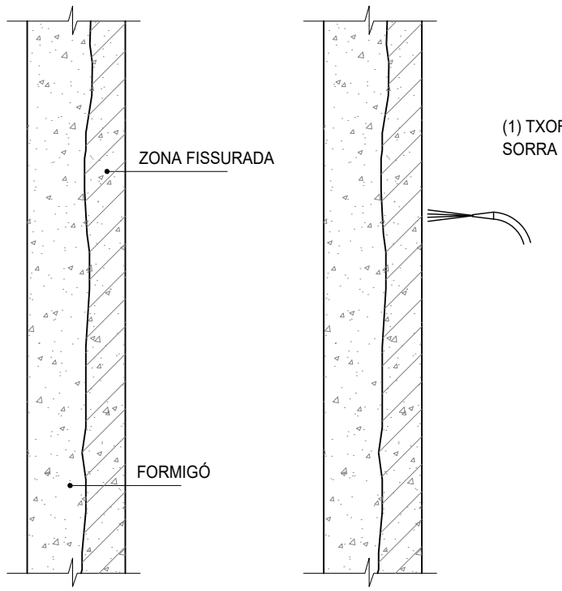
PLÀNOL NÚM.: 05C

FULL 04 DE 05

# ACTIVITATS INTERMÈDIES

ESCALA 1/100

## 1. PROCEDIMENT GENERAL PER A LA INJECCIÓ DE FISSURES I ESQUERDES EN PARAMENTS DE FORMIGÓ

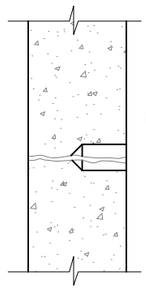


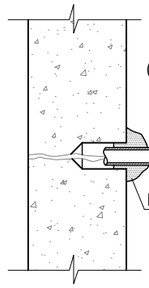

ESTAT INICIAL



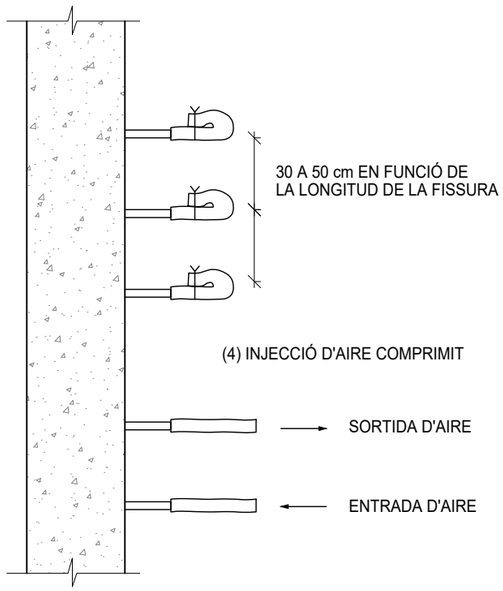
SANEJAT



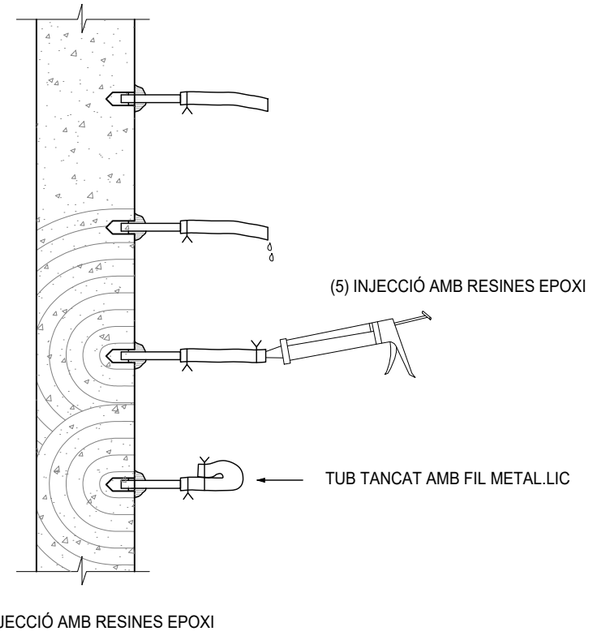




PERFORACIÓ I COL.LOCACIÓ DE BOQUERES

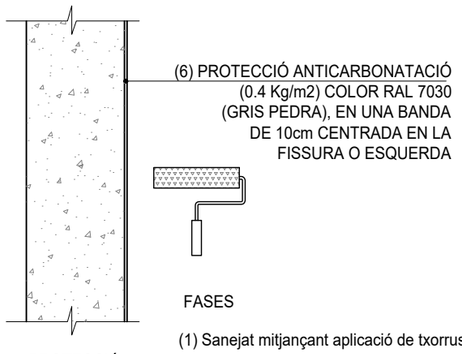



INJECCIÓ D'AIRE COMPRIMIT




INJECCIÓ AMB RESINES EPOXI

## 2. PROCEDIMENT GENERAL PEL EMMASSILLAT DE FISSURES




PROTECCIÓ

FASES

(1) Sanejat mitjançant aplicació de txorrus de sorra de sílice

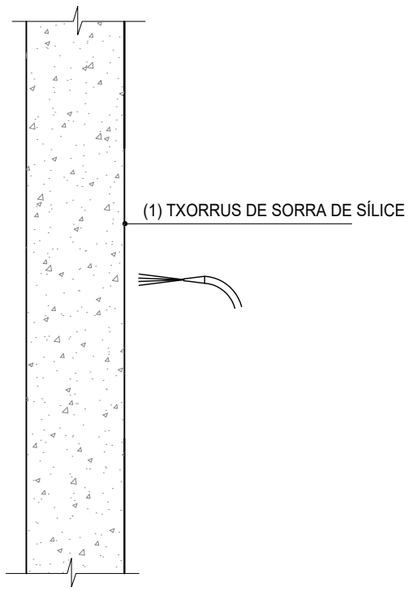
(2) Perforació de taladres (20 a 50 cm en funció de la profunditat de la fissura o esquerda)

(3) Col.locació de les boqueres d'injecció espaiades de 30 a 50 cm (en funció de la profunditat de la fissura o esquerda) i fixant-les amb massella epoxídica

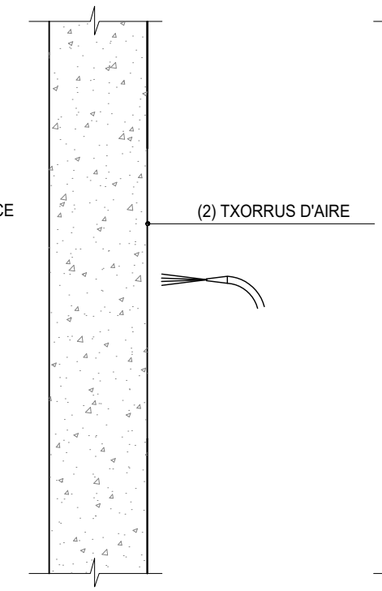
(4) Injecció d'aire comprimit, per les boqueres per assegurar-se que no estan obstruïts els conductes d'injecció ni les pròpies fisssures

(5) Injecció de resines epoxi amb pistola manual a una pressió de 1 MPa. Es comença per la boquera situada a cota inferior i es continúa fins a observar la fuga de producte per la boquera immediata, moment en el qual s'obtura la boquera ja injectada i es continúa la injecció per la següent, continuant el procès fins acompletar l'operació

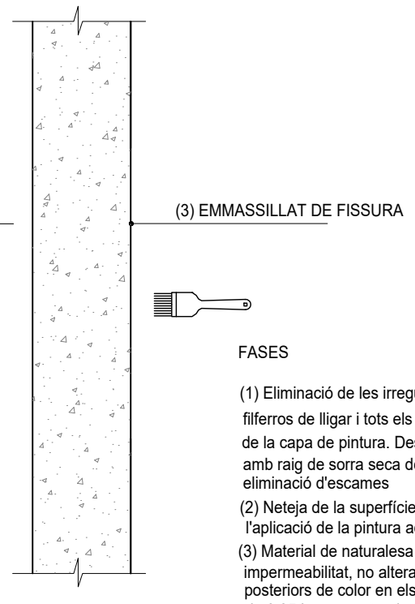
(6) Aplicació de pintura anticarbonatació, a base de resines acríliques, en dues capes i un consum de 0.4 Kg/m2, color RAL 7030 (GRIS PEDRA), amb corró La primera capa tindrà una tonalitat més fosca que la primera per a diferenciar-se




TRACTAMENT DE SANEJAT




NETEJA




APLICACIÓ

FASES

(1) Eliminació de les irregularitats de l'encofrat, tirantets, filferros de lligar i tots els elements que puguin afectar la uniformitat de la capa de pintura. Després es farà el tractament de la superfície amb raig de sorra seca de sílice de 1-2mm i compressor de 7atm i eliminació d'escames

(2) Neteja de la superfície amb aire a pressió just abans de l'aplicació de la pintura acrílica

(3) Material de naturalesa epoxídica amb característiques de flexibilitat, impermeabilitat, no alterable en el temps i que no produeixi defectes posteriors de color en els revestiments protectors amb un consul de 0,05 kg per metre de fissura emmassillada

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/100 — ORIGINALS — 0 1.25 2.5 — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
REPARACIONS DE REPARAMENT DE FORMIGÓ (II)

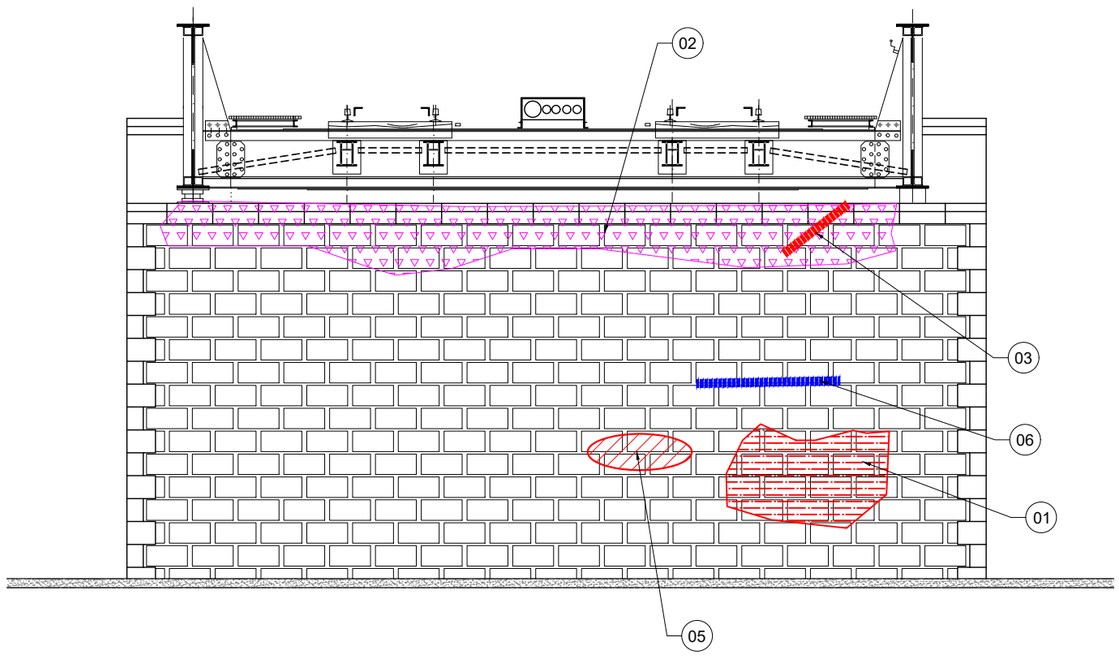
DATA: GENER 2024

PLÀNOL NÚM.: 05C

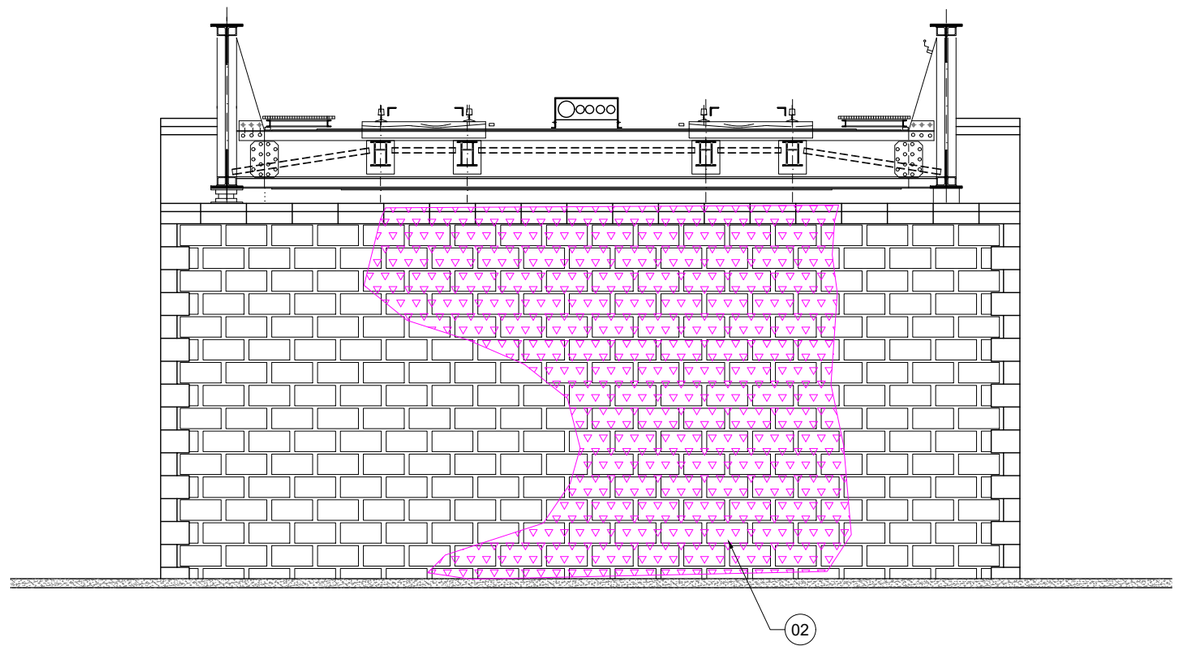
NOM FITXER: 05CF01-F05.dwg

FULL 05 DE 05

## ALÇAT D´ESTREP COSTAT MANRESA
ESCALA 1/75

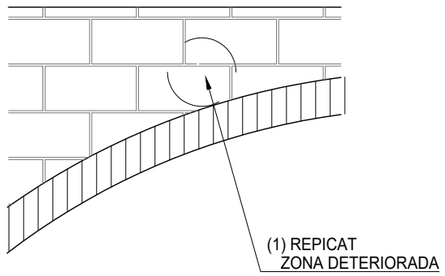



## ALÇAT D´ESTREP COSTAT BARCELONA
ESCALA 1/75

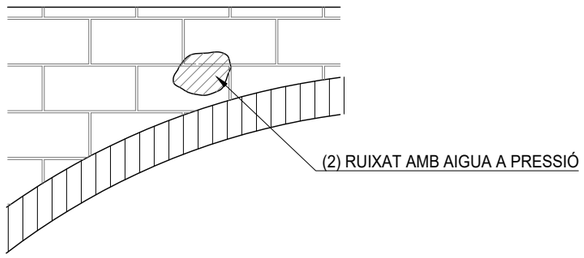



## 1. PROCEDIMENT PER A LA REPARACIÓ DE DANYS EN PONTS DE MAÇONERIA: METEORITZACIÓ DE PEÇA
ESCALA 1/100

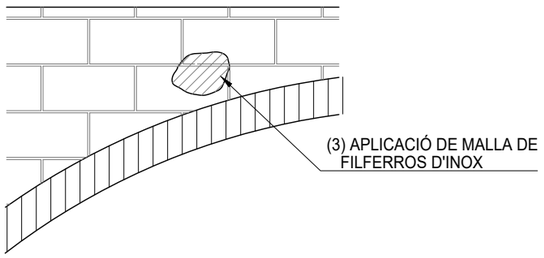
ESTAT INICIAL



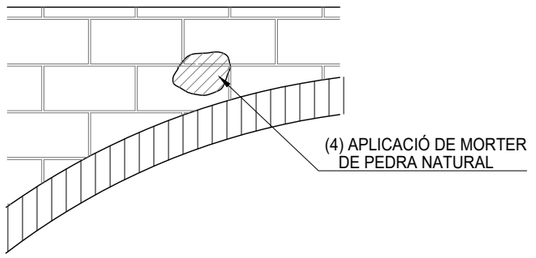

SANEIG I NETEJA




APLICACIÓ DE CONSOLIDANT




TRACTAMENT HIDROFUGANT




FASES

(1) Saneig mitjançant repicat manual de la zona afectada per a la eliminació de parts disgregables i soltes.

(2) Neteja de la superficie mitjançant projecció d'aigua a una pressió mínima de 60 a 200 atm.

(3) Aplicació de malla de filferros d'acer inoxidable de 100mm de pas de malla i de Ø=2mm.

(4) Aplicació de morter per a reconstrucció superficial de pedra natural, amb color d'imitació de la pedra original.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 01 | HUMITATS | 03 | FISSURA EN CARREU | 05 | METEORITZACIÓ EN CARREU | 07 | ENLAIRAMENT DE CARREU | 09 | ENLAIRAMENTS EN ESQUERDEJAT |
| 02 | EFLORESCÈNCIES | 04 | TRENCAMENT DE CARREU | 06 | TRENCAMENT/SEPARACIÓ DE REJUNTAT | 08 | FISSURES EN ESQUERDEJAT | 10 | PÈRDUA DE FORMIGÓ EN MUR GUARDABALAST |

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29/01/2024

| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/100 — ORIGINALS — 0 1.25 2.5 — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
ALÇATS DE MURS (II) - DETALLS REPARACIONS DE REPARAMEN (I)

DATA: GENER 2024

PLÀNOL NÚM.: 05C

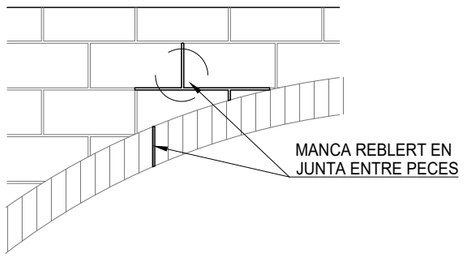
NOM FITXER: 05CF01-F04.dwg

FULL 02 DE 05

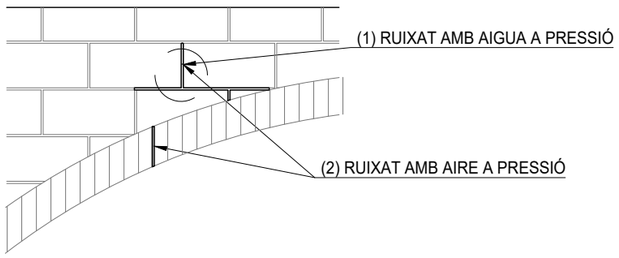
## 2. PROCEDIMENT PER A LA REPARACIÓ DE DANYS EN PONTS DE MAÇONERIA: FALTA MATERIAL DE JUNTA ENTRE PECES

ESCALA 1/100

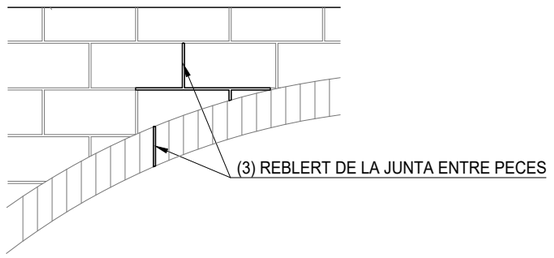
ESTAT INICIAL




SANEIG I NETEJA




TRACTAMENT DE JUNTA




FASES

(1) Saneig mitjançant projecció d'aigua a pressió mínima de 100 atm per a l'eliminació de les parts disgregables i soltes.

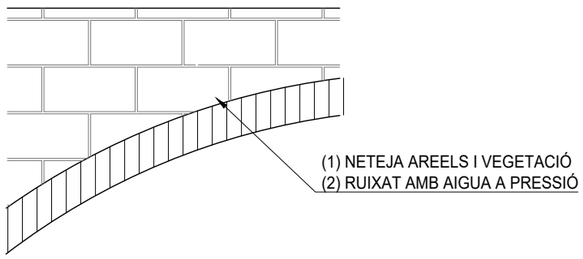
(2) Neteja de la superficie mitjançant projecció d'aigua a una pressió mínima de 100 atm.

(3) Reblert de la junta entre peces amb morter de ciment de cal hidràulica, i resines epoxi.

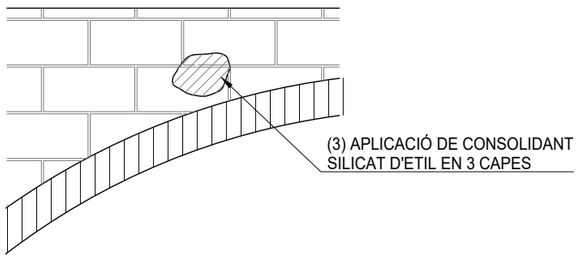
## 3. PROCEDIMENT PER A LA REPARACIÓ DE DANYS EN PONTS DE MAÇONERIA: NETEJA I APLICACIÓ DE CONSOLIDANT

ESCALA 1/100

SANEIG I NETEJA




APLICACIÓ DE CONSOLIDANT




FASES

(1) Retirada arrels i vegetació, tractament herbicida, fungicida-alguicida.

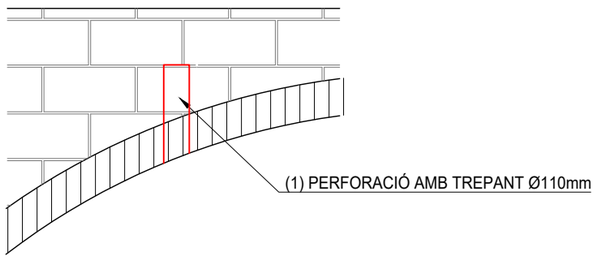
(2) Saneig i neteja amb ruixat d'aigua a pressió mínima de 100 atm.

(3) Aplicació de consolidant consistent en silicat d'etil aplicat amb polvoritzador en tres capes.

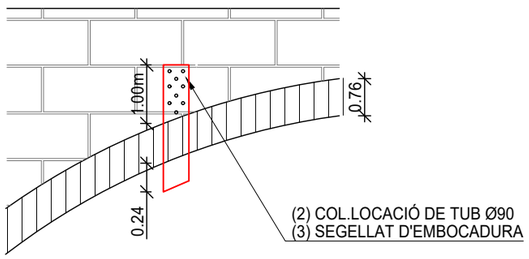
## 4. PROCEDIMENT PER A LA INSTAL·LACIÓ DE DRENATGE

ESCALA 1/100

PERFORACIÓ AMB TREPANT




COL.LOCACIÓ DE TUB




FASES

(1) Perforació amb trepant Ø100mm, amb una profunditat de 1,76m, entrant 1m al reblert.

(2) Col.locació de tub ranurat Ø90mm, longitud total 2m, embolicat amb geotextil.

(3) Segellat d'embocadura.

21/03/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJ\AIESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\05CF01-F05.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: 1/100 — ORIGINALS — 0 1.25 2.5 — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
DETALLS REPARACIONS DE REPARAMEN (II)

DATA: GENER 2024

PLÀNOL NÚM.: 05C

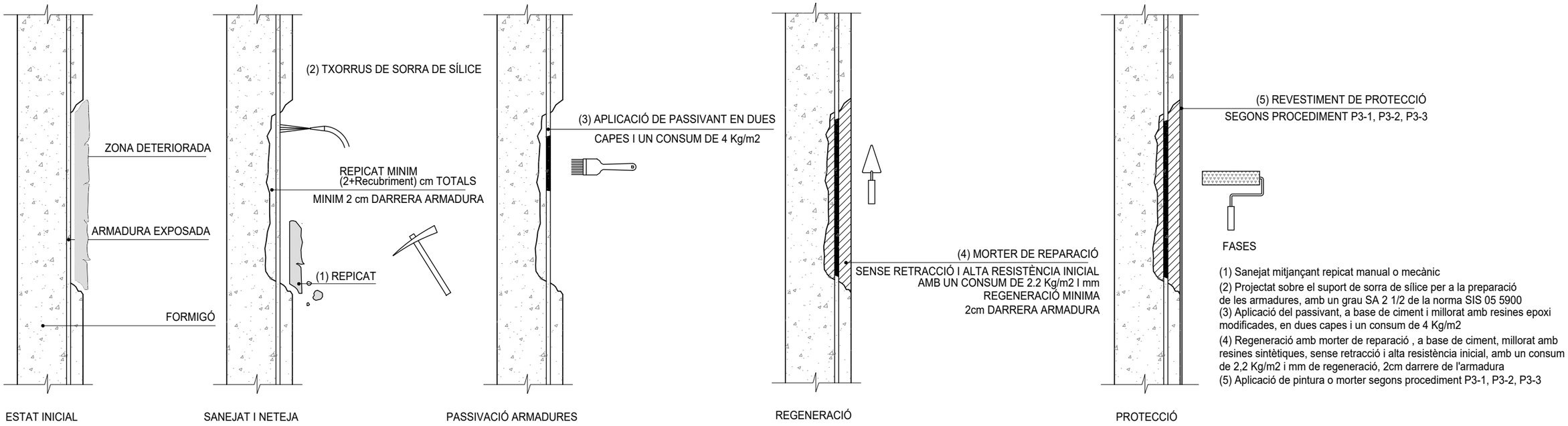
NOM FITXER: 05CF01-F05.dwg

FULL 03 DE 05

# REPARACIÓ DE FORMIGÓ. ACTIVITATS INICIALS

ESCALA 1/100

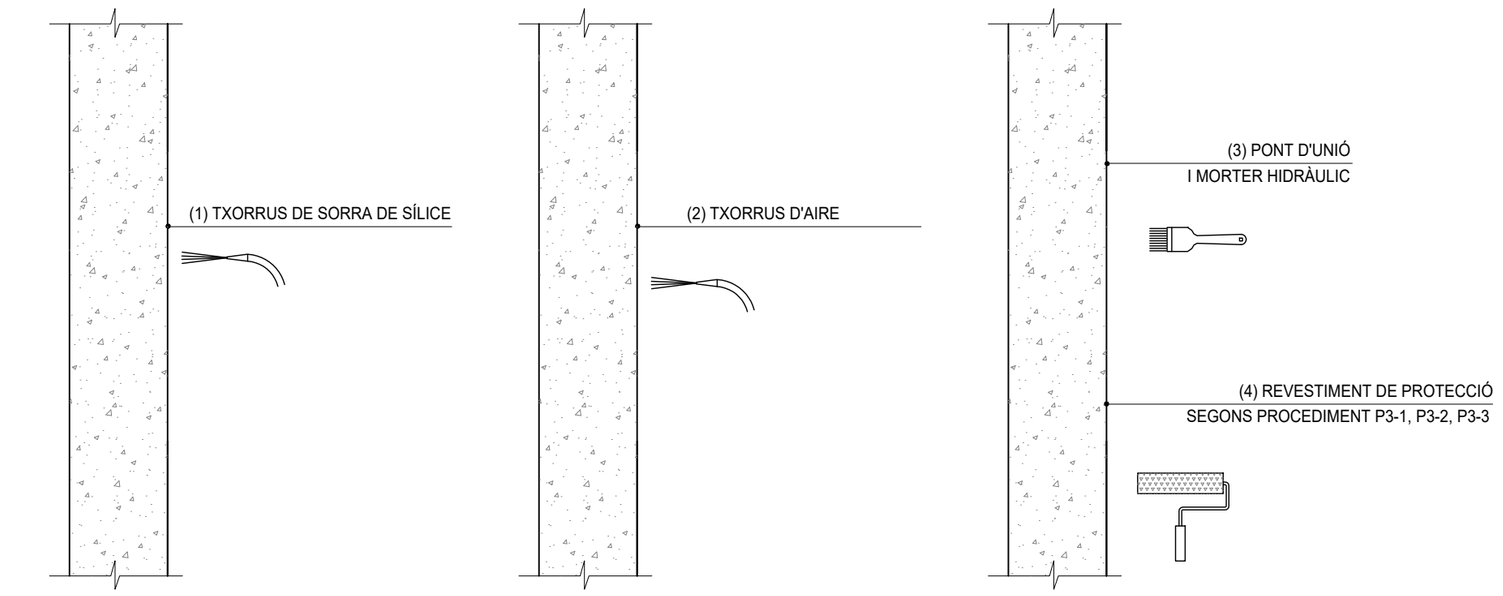
## 1. PROCEDIMENT PER A LA REPARACIÓ DELS ESCROSTONAMENTS AMB ARMADURA EXPOSADA EN PARAMENTS DE FORMIGÓ




FASES

(1) Sanejat mitjançant repicat manual o mecànic
(2) Projectat sobre el suport de sorra de sílice per a la preparació de les armadures, amb un grau SA 2 1/2 de la norma SIS 05 5900
(3) Aplicació del passivant, a base de ciment i millorat amb resines epoxi modificades, en dues capes i un consum de 4 Kg/m2
(4) Regeneració amb morter de reparació , a base de ciment, millorat amb resines sintètiques, sense retracció i alta resistència inicial, amb un consum de 2,2 Kg/m2 i mm de regeneració, 2cm darrere de l'armadura
(5) Aplicació de pintura o morter segons procediment P3-1, P3-2, P3-3

## 2. PROCEDIMENT PER A LA REPARACIÓ DELS SEGÜENTS DANYS EN PARAMENTS DE FORMIGÓ: REGULARITZACIÓ DE PARAMENTS HORITZONTALS AMB MORTER




FASES

(1) Neteja i eliminació total de partícules soltes damunt del tauler. Es farà mitjançant decapatge mecànic amb maquinària que permeti l'aspiració de les partícules soltes, raig de sorra o dels mitjans naturals que determini la Direcció d'Obra
(2) Neteja de la superfície amb aire a pressió just abans de l'aplicació de la pintura acrílica
(3) Aplicació de morter hidràulic de resistència alta i sense retracció amb un consum de 21 kg/m2.cm Prèviament a la col-locació del morter de regularització s'estendrà un adhesiu per assegurar la unió del morter de regularització amb el tauler de formigó amb un consum de 1,5 kg/m2
(4) Aplicació de pintura o morter segons procediment P3-1, P3-2, P3-3

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: 1/100 (ORIGINALS) — 0 1.25 2.5 (GRÀFIQUES)

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
REPARACIONS DE REPARAMENT DE FORMIGÓ (I)

DATA: GENER 2024

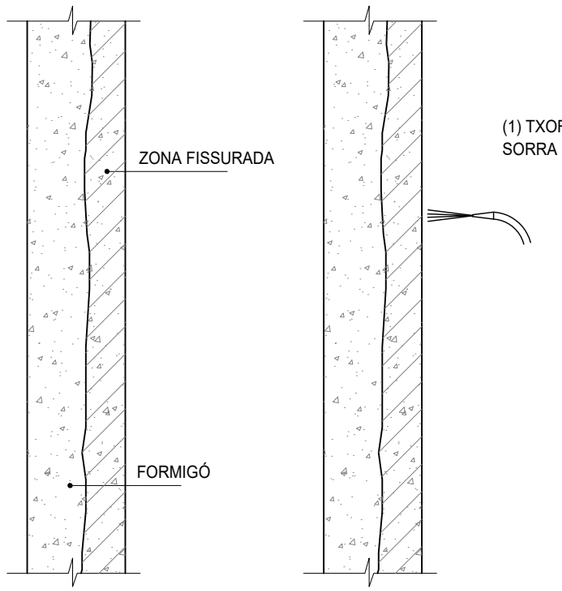
NOM FITXER: 05CF01-F04.dwg

PLÀNOL NÚM.: 05C

FULL 04 DE 05

# ACTIVITATS INTERMÈDIES
ESCALA 1/100

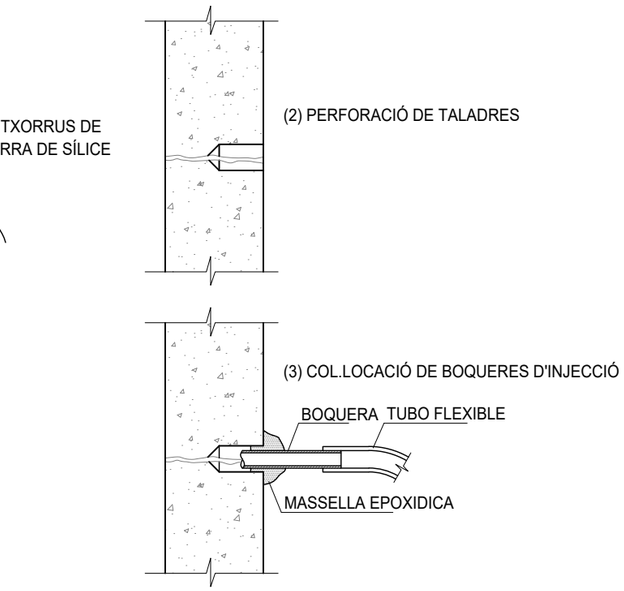
## 1. PROCEDIMENT GENERAL PER A LA INJECCIÓ DE FISSURES I ESQUERDES EN PARAMENTS DE FORMIGÓ



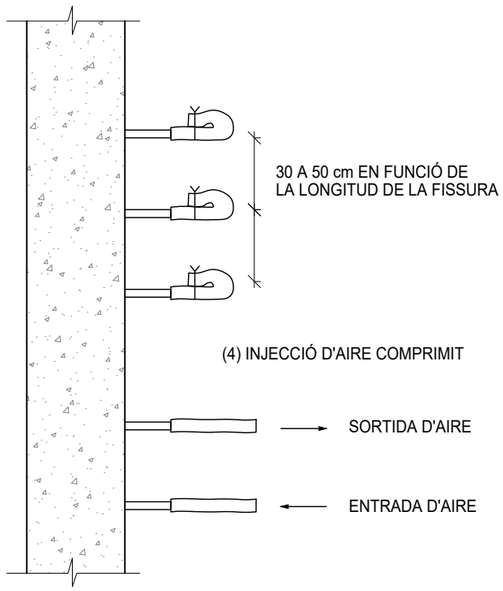

ESTAT INICIAL



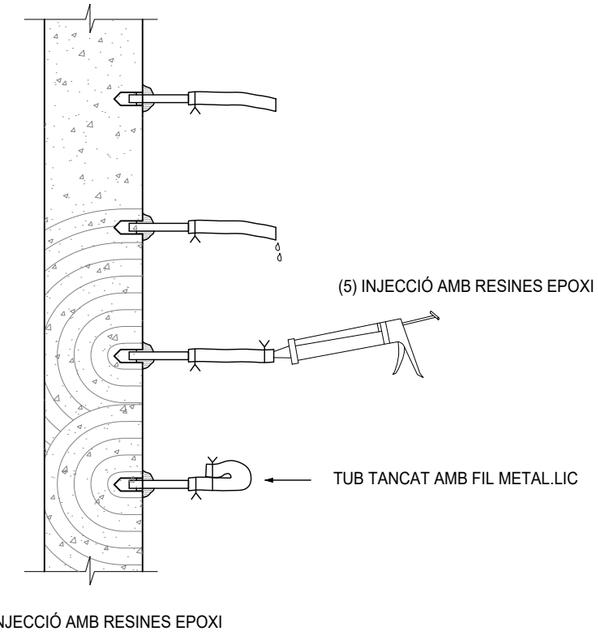
SANEJAT




PERFORACIÓ I COL.LOCACIÓ DE BOQUERES

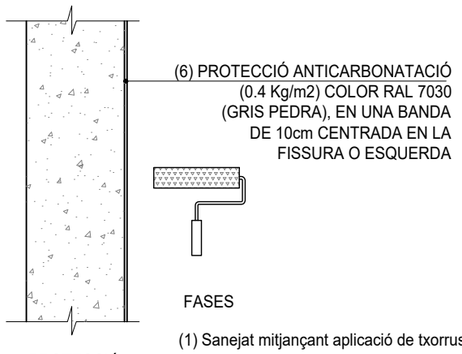



INJECCIÓ D'AIRE COMPRIMIT




INJECCIÓ AMB RESINES EPOXI

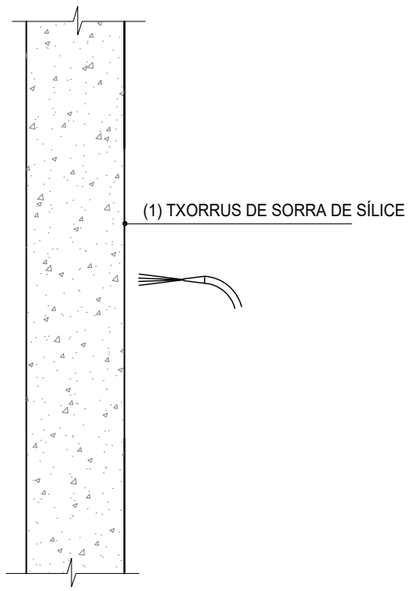
## 2. PROCEDIMENT GENERAL PEL EMMASSILLAT DE FISSURES



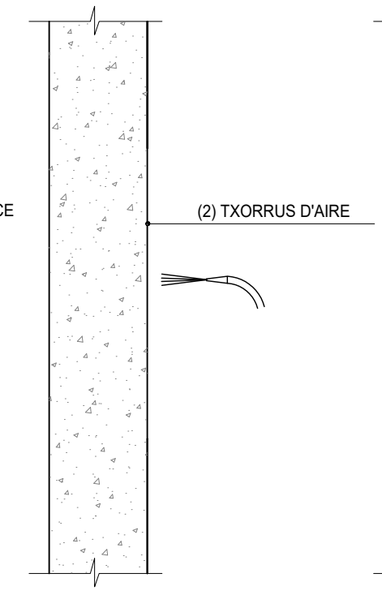

PROTECCIÓ

FASES

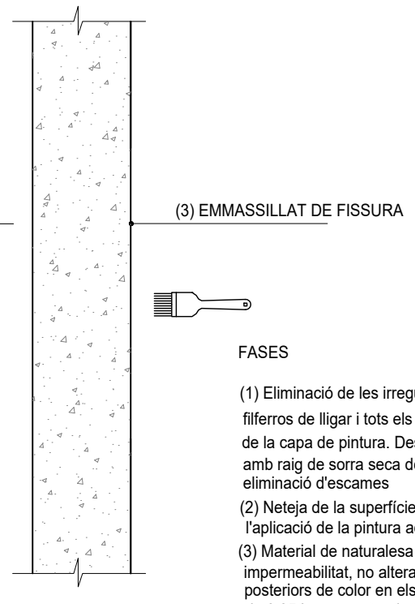
(1) Sanejat mitjançant aplicació de txorrus de sorra de sílice
(2) Perforació de taladres (20 a 50 cm en funció de la profunditat de la fissura o esquerda)
(3) Col.locació de les boqueres d'injecció espaiades de 30 a 50 cm (en funció de la profunditat de la fissura o esquerda) i fixant-les amb massella epoxídica
(4) Injecció d'aire comprimit, per les boqueres per assegurar-se que no estan obstruïts els conductes d'injecció ni les pròpies fisssures
(5) Injecció de resines epoxi amb pistola manual a una pressió de 1 MPa. Es comença per la boquera situada a cota inferior i es continúa fins a observar la fuga de producte per la boquera immediata, moment en el qual s'obtura la boquera ja injectada i es continúa la injecció per la següent, continuant el procès fins acompletar l'operació
(6) Aplicació de pintura anticarbonatació, a base de resines acríliques, en dues capes i un consum de 0.4 Kg/m2, color RAL 7030 (GRIS PEDRA), amb corró La primera capa tindrà una tonalitat més fosca que la primera per a diferenciar-se




TRACTAMENT DE SANEJAT




NETEJA




APLICACIÓ

FASES

(1) Eliminació de les irregularitats de l'encofrat, tirantets, filferros de lligar i tots els elements que puguin afectar la uniformitat de la capa de pintura. Després es farà el tractament de la superfície amb raig de sorra seca de sílice de 1-2mm i compressor de 7atm i eliminació d'escames
(2) Neteja de la superfície amb aire a pressió just abans de l'aplicació de la pintura acrílica
(3) Material de naturalesa epoxídica amb característiques de flexibilitat, impermeabilitat, no alterable en el temps i que no produeixi defectes posteriors de color en els revestiments protectors amb un consul de 0,05 kg per metre de fissura emmassillada

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: 1/100 (0 1.25 2.5) ORIGINALS GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
ESQUEMA D'ACTUACIÓ
ACTUACIONS EN MURS D'ESTREPS
REPARACIONS DE REPARAMENT DE FORMIGÓ (II)

DATA: GENER 2024

PLÀNOL NÚM.: 05C

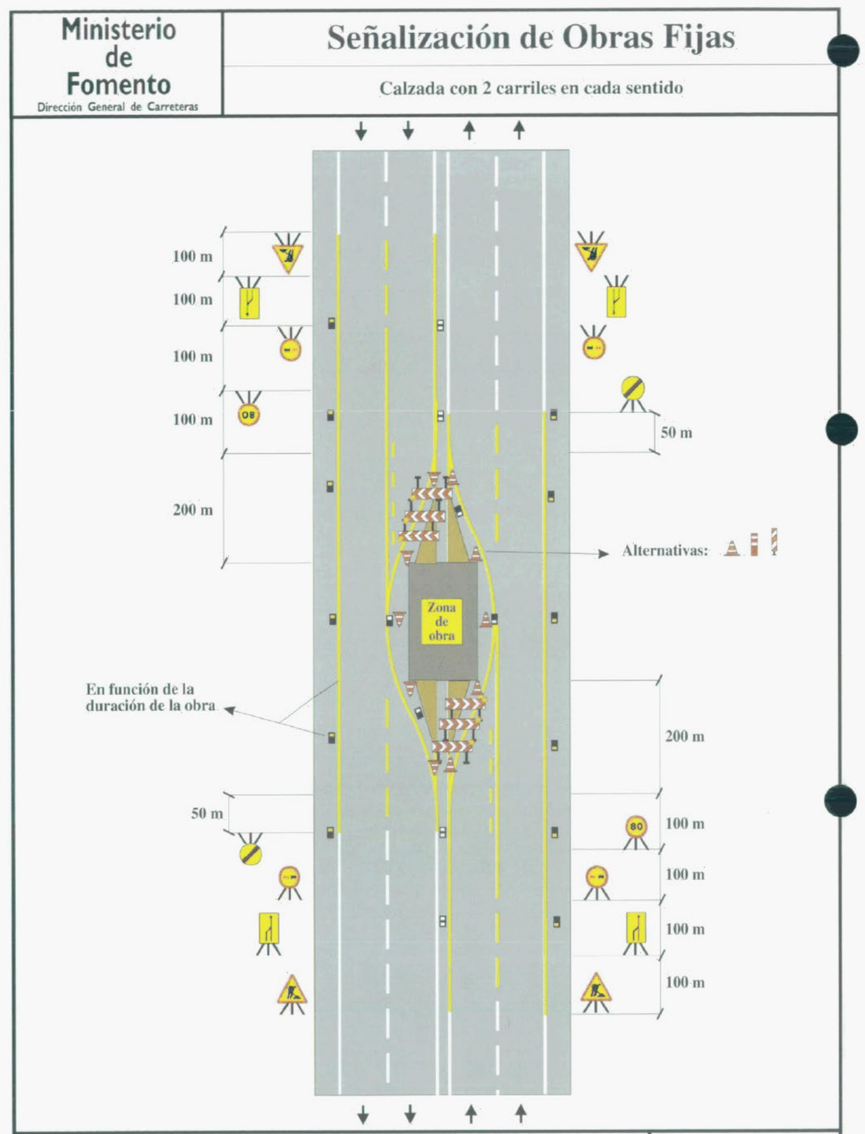
NOM FITXER: 05CF01-F04.dwg

FULL 05 DE 05

Ministerio de Fomento
Dirección General de Carreteras

# Señalización de Obras Fijas

## Calzada con 2 carriles en cada sentido




| | |
|---|---|
| Zona de obra: Ocupando un carril en cada sentido | Ejemplo: 2.8 |
| Por ejemplo: Mantenimiento, etc. | Figura: C7/18 |



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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
EXEMPLES DE SENYALITZACIÓ (II)

DATA: GENER 2024

PLÀNOL NÚM.: 06A

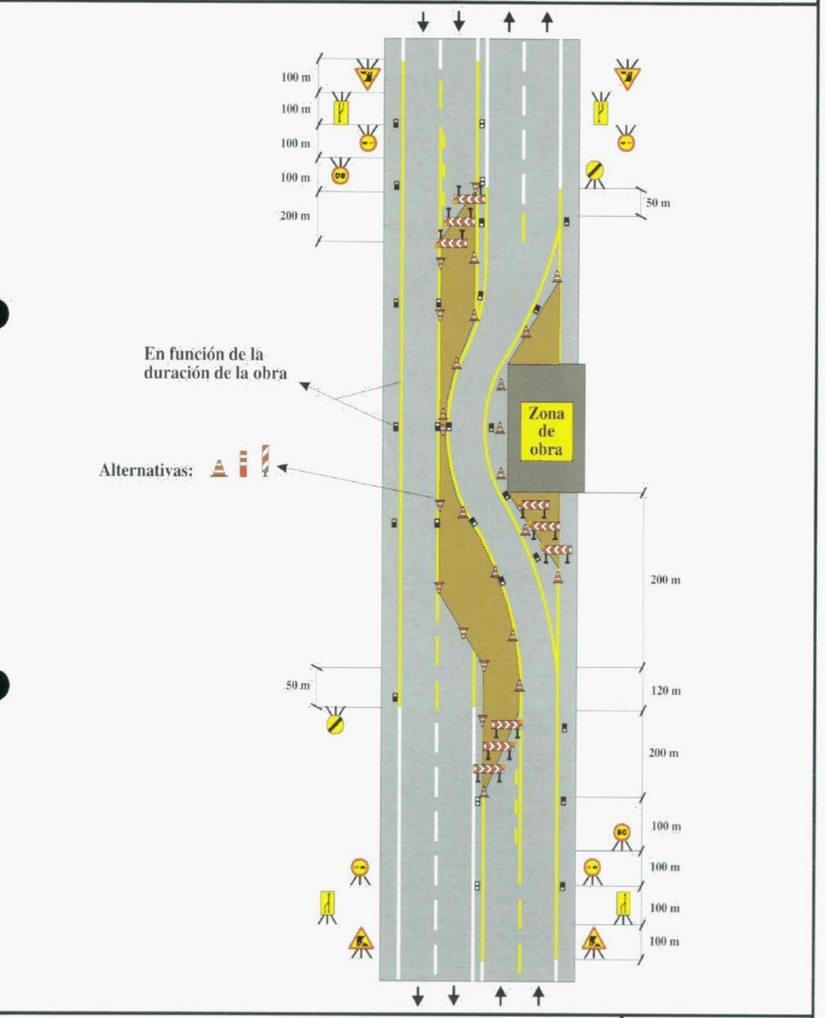
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FULL 2 DE 2

Ministerio de Fomento
Dirección General de Carreteras

# Señalización de Obras Fijas

## Calzada con 2 carriles en cada sentido




| | |
|---|---|
| Zona de obra: Ocupando dos carriles | Ejemplo: 2.7 |
| Por ejemplo: Mantenimiento, etc. | Figura: C7/18 |



02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJA\ESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\06AF01-F02.DWG

| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
EXEMPLES DE SENYALITZACIÓ (I)

DATA: GENER 2024

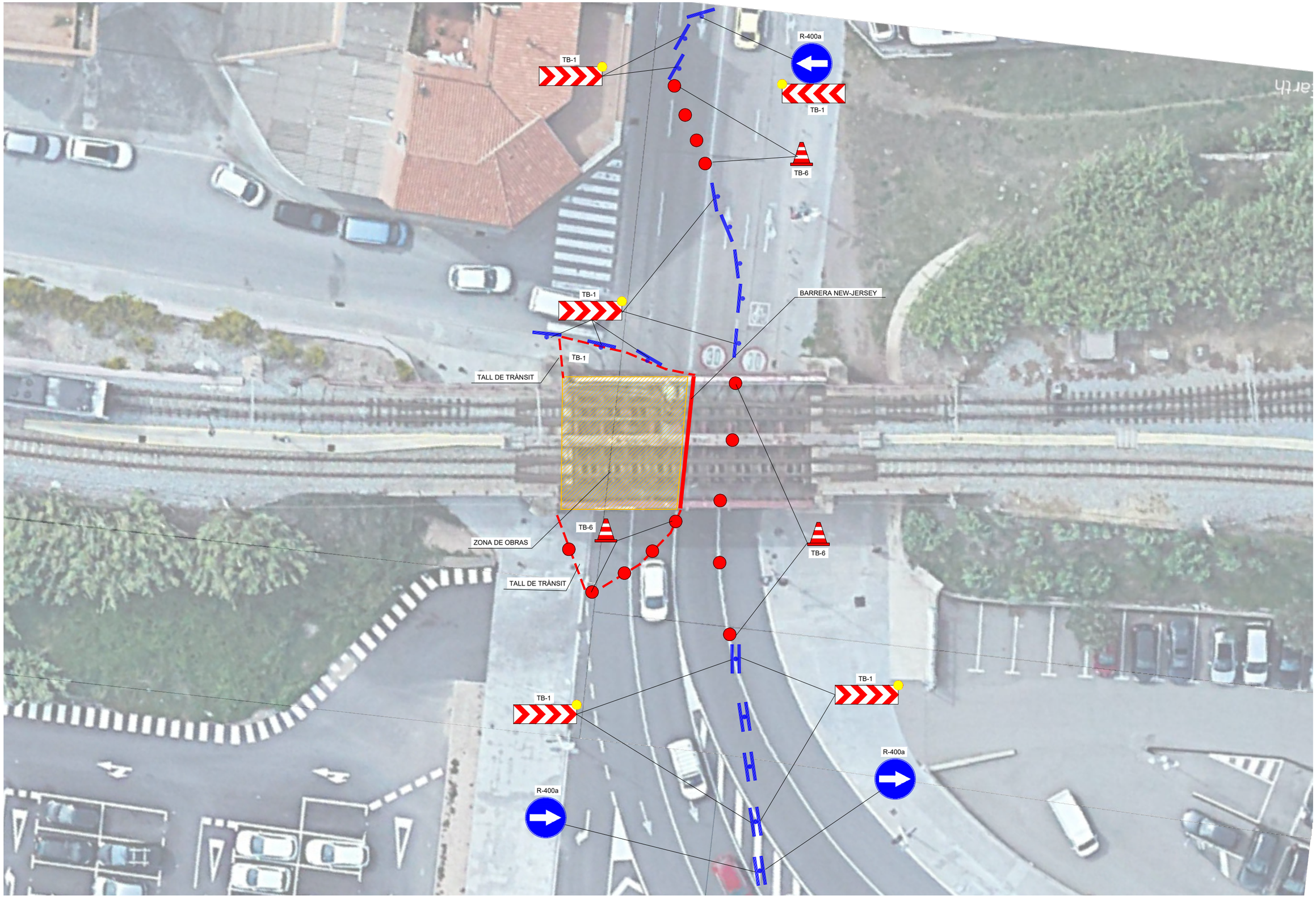
PLÀNOL NÚM.: 06A

NOM FITXER: 06AF01-F02.dwg

FULL 1 DE 2

## PONT SOBRE CARRETERA DE VIC

ESCALA 1:150




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|---|---|---|
| ELAB. | REV. | APR. |
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

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CLAU PROJECTE

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
FASE 1 DESVIAMENT PROVISIONAL

DATA: GENER 2024

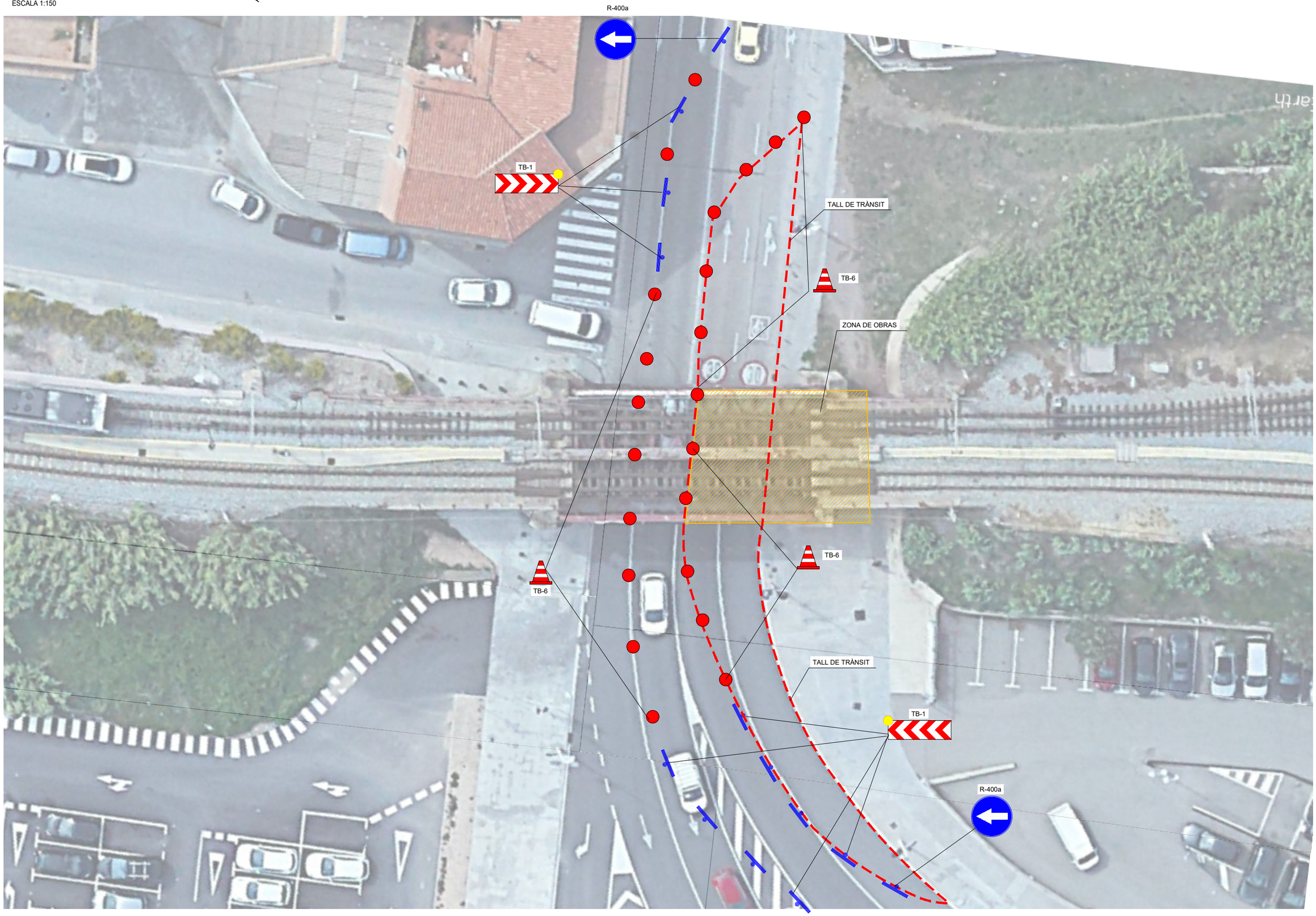
NOM FITXER: 06BF01-F03.dwg

PLÀNOL NÚM.: 08A

FULL 1 DE 3

# PONT SOBRE CARRETERA DE VIC

ESCALA 1:150




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| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
FASE 2 DESVIAMENT PROVISIONAL

DATA: GENER 2024

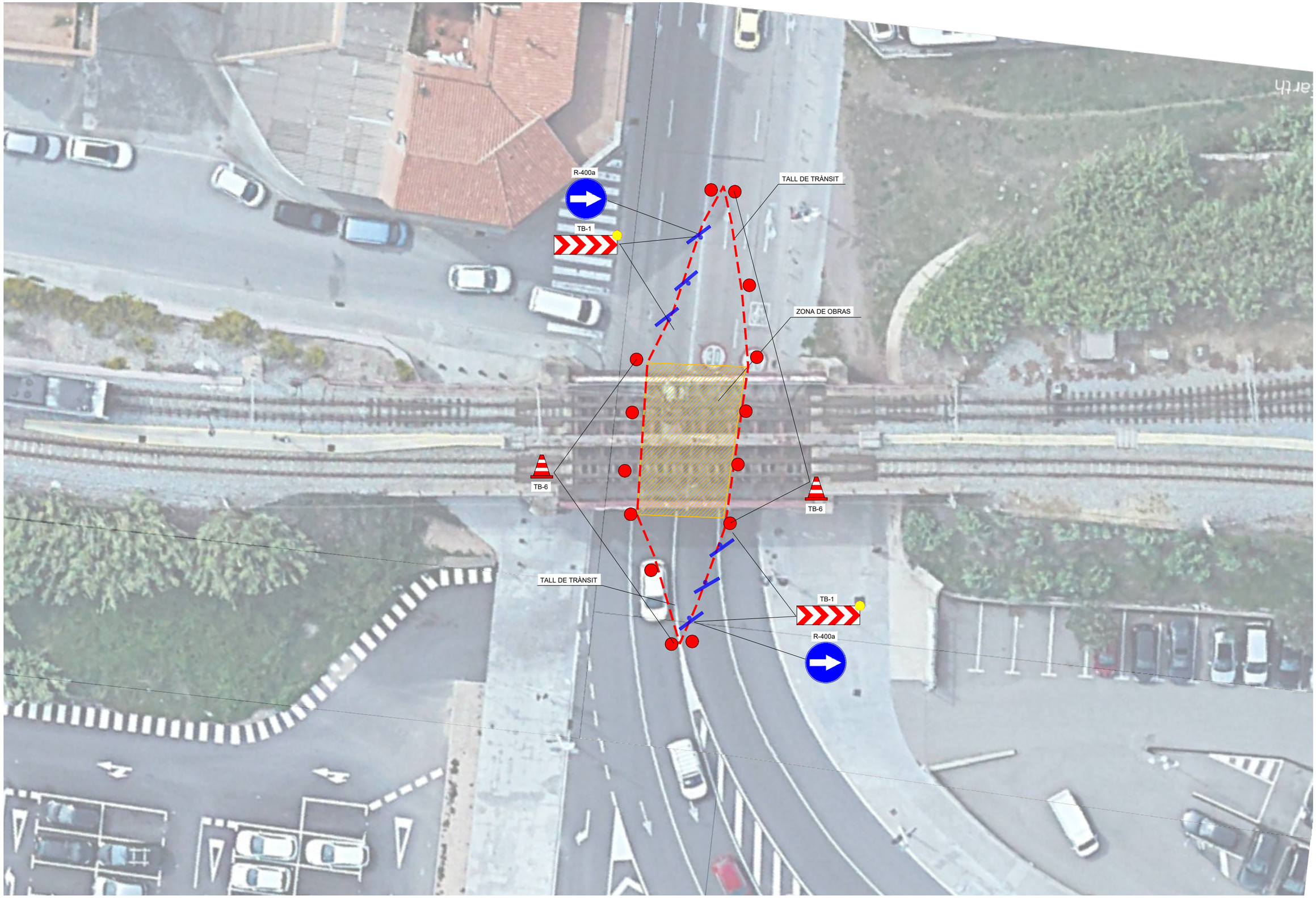
PLÀNOL NÚM.: 08A

NOM FITXER: 06BF01-F03.dwg

FULL 1 DE 3

## PONT SOBRE CARRETERA DE VIC

ESCALA 1:150




02/02/2024 C:\USERS\AVERA\DROPBOX (PEDELTA)\DATA\PRJA\ESP\23B117PMAN-FGC\07BIM\01PH1\04DRW\06BF01-F03.DWG

| | |
|---|---|
| ELAB. | AVB |
| REV. | IV |
| APR. | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
FASE 3 DESVIAMENT PROVISIONAL

DATA: GENER 2024

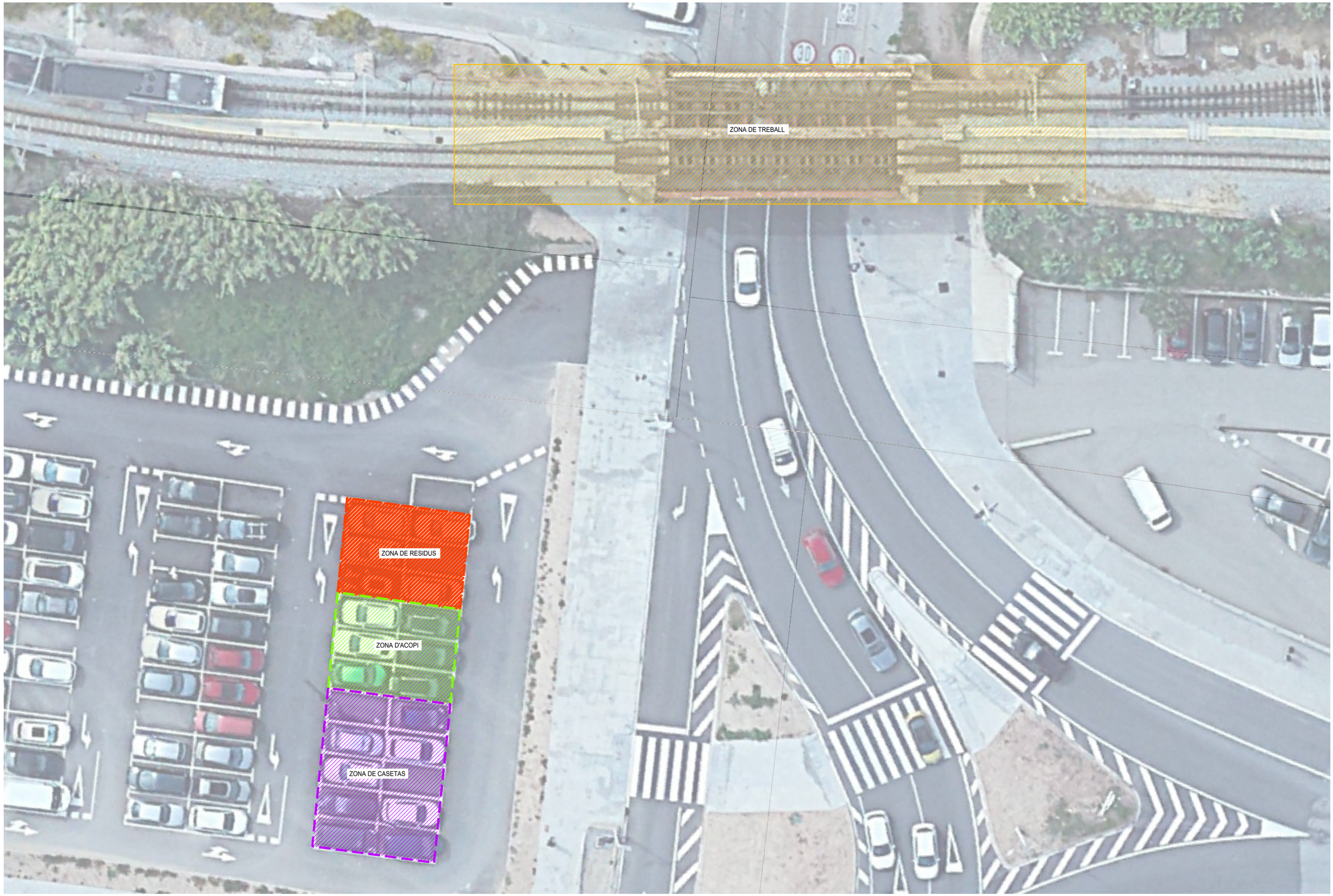
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PLÀNOL NÚM.: 08A

FULL 1 DE 3

# PONT SOBRE CARRETERA DE VIC

ESCALA 1:150




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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE:

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
SENYALITZACIÓ, ABALISAMENT I DEFENSES
OCUPACIONS TEMPORALS

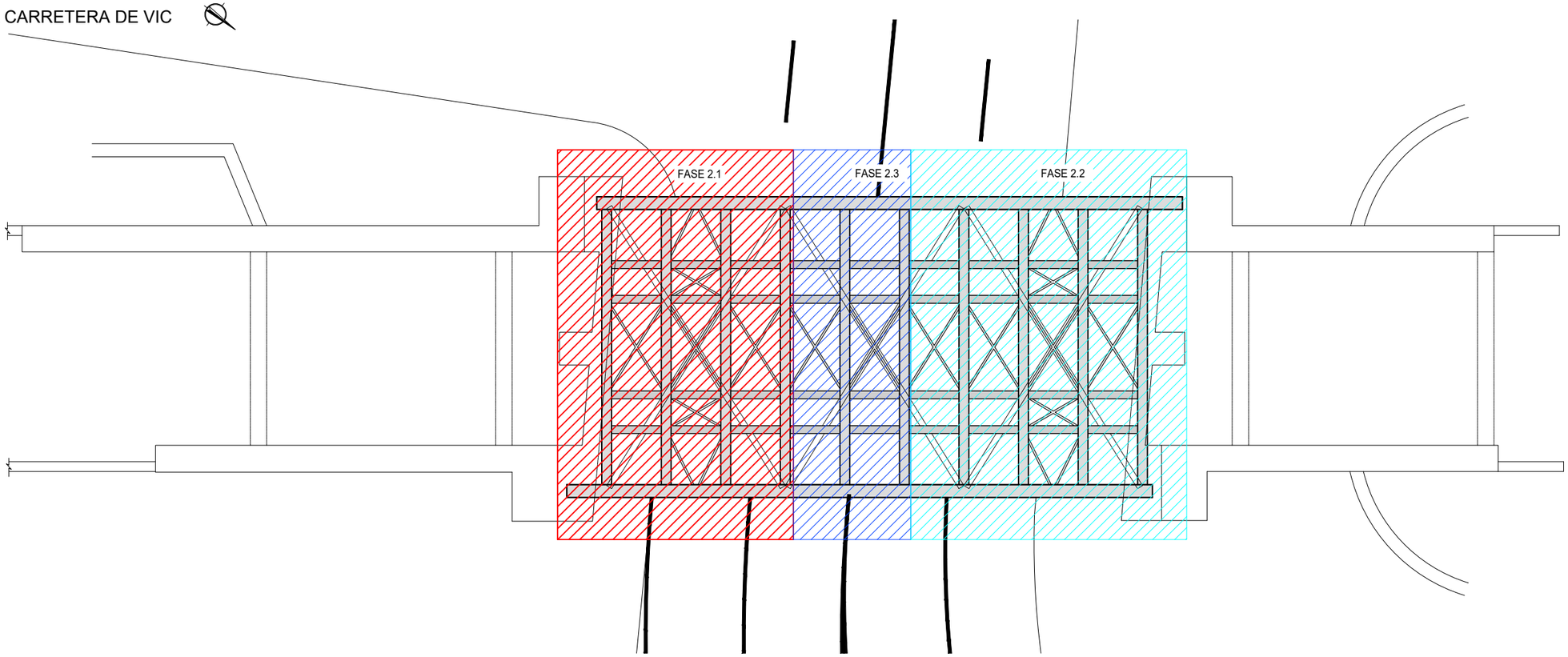
DATA: GENER 2024

PLÀNOL NÚM.: 07A

NOM FITXER: 07AF01.dwg

FULL 1 DE 1

PONT SOBRE CARRETERA DE VIC
ESCALA 1:150




## FASE 1: TREBALLS PREVIS

- S'instal·laran els tancaments de la zona de casetes, apilaments, contenidors, es col·locaran els senyals de seguretat i salut, s'habilitaran les casetes d'obra (oficina, menjador, sanitaris, vestidor, caseta d'eines) incloent els subministraments a casetes d'aigua, llum. Es prepararan les zones de recollida i es col·locaran els contenidors de residus.

## FASE 2: ACTUACIONS DE REPARACIÓ I CONSERVACIÓ

*FASE 2.1: ACTUACIONS AL TALL FASE 1*

- Tall de trànsit per fase 2.1.
- Instal·lació de mitjans auxiliars i proteccions (lones, xarxa, barrera new jersey etc.)
- Retirada d'arriostrament inferior
- Retirada de tramex
- Neteja amb raig de sorra de sílice
- Campanya d´inspecció i caracteritzáció
- Reparacions: reparació de bigues d´estrep danyades, substitució d'ala inferior de les bigues i arriostrament inferior, Reparació de fissures i soldadures, revisió de bigues del tramex
- Conservació d'aparells de recolzament
- Pintura de protecció
- Col·locació de tramex
- Retirada de mitjans auxiliars i elements de protecció
- Desmantellament del tall fase 2.1

*FASE 2.2: ACTUACIONS AL TALL FASE 2*

- Tall de trànsit per fase 2.2.
- Instal·lació de mitjans auxiliars i proteccions (lones, xarxa, barrera new jersey etc.)
- Retirada d'arriostrament inferior
- Retirada de tramex
- Neteja amb raig de sorra de sílice
- Campanya d´inspecció i caracteritzáció
- Reparacions: reparació de bigues d´estrep danyades, substitució d'ala inferior de les bigues i arriostrament inferior, Reparació de fissures i soldadures i revisió de bigues del tramex
- Conservació d'aparells de recolzament.
- Pintura de protecció.
- Col·locació de tramex
- Retirada de mitjans auxiliars i elements de protecció
- Desmantellament del tall fase 2.2

*FASE 2.3: ACTUACIONS AL TALL FASE 3*

- Tall de trànsit per fase 2.3.
- Instal·lació de mitjans auxiliars i proteccions (lones, xarxa, barrera new jersey etc.)
- Retirada d'arriostrament inferior
- Retirada de tramex
- Neteja amb raig de sorra de sílice
- Campanya d´inspecció i caracteritzáció
- Reparacions: Substitució d'ala inferior de les bigues i arriostrament inferior, reparació de fissures i soldadures i revisió de bigues del tramex
- Pintura de protecció
- Col·locació de tramex
- Retirada de mitjans auxiliars i elements de protecció
- Desmantellament del tall fase 2.3

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| ELAB. | REV. | APR. |
|---|---|---|
| AVB | IV | JJG |

FGC

CONSULTOR: PEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL·LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
FASES DE CONSTRUCIÓ
FASES DE CONSTRUCIÓ (I)

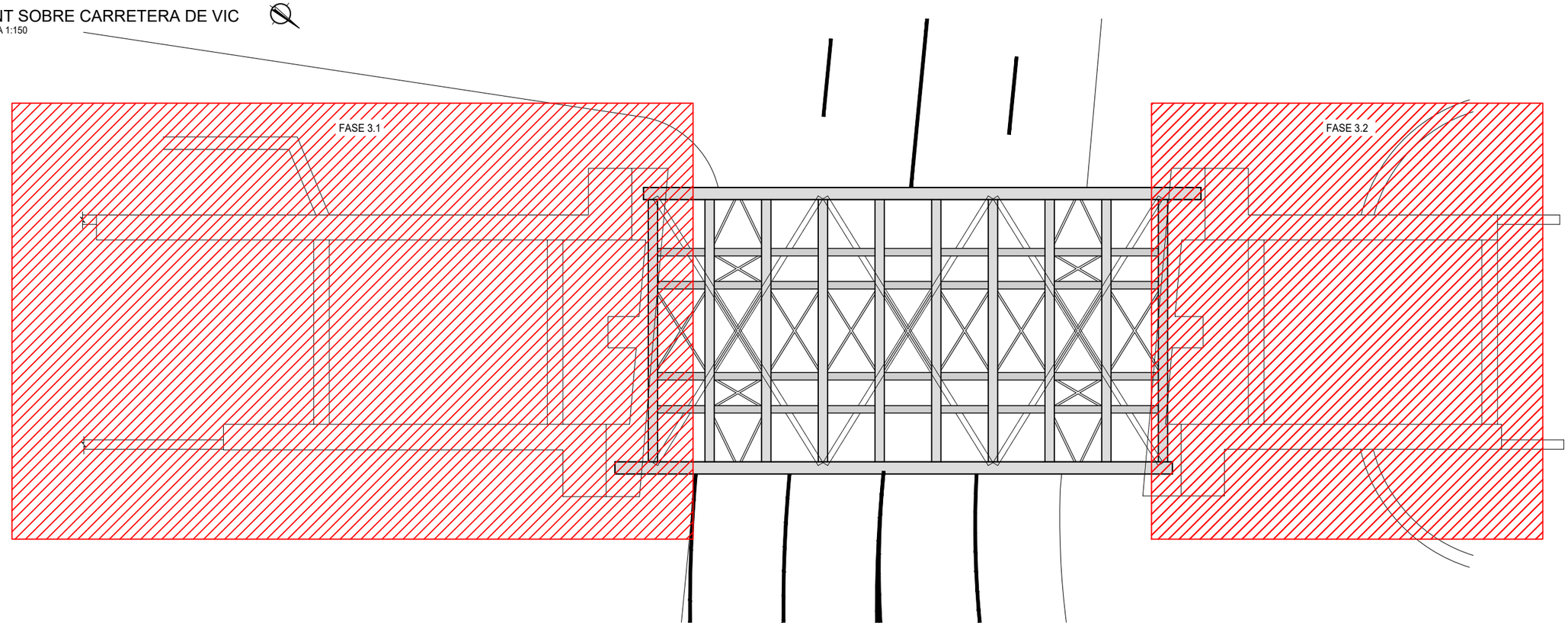
DATA: GENER 2024

PLÀNOL NÚM.: 08A

NOM FITXER: 08AF01-F02.dwg

FULL 1 DE 2

PONT SOBRE CARRETERA DE VIC
ESCALA 1:150




## FASE 3: ACTUACIONS DE REPARACIÓ I COSERVACIÓ DELS VANOLS D'APROXIMACIÓ

*FASE 3.1: VANOL D'APROXIMACIÓ COSTAT BARCELONA*

- Es farà el tall i desviació de trànsit de vianants.
- Instal·lació de de mitjans auxiliars i proteccions.
- Reparacions: Neteja i regeneració superficial, tractament hidròfug i consolidant, segellat de fissures i instal·lació de drens.
- Desmantellament de l´ocupació i mitjans.

*FASE 3.2: VANOL D'APROXIMACIÓ COSTAT MANRESA*

- Es farà el tall i desviació de trànsit de vianants.
- Instal·lació de de mitjans auxiliars i proteccions.
- Reparacions dels carreus de l'estrep.
- Reparacions: Neteja i regeneració superficial, tractament hidròfug i consolidant, segellat de fissures i instal·lació de drens.
- Desmantellament de l´ocupació i mitjans.

## FASE 4: NETEJA I ACABAT DE LES OBRES

Es retirarà i desmantellarà tota la implantació d'obres (casetes d'obres, zona apilaments, subministraments a casetes d'aigua, llum, contenidors de residus, retirada de tancaments d'obra, retirada de senyals de seguretat i salut), es realitzaran els repassos i la reparació de petits desperfectes que indiqui la direcció d'obres i es procedirà a una neteja exhaustiva de tota la zona d'obres per tal de deixar-ho en condicions equivalents previa a l´execució de l´obra.

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| AVB | IV | JJG |

FGC

CONSULTOR: EPEDELTA

AUTOR DEL PROJECTE: JAVIER JORDÁN GARCÍA

TÍTOL DEL PROJECTE: INFORME DE L'ESTAT DE CONSERVACIÓ DELS PONTS METÀL-LICS DE LA XARXA DELS FERROCARRILS DE LA GENERALITAT DE CATALUNYA

CLAU PROJECTE

ESCALES: S/E — ORIGINALS — GRÀFIQUES

NOM DEL PLÀNOL: PONT SOBRE LA CARRETERA DE VIC P.K. 060/720
FASES DE CONSTRUCIÓ
FASES DE CONSTRUCIÓ (I)

DATA: GENER 2024

NOM FITXER: 08AF01-F02.dwg

PLÀNOL NÚM.: 08A

FULL 1 DE 2

COL·LEGI D'ENGINYERS DE CAMINS, CANALS I PORTS CATALUNYA

| Expedient | Data |
|---|---|
| 2024/01262/01 | 10/04/2024 |

V I S A T

# DOCUMENT NÚM. 3: PLEC DE PRESCRIPCIONS TÈCNIQUES

CONTROL DE DOCUMENTACIÓ

| Versió | Data | Realitzat | Revisat | Aprovat |
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| 0 | 01/02/2024 | MAP+DJS | | |
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ACTUALITZACIONS

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*NOM FITXER : 240201 PMAN-PED-PLEC_ v00*

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# PART 1A.- INTRODUCCIÓ I GENERALITATS

## ARTICLE 100.- DEFINICIÓ I ÀMBIT D'APLICACIÓ

100.1. DEFINICIÓ

El present Plec de Prescripcions Tècniques Particulars, constitueix el conjunt d'instruccions, normes i especificacions que, juntament amb les complementàries que s'indiquin, defineixen les condicions tècniques de les obres definides al *"Projecte de reparació del pont de crta. De Vic a la línia Llobregat – Anoia dels Ferrocarrils de la Generalitat de Catalunya".*

100.2. APLICACIÓ DEL PLEC DE PRESCRIPCIONS TÈCNIQUES GENERALS

Serà d'aplicació íntegra, en aquest Projecte, el Plec de Prescripcions Tècniques Generals per a obres de Carreteres i Ponts, en endavant denominat de forma resumida PG-3.

El text vigent del PG-3 és l'aprovat pel Ministeri d'Obres Públiques, segons Ordre Ministerial de 6 de Febrer de 1976, publicada al BOE de 7 de Juliol de 1976, amb l'última actualització de Desembre de 2014. Des de la publicació , el contingut del PG-3 ha estat modificat nombroses vegades. A continuació s'inclouen les modificacions actualment en vigor compreses a les Ordres Ministerials i a les Ordres Circulars de la Direcció General de Carreteres.

- Ordre ministerial de 28 de setembre de 1989, que ha revisat l'article 104 "Desenvolupament i control de les obres".
- Ordre Ministerial de 27 de desembre de 1999 per la qual s'actualitzen determinats articles del plec de prescripcions tècniques generals per a obres de carreteres i ponts quant a conglomerants hidràulics i lligants hidrocarbonats.
- Ordre Ministerial de 28 de desembre de 1999 per la qual s'actualitza el PPTG per a obres de carreteres i ponts quant a senyalitzacions, abalisament i sistemes de contenció de vehicles.
- Ordre Ministerial (FOM/475/02) de 13 febrer, per la qual s'actualitzen determinats articles del Plec de Prescripcions Tècniques Generals per a obres de carreteres i ponts relatius a formigons i acers
- Ordre FOM/1382/02, de 16 de Maig , que actualitza i incorpora determinats articles del Plec de Prescripcions Tècniques Generals relatius a la construcció d'esplanacions, drenatges i fonamentacions.
- Orde Circular 11/2002 sobre elements prefabricats.
- Ordre Circular 10 bis/2002 per la qual es modifiquen parcialment determinades referències a l'assaig de blau de metilè a les ordres circulars 5/01 i 10/02.
- Ordre Circular 5 bis/2002 sobre les condicions per a l'addició de pols de pneumàtics usats a les barreges bituminoses.
- Ordre Circular 891/2004, d'1 de març, per la qual s'actualitzen determinats articles del plec de prescripcions tècniques generals per a obres de carretera i ponts relatius a ferms i paviments.
- Ordre Circular 21/2007 sobre l'ús i especificacions que han de complir els lligants i barreges bituminoses que incorporin cautxú procedent de pneumàtics fora d'ús.
- Ordre Circular 3818/2007, de 10 de desembre, per la qual es dicten instruccions complementàries per a la utilització d'elements auxiliars d'obra en la construcció de ponts viaris.
- Ordre Circular 24/2008 sobre el plec de prescripcions tècniques generals per a obres de carreteres i ponts (PG-3). Articles: 542-Barreges bituminoses en calent tipus formigó bituminós i 543-Barreges bituminoses per a capes de rodament. Barreges drenants i discontínues.
- Ordre Circular 21bis/2009 sobre betums millorats i betums modificats d'alta viscositat amb cautxú procedent de pneumàtics fora d'ús (nfu) i criteris a tenir en compte per a la fabricació in situ i emmagatzematge a l'obra.
- Ordre Circular sobre el plec de prescripcions tècniques generals per a obres de carreteres i ponts (PG-3). Lligants bituminosos i microaglomerats en fred.
- Ordre Circular 2523/2014, de 12 de desembre, per la qual s'actualitzen determinats articles del plec de prescripcions tècniques generals per a obres de carreteres i ponts, relatius a materials bàsics, a ferms i paviments, i a senyalització, abalisament i sistemes de contenció de vehicles.

Aquest Plec de Prescripcions Tècniques Particulars s'ha articulat de la mateixa manera que el Plec General. Si no es fa referència a determinats articles o apartats, s'entendrà que es mantenen íntegrament les prescripcions del Plec de Prescripcions Tècniques Generals, PG-3, o de les OO.MM. i OO.CC. que els modifiquin.

En tot el que no s'especifica en el present Plec, el Contractista haurà de complir allò que s'ha especificat en les normes i disposicions pròpies de Ferrocarrils de la Generalitat de Catalunya (en endavant FGC), Direcció d'Obra així com en les normatives d'obligat compliment, en especial a aquelles relatives a la Prevenció de Riscos Laborals i Reial Decret 1627/1997.

El Contractista està obligat a conèixer i complir les Instruccions, normes i Plecs de qualsevol tipus promulgats per FGC o per les seves entitats delegades, que tinguin aplicació en els treballs a realitzar, tant si estan citats en el present Plec com si no, quedant a la decisió del Director d'Obra i la propietat de FGC la resolució de qualsevol discrepància que pugui existir entre elles i el que disposa aquest Plec.

100.3. ALTRES INSTRUCCIONS, NORMES I DISPOSICIONS APLICABLES

A més del present Plec de Condicions, i subsidiàriament pel que fa a ell, seran d'aplicació les normatives tècniques següents:

- UNE-EN 1990: Eurocodi 0 : Bases de càlcul d'estructures
- UNE-EN 1991-1: Eurocodi 1: Accions en estructures. Part 1: Accions generals
- UNE-EN 1991-2: Eurocodi 1: Accions en estructures. Part 2: Càrregues de trànsit en ponts
- UNE-EN 1992-1: Eurocodi 2: Projecte d'estructures de formigó. Part 1: Regles generals
- UNE-EN 1993-1-1: Eurocodi 3: Projecte d´estructures d´acer. Part 1-1: Regles generals i regles per a edificis
- UNE-EN 1993-1-5: Eurocodi 3: Projecte d´estructures d´acer. Part 1-5: Plaques carregades al plànol
- UNE-EN 1993-1-9: Eurocodi 3: Projecte d´estructures d´acer. Part 1-9: Fatiga
- UNE-EN 1993-2: Eurocodi 3: Projecte d´estructures d´acer. Part 2: Ponts
- UNE-EN 1994-1: Eurocodi 4: Projecte d´estructures mixtes d´acer i formigó. Part 1: Regles generals
- UNE-EN 1994-2: Eurocodi 4: Projecte d´estructures mixtes d´acer i formigó. Part 2: Ponts
- UNE-EN 1998-1: Eurocodi 8: Projecte d'estructures sismorresistents. Part 1: Regles generals
- UNE-EN 1998-2: Eurocodi 8: Projecte d'estructures sismorresistents. Part 1: Ponts
- Instrucció de Formigó Estructural (EHE-08), pel que fa a les característiques dels materials
- Instrucció d'Acer Estructural (EAE-11), pel que fa a les característiques dels materials
- Recomanació de proves de càrrega en ponts viaris. Ministeri de Foment, 1999
- ISO 13822:2010 Bases for design of structures — Assessment of existing structures. 2010
- UNEIX EN 1337-3:2005. Suports estructurals. Part 3: Suports elastomèrics. UNEIX any 2005
- Reial Decret 256/2016, de 10 de juny, pel qual s'aprova la Instrucció per a la recepció de ciments (RC – 16)
- UNE-EN 12620:2003 Àrids per a formigó.
- UNEIX EN ISO 12944-2:2018 Pintures i vernissos. Protecció d'estructures d'acer davant de la corrosió mitjançant sistemes de pintura protectors
- UNE-EN 10080:2006 Acer per a l'armat del formigó. Acer soldable per a armadures de formigó armat. Generalitats.
- UNE-EN 10025-1:2006 Productes laminats en calent d'acers per a estructures. Part 1: Condicions tècniques generals de subministrament.
- UNE-EN 10025-2:2006 Productes laminats en calent d'acers per a estructures. Part 2: Condicions tècniques de subministrament dels acers estructurals no aliats.
- UNE-EN 10210-1:1994 Perfils buits per a construcció, acabats en calent, d'acer no aliat de gra fi. Part 1: condicions tècniques de subministrament.
- UNE-EN 10219-1:1998 Perfils buits per a construcció conformats en fred d'acer no aliat i de gra fi. Part 1: Condicions tècniques de subministrament.
- UNE-EN 10162:2005 Perfils d'acer conformats en fred. Condicions tècniques de subministrament. Toleràncies dimensionals i de la secció transversal.
- UNE-ENV 1090-1:1997 Execució d'estructures d'acer. Part 1: Regles generals i regles per a edificació.
- NBE EA-95 "Estructures d'acer en edificació."
- UNE-EN ISO 8501-1:2008 Preparació de substrats d´acer prèvia a l´aplicació de pintures i productes relacionats. Avaluació visual de la neteja de les superfícies. Part 1: Graus d'òxid i preparació de substrats d'acer no pintats després d'eliminar totalment els recobriments anteriors. (ISO 8501-1:2007).
- UNE-EN 13808:2013 Betums i lligants bituminosos. Especificacions de les emulsions bituminoses catiòniques.
- UNE 104231:1999 Impermeabilització. Materials bituminosos i bituminosos modificats. Emulsions asfàltiques.

- UNE-EN 13108-1:2008 Mescles bituminoses. Especificacions de materials. Part 1: Formigó bituminós.
- UNE-EN 12004:2001 Adhesius per a rajoles ceràmiques. Definicions i especificacions.
- UNE-EN 13163:2009 Productes aïllants tèrmics per a aplicacions a l'edificació. Productes manufacturats de poliestirè expandit (EPS). Especificació.
- DIN 7865 (2) 02.82 Làmines elastomèriques per segellar juntes al formigó. Condicions del material i assaigs.
- UNE 53628:1988 Elastòmers. Cautxú vulcanitzat. Juntes de dilatació preformades utilitzades entre blocs de formigó a autopistes. Especificacions per als materials.
- Orde FOM/534/2014, de 20 de març, per la qual s'aprova la norma 8.1-IC senyalització vertical de la Instrucció de Carreteres.
- UNE-EN 12899:2010 Senyals verticals fixes de circulació.
- UNE 135331:2011 Senyalització vertical. Senyals metàl·lics permanents. Zona no retroreflectant. Pintures. Característiques i mètodes d'assaig.
- Orde de 16 de juliol de 1987 per la qual s'aprova la Norma 8.2-IC Marques Vials, de la Instrucció de carreteres.
- UNE-EN 1423:2013 Materials per a senyalització vial horitzontal. Materials de postbarrejat. Microesferes de vidre, àrids antilliscants i barreges de tots dos.
- UNE-EN 1871:2000 Materials per a senyalització vial horitzontal. Propietats físiques.
- UNE-EN 12802:2012 Materials per a senyalització vial horitzontal. Mètodes de laboratori per a la identificació.
- UNE-EN 1436:2009+A1:2009 Materials per a senyalització vial horitzontal. Comportament de les marques vials aplicades sobre la calçada.
- Plec de Prescripcions Tècniques Generals per a Canonades de Sanejament de Poblacions (OM 15 Setembre 1986)
- Norma 5.2-IC drenatge superficial de la Instrucció de Carreteres.
- UNE-EN 1456:2002 Sistemes de canalització en materials plàstics per a sanejament soterrat o aeri amb pressió. Poli ( clorur de vinil) no plastificat (PVC-U).
- UNE-EN 1452:2000 Sistemes de canalització en materials plàstics per a conducció d'aigua. Poli ( clorur de vinil) no plastificat (PVC-U).
- Ordre Circular 35/2014 Sobre Criteris d'Aplicació De Sistemes de Contenció de Vehicles del Ministeri de Foment
- UNE 135121:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Tanca de perfil de doble ona. Materials, geometria, dimensions i assaigs.
- UNE 135124:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Condicions de manipulació i emmagatzematge. Procediments de muntatge i metodologia de control.
- UNE 135122:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Elements accessoris de les barreres metàl·liques. Materials, geometria, dimensions i assaigs.
- UNE-EN 1317-1:2011 Sistemes de contenció per a carreteres
- Directiva núm. 89/106/CEE i Marcat CE de Productes de Construcció (BOE núm. 36 de 11.02.2004)
- Tota disposició legal vigent durant l'obra i, particularment, les de seguretat i senyalització.

Serà de responsabilitat del Contractista conèixer-les i complir-les, sense poder al·legar, en cap cas, que no se li hagi fet comunicació explícita.

A més de les instruccions, recomanacions i normes tècniques anteriorment citades, són aplicables les disposicions següents:

- Llei 9/2017, de 8 de novembre, de Contractes del Sector Públic, per la qual es transposen a l'ordenament jurídic espanyol les Directives del Parlament Europeu i del Consell 2014/23/UE i 2014/24/UE, de 26 de febrer de 2014.
- Reial Decret 1098/2001, de 12 d'octubre, pel qual s'aprova el Reglament General de la Llei de Contractes de les Administracions Públiques. (BOE 26/10/2001)
- Plec de Clàusules Administratives Generals per a la contractació d'obres de l'Estat, aprovat pel Decret 3854/1970 de 31 de desembre
- Plec de Clàusules Administratives Particulars que s'estableixin per a la contractació d'aquestes obres
- Reial Decret 1627/1997 de 24 d' octubre (BOE de 25 d'octubre de 1997) pel qual s'estableix l'obligatorietat de la inclusió d'un estudi de seguretat i salut en el treball en els projectes d'edificació i obres públiques
- Llei 31/1995 de 8 de novembre de prevenció de riscos laborals
- Llei 32/2006, de 18/10/2006, Reguladora de la Subcontractació al Sector de la Construcció (BOE 19/10/2006)

- Ordre de 9 de març de 1971 per la qual s'aprova l'Ordenança general de seguretat i higiene en el treball.

S'estarà, en tot cas, al que disposa la legislació vigent en matèria mediambiental, de seguretat i salut, i d'emmagatzematge i transport de productes de construcció.

## ARTICLE 102.- DESCRIPCIÓ DE LES OBRES

102.1. DESCRIPCIÓ GENERAL

Prenent com a punt de partida l'estat actual del pont s'han proposat diverses millores per incrementar la seguretat estructural del pont existent i afavorir- la conservació.

Pel que fa a l'estructura metàl·lica, les reparacions proposades són:

- S'ha de reparar l'ànima de les bigues d'estrep, ja que hi ha perforacions. Per això es proposa accedir des de sota del tauler i retirar les L que cobrin l'ànima i les xapes inferiors. Posteriorment es talla la zona malmesa i es remulla amb soldadura. A més, i per evitar, en la mesura del possible, la presència de soldadures en elements antigues, es proposa reblar els perfils en L i les xapes per uns de nous. Finalment, s'ha comprovat que aquesta connexió té problemes de capacitat estructural, per la qual cosa es proposa el seu reforç.
- Es proposa substituir les xapes de l' ala inferior de totes les bigues transversals a causa del seu avançat estat de deteriorament. A causa dels problemes d' accessibilitat als perns, i per tal de simplificar la reparació, es proposa que la nova xapa se soldi a les L existents. Per això, la xapa serà més estreta que les L, 230 mm, i de gruix idèntic a la suma de les dues, 20 mm.
- S' han de substituir els arriostraments inferiors per uns de major capacitat, ja que els actuals no compleixen amb la normativa. Per això es proposa reblar els perfils actuals L 70x10 per uns L 90x10. A més, s' ha de verificar l' estat de les xapes de connexió i reblar-les si és necessari.
- Per a la reparació de la fissura existent en la diagonal, es proposa la tècnica d'adossar xapes als costats, ja que és el recomanat en aquest tipus de estructures roblonades.
- Es recomana realitzar les tasques habituals de manteniment en recolzaments: neteja, aplicació de greix i remull de proteccions.
- Finalment, és important en aquesta mena d'estructures assegurar la seva durabilitat mitjançant l'aplicació d'un tractament anticorrosiu adequat. Per a això, primerament s'ha de netejar el pont amb doll de sorra, deixant al descobert l'estructura metàl·lica i eliminant l'òxid. Posteriorment s'ha d'inspeccionar l'estructura per a identificar soldadures degradades i altres possibles fissures en elements metàl·lics. Aquests desperfectes s'han de reparar seguidament. I finalment, es pot aplicar la nova capa de pintura. Es proposa que la pintura aquest preparada per a un ambient agressiu (Classe C5) i que tingui una durabilitat alta (Més de 15 anys).

Pel que fa als vanols d' aproximació en carreuat, les principals reparacions proposades són:

- Reparació dels arrebossats en les voltes. Es proposa primerament la seva neteja mitjançant doll a pressió. Seguidament s'instal·laran drenis californians per a millorar el drenatge dels murs i evitar futures humitats. A més, es reparessin les zones deteriorades dels arrebosats. Finalment, s'apliqués una pintura de protecció.
- També s'han de reparar els altres arrebossats, ja que presenten algunes fissures.
- Alguns carreus estan trencats i altres presenten fissures. A més, algunes juntes entre carreus estan degradades. S'han de reparar.
- En l'extrem exterior del mur del costat Barcelona s'ha després un carreu. S'ha de reposar el seu volum.
- Algunes armadures en els murs guarda balast estan exposades. Es recomana sanejar el formigó en aquestes zones.

Finalment, es proposa la neteja dels murs, ja que presenten pintades i eflorescències.

102.2. PLÀNOLS

A petició del director d'obra, el contractista prepararà tots els plànols de detalls que s'estimin necessaris per a l'execució de les obres contractades. Aquests plànols se sotmetran a l'aprovació de l'esmentat director , acompanyant, si cal, les memòries i càlculs justificatius que es requereixin per a una millor comprensió. En concret, el Contractista, juntament amb el taller metàl·lic on es fabriquin els perfils i les xapes, prepararà els plànols de taller que se sotmetran a l'aprovació de la Direcció d'Obres.

De la mateixa manera, el contractista prepararà els quadres i els plànols d'especejament d'armadures dels elements de formigó armat.

Pel que fa a l'ampit de contenció, el contractista prepararà el pla de replanteig amb els diferents trams a executar i els punts on es realitzarà les perforacions per a ancoratges químics de l’ampit.

En tots els casos, prèviament al seu transport i execució a l'obra, s'haurà de comptar amb l'aprovació expressa de la Direcció d'Obres.

102.3. CONTRADICCIONS, OMISSIONS O ERRORS

Si el Director d'Obra trobés incompatibilitat en l'aplicació conjunta de totes les limitacions tècniques que defineixen una unitat, aplicarà només aquelles limitacions que a parer seu reportin més qualitat.

## ARTICLE 103.- INICI DE LES OBRES

103.1. INSPECCIÓ DE LES OBRES

La inspecció de les obres abasta també els tallers, fàbriques, pedreres o abocadors, on es produeixin, preparin, extreguin o dipositin els materials o es realitzin treballs per a les obres.

103.3. PROGRAMA DE TREBALLS

És aplicable el que disposa la Llei 30/2007 de Contractes del Sector Públic que estableix l'abast del programa de treball que haurà de presentar el Contractista.

El Contractista proposarà a l'Administració, en el termini d'un (1) mes a partir de la data de la notificació de l'autorització per a la iniciació de les obres, un programa de treballs, desenvolupat pel mètode PERT, CPM o anàlegs i diferenciant com a mínim, els grups d'unitats relatives a esplanacions, ferms, estructura, drenatge i obres complementàries, de manera que no superin els terminis parcials ni final que per a les mateixes unitats es fixen al programa d'obra que s'inclou al Projecte.

L'adjudicatari presentarà igualment una relació completa dels serveis i material que es comprometi a utilitzar en cadascuna de les etapes del pla d'obra. Els mitjans proposats i acceptats per l'enginyer director quedaran adscrits a les obres sense que en cap cas puguin ser retirats pel contractista sense autorització expressa de l'enginyer director.

L'acceptació del Pla i la posada a disposició dels mitjans proposats no implicarà cap exempció de responsabilitat per part del Contractista en cas d'incompliment dels terminis totals o parcials convinguts.

103.4. ORDRE D'INICIACIÓ DE LES OBRES

El Contractista iniciarà les obres tan aviat com rebi l'ordre del director d'obra i començarà els treballs als punts que s'assenyalin.

## ARTICLE 104.- DESENVOLUPAMENT I CONTROL DE LES OBRES

104.1. REPLANTEJAMENT DE DETALL DE LES OBRES

El Contractista proveirà, a costa seva, tots els materials, equips i mà d'obra necessaris per efectuar els replantejaments esmentats i determinar els punts de control i de referència que es requereixin.

El Contractista serà responsable dels replantejaments necessaris quant a la seva execució i prepararà els plànols necessaris que els sotmetrà a l'aprovació del Director de les Obres perquè les obres puguin ser realitzades.

Abans de començar les obres es farà el replanteig general de les mateixes, marcant els traços sobre el terreny amb estaques, claus, senyals, on aquestes siguin possibles, o punts ben definits o referències que tinguin suficient garantia de permanència perquè durant el temps de construcció de les obres es pugui fixar amb relació a elles les alineacions i rasants i la resta de detalls de les obres.

La comprovació del replanteig ha d'incloure com a mínim, l'eix principal dels diversos trams d'obra i els eixos principals dels serveis desviats; així com els punts fixos o auxiliars necessaris per als successius replantejaments de detall.

A més del replanteig general es compliran les següents prescripcions:

a) El director o el personal subaltern en qui delegui, quan es tracta de part d'obra d'importància, executarà sobre el terreny el replanteig deixant perfectament definides les alçades corresponents a enrases de fonaments.

b) No es procedirà al rebliment de les rases de fonaments sense que el director o subaltern, segons els casos, prenguin de conformitat amb el Contractista i en presència d'aquest, les dades necessàries per cubicar i valorar aquestes rases.
A mesura que es vagin elevant les fàbriques, es prendran igualment les dades que han de servir per a abonar-les.

c) Seran a compte del Contractista totes les despeses que s'originin en practicar els replantejaments i reconeixements a què es refereix aquest article.

104.3. ASSAJOS

L'enginyer director de les obres assenyalarà la classe i el nombre d'assajos de contrast a realitzar per al control de la qualitat dels materials i de les unitats d'obra executades. per cent del Pressupost d'Execució (per Contracta) del Projecte, d'acord amb l'article 35 del PCAG

Els materials i les unitats o les parts d'unitat d'obra necessaris per als assajos i les proves de control de qualitat no es consideren, a efectes de mesurament com a obra executada, i s'han de reposar en cas d'obtenir-se d'elements d'obra ja acabats.

No es computaran com a despeses les derivades del control de qualitat d'unitats que, com a conseqüència d'aquest, donessin resultat negatiu per incorrecta execució o ús de materials inadequats.

Excepte indicació expressa de la Direcció d'Obra, els assaigs a realitzar amb càrrec a aquest un per cent i els addicionals que poguessin exigir-se es valoraran segons tarifes oficials, deduïdes del decret 136, de 4 de febrer de 1960 i les seves actualitzacions posteriors, o les tarifes aplicades per laboratoris oficials.

No seran objecte d'abonament independent i addicional els desplaçaments a l'obra dels treballadors.

Els assajos ordenats per la Direcció de les Obres per sobre de l'un per cent del Pressupost d'Execució per Contracta seran abonats al Contractista només si els resultats mostren qualitat i execució adequades, i no en cas contrari.

Si no s'efectuen els assaigs per mitjans propis i directament per la Direcció de les Obres, el pagament dels assajos esmentats al laboratori executant es durà a terme pel contractista, a qui rescabalarà l'Administració per imputació a l'un per cent (1%) indicat valorant-los segons els criteris anteriors, no incloent-hi els desplaçaments a obra dels treballadors.

L'abonament es farà en els terminis indicats per a pagament a subcontractistes i col·laboradors a la llei 13/1995.

Els procediments d'assaig s'ajustaran a normes oficials, i per part del Contractista no es podrà exigir responsabilitat ni indemnització, ni es podrà adduir com a causa justificada de demora en l'execució, l'ús de mètodes d'assaig convencionals si s'efectuen amb la diligència deguda . A aquest objecte, el Contractista programarà els seus talls de manera que es tinguin en compte aquestes demores. Per això, el Contractista formalitzarà dia a dia una petició d'assajos a executar per conclusió de talls o amb reconeixement durant la seva execució, per al dia o dies successius, de manera que per la Direcció d'obra o organització en qui delegui s'organitzi el control , amb comunicació al contractista.

Per la Direcció de l'obra no es consideraran vàlids sinó els resultats obtinguts pels seus mitjans propis o els assenyalats per ella. D'aquesta manera, no seran acceptats els resultats obtinguts per mitjans de control del contractista en cas de discrepància amb els de la Direcció d'obra.

L'aclariment d'aquests casos, i a iniciativa del Contractista, serà efectuat per laboratoris oficials o per laboratoris prèviament acceptats per la Direcció de les Obres.

Si d'aquests nous assajos resultés l'acceptació del material o la unitat d'obra, l'Administració estaria obligada a la consideració dins de l'un per cent del Pressupost d'Execució per Contracta o a l'abonament, en cas d'haver-se sobrepassat, d'ambdós assajos, amb els criteris abans indicats.

Per al control de rebliments i capes de ferms, el contractista posarà a disposició de la Direcció d'obra i de l'eventual gestor de control un camió carregat, i, si es fan servir sistemes radioactius, un peó per a preparació de perforacions, i els costos de tot això són de compte del contractista.

Si la realització de proves, presa de mostres o qualssevol altres operacions de control requerissin de senyalització o de regulació del trànsit, tots els mitjans auxiliars, personals o materials, que siguin necessaris seran aportats pel Contractista, sense que això doni dret a abonament ni cap indemnització.

104.4. MATERIALS

Tots els materials que s'utilitzin a les obres, hauran de complir les condicions que s'estableixen als Plecs de Prescripcions Tècniques, podent ser rebutjats en cas contrari per l'Enginyer Director. Per això, tots els materials que es proposi ser utilitzats a l'obra han de ser examinats i assajats abans de la seva acceptació.

El no rebuig o l'acceptació d'una procedència no impedeix el rebuig posterior de qualsevol partida de material que no compleixi les prescripcions i fins i tot l'eventual prohibició d'aquesta procedència.

En particular, no es produiran aprovacions genèriques de procedències o préstecs, sinó que es produiran acceptacions concretes de materials un cop posats en obra.

Si en els documents contractuals hi ha alguna marca d'un producte industrial per designar-lo, s'entendrà que aquesta menció es constrenyi a les qualitats i les característiques del producte, i el Contractista pot utilitzar productes d'una altra marca o model que tingui les mateixes o superiors.

Si no es fixés una determinada procedència, el contractista notificarà al director de les obres amb antelació suficient la procedència dels materials que es proposi utilitzar, a fi que pel director de les obres puguin ordenar-se els assajos necessaris per acreditar-ne la idoneïtat.

L'acceptació de les procedències proposades serà requisit indispensable per a l'amuntegament dels materials, sens perjudici de la comprovació ulterior, en qualsevol moment, de la permanència d'aquesta idoneïtat. L'acceptació de la procedència tindrà un caràcter previ i no implicarà l'acceptació del producte.

104.5. ACOPIS

**L'** emplaçament dels apilaments als terrenys de les obres o als marginals que poguessin afectar-les, així com el dels eventuals magatzems, requeriran l'aprovació prèvia del Director de les obres.

Si els abassegaments d'àrids es disposen sobre el terreny natural, no s'utilitzaran els quinze centímetres (15 cm) inferiors. Aquests apilaments es construiran per capes de gruix no superior a metre i mig (1,5 m), i no per munts cònics: Les càrregues es col·locaran adjacents, prenent les mesures oportunes per evitar la seva segregació.

Si es detecten anomalies en el subministrament, els materials s'apilaran per separat fins a confirmar la seva acceptabilitat. Aquesta mateixa mesura s'aplica quan s'autoritzi un canvi de procedència.

Les superfícies utilitzades s'han de condicionar, una vegada utilitzat l'amuntegament, i les han de restituir al seu Estat natural.

Totes les despeses i indemnitzacions, si escau, que es derivin de la utilització dels apilaments seran a compte del contractista.

104.6 COORDINACIÓ AMB ALTRES ORGANISMES

AJUNTAMENT DE MANRESA /DEPARTAMENT DE VIALITAT

El trànsit viari inferior del pont es troba obert actualment, les actuacions al pont requereix el tall de carrils per fases a la carretera per la reparació de l'estructura en l'àmbit inferior. Les actuacions a executar en l'àmbit superior en el qual el trànsit viari inferior no es veu afectat o es trobin prou allunyats d'aquest, no serà necessari tallar el trànsit, però sempre es plantejaran certes restriccions per la correcta funcionalitat del trànsit perquè no hi hagin accidents o similar.

Es realitzaran talls parcials dels carrils durant les reparacions puntuals en la part inferior del pont.

Com abans s'esmenta es plantejaran certes restriccions per la correcta funcionalitat i fluïdesa del trànsit degut a la reducció d'espai per al pas de vehicles.

- Fase 1: Es tallarà el sentit de circulació viaria del costat Barcelona i s'habilitarà un carril provisional al sentit contrari. S'adjunta el plànol al mateix annex, de l'exemple del tall a realitzar en aquesta fase. Exemple 2.7 del "Manual de ejemplos de sañalización de obras fijas" del Ministeri de Foment.

- Fase 2: Es tallarà el sentit de circulació viaria del costat Manresa i s'habilitarà un carril provisional al sentit contrari. S'adjunta el plànol al mateix annex, de l'exemple del tall a realitzar en aquesta fase. Exemple 2.7 del "Manual de ejemplos de sañalización de obras fijas" del Ministeri de Foment.

- Fase 3: Es tallarà un carril per cada sentit de circulació i deixant el carril exterior de cada sentit lliure. S'adjunta el plànol al mateix annex, de l'exemple del tall a realitzar en aquesta fase. Exemple 2.8 del "Manual de ejemplos de sañalización de obras fijas" del Ministeri de Foment.

En el àmbit superior es tracta del pas d'una via ferroviària de trens de FGC. Durant la realització de les obres de reparació del pont, la via es veurà afectada durant treballs nocturns determinats per les

diferents fases. Mentre l'equip d'obra estigui treballant al pont, la via haurà de ser tallada amb pas alternatiu fins que acabi el treball i no hagi cap tipus de perill.

El contractista realitzarà les gestions necessàries per obtenir els permisos dels departaments de circulació i mobilitat tant de l'Ajuntament de Manresa com de l'àmbit de FGC. Per fer-ho, prepararà els plànols necessaris, assistirà a reunions i s'encarregarà de les sol·licituds pertinents per a l'aprovació de permisos.

SERVEIS AFECTATS

Durant la inspecció visual realitzat amb data de 01 de desembre 2023 s'ha observat que no es preveu necessari consultar les companyies i organismes de la zona ja que no s'estima cap incidència ni afectació en relació als serveis, atès que les actuacions de la reparació es determinen majoritàriament dins de l'àmbit de l'estructura metàl·lica del pont.

104.7 IMPLANTACIÓ D'OBRA

Anirà a càrrec del contractista de les obres:

- La preparació de les zones destinades a casetes d'obra, contenidors, zona de recollida de materials

- El subministrament d'energia, aigua, telecomunicacions i desguàs d'aigües tant de vàters com de lavabos

- El muntatge i el desmuntatge de les casetes d'obra, incloent-hi l'aportació de serveis

- Al marge de les casetes d'obra incloses al pressupost de seguretat i salut (menjador, vestidor, lavabos, etc.), anirà a càrrec del contractista sense possibilitat d'abonament independent la disposició d'una caseta per a reunions d'obra amb CZFB i la Direcció d'Obres, i que inclourà com a mínim:

    - Taula i cadires per a 8 persones de capacitat, assegurant una distància entre persones de 1.5m

    - Estació de treball amb ordinador i impressora-escàner DIN A4/A4 a BL/N i Color

    - Taula i butaca per a lloc de treball permanent per a Direcció d'Obra

    - Taula i butaca per a lloc de treball ocasional per a CZFB.

    - Cambra higiènica amb inodor i lavabo.

    - Nevera

    - Aire condicionat

    - Penjador per abrics

- Anirà a càrrec del contractista sense possibilitat d'abonament independent la disposició de la/les caseta/es d'eines que li siguin necessàries.

- Anirà a càrrec del contractista sense possibilitat d'abonament independent el desmuntatge i desmantellament de la campa d'obra, incloent les casetes, tanques, serveis, restitució i arranjaments necessaris en vials (paviments, voreres, parterres, etc.) que en ocasió del muntatge i ús de la zona de campa d'obres i/o zona d'obres, hagin quedat malmeses, i sempre quedant com a mínim al mateix estat en què estaven prèviament a l'inici de les obres.

104.6 MITJANS AUXILIARS I D'ELEVACIÓ, TREBALLS EN HORARI NOCTURN, EN FESTIUS O EN CAP DE SETMANA

Tots els mitjans auxiliars i mitjans d'elevació que siguin necessaris per a la completa execució de les obres aniran a càrrec del contractista i no seran objecte d'abonament ja que es troben repercutits als preus de pressupost de projecte.

S'aportaran els perfils específics següents: encarregat de treballs, protector de via, pilot de tensió. Tots els costos associats i que siguin necessaris per a la completa execució de les obres aniran a càrrec del contractista i no seran objecte d'abonament ja que es troben repercutits als preus de pressupost de projecte.

104.7. TREBALLS DEFECTUOSOS

Les unitats incorrectament executades o en què s'incorporin materials de qualitat inadequada, no s'han d'abonar, i el Contractista, si s'escau, ha de procedir a la seva demolició i correcta reconstrucció, tot això a costa seva.

En el cas que els treballs defectuosos s'entenguessin acceptables, segons el parer del director d'obra, el contractista podrà optar per la seva demolició i reconstrucció segons el paràgraf anterior, o bé a

conservar el construït defectuosament o amb materials inadequats, amb una rebaixa al preu de la totalitat de la unitat defectuosament executada o a la qual s'hagi incorporat material d'inadequada qualitat xifrada, en percentatge, al triple del percentatge de defecte, estimat aquest com a relació entre la diferència entre la qualitat estimada i el límit establert, com a numerador , i el límit establert com a denominador, expressada aquesta relació en percentatge.

En el cas de propietats a complir de manera positiva el límit establert serà el valor mínim fixat per a estes, i en el cas de propietats a no sobrepassar, el límit establert serà el valor màxim definit per a estes.

De concórrer diversos defectes simultàniament, les penalitzacions per cadascun seran acumulatives.

El límit màxim de penalització, en percentatge, s'estableix al cent per cent (100%) del preu de la unitat d'obra.

El Director de les obres, en el cas que es decidís la demolició i reconstrucció de qualsevol obra defectuosa, podrà exigir el contractista la proposta de les pertinents modificacions al programa de treball, maquinària, equip i personal facultatiu, que garanteixin el compliment de els terminis o la recuperació, si escau, del retard patit.

104.9. SENYALITZACIÓ, BALISAMENT I DEFENSA D'OBRES I INSTAL·LACIONS

L'adjudicatari disposarà per ell mateix la senyalització adequada per garantir la seguretat del trànsit durant l'execució de les obres.

El Contractista està obligat al coneixement i compliment de totes les disposicions vigents sobre senyalització de les obres i instal·lacions i, en particular, del que disposa el Codi de la Circulació, a l'OM de 14 de març de 1.960 i l'OC núm. 1/1960, en la comunicació núm. 32-62 CV de 9 d'agost de 1.962 i les normes 8.1.IC, de 16 de juliol de 1961, 8.2.IC, de març de 1.987 i 8.3.IC, de 31 d'agost de 1.987, referent a la senyalització d'obres a la carretera, i OC sobre "Senyalització, abalisament, defensa i neteja i terminació d'obres fixes en vies fora de poblat", OC300, de 1.989.

Aquesta senyalització l'ha d'aprovar expressament la Direcció d'Obra.

Quan la regulació del trànsit es dugui a terme mitjançant personal amb banderes o un altre mitjà similar, i les persones situades als extrems no es vegin directament, aquestes persones han d'estar proveïdes de radiotelèfons d'abast suficient i en perfecte estat de funcionament.

Si cal establir desviaments provisionals diferents dels projectats, l'adjudicatari ha de garantir una adequada capacitat portant i el seu manteniment en condicions suficientment bones de circulació.

El contractista de l'obra determinarà les mesures que s'hauran d'adoptar en cada ocasió.

El Director de l'obra podrà introduir les modificacions i ampliacions que consideri adequades per a cada tall, mitjançant les oportunes ordres escrites, les quals seran de compliment obligat per part del Contractista. Podrà igualment l'enginyer director de les obres ordenar aquests mitjans d'ofici.

Sense perjudici del que disposa la clàusula 23 de les Administratives Generals per a la Contractació d'Obres de l'Estat, ni dels articles 104.9 i 106.3 del Plec de Prescripcions Tècniques Generals per a obres de carreteres i ponts, no s'hauran d'iniciar activitats que afectin la lliure circulació per una via de la Xarxa d'Interès General de l'Estat fora de poblat sense que s'hagi col·locat la senyalització, abalisament corresponent i, si s'escau, defensa.

La senyalització, abalisament i, si escau, defensa hauran de ser modificades i fins i tot retirades per qui les va col·locar, tan aviat com variï o desaparegui l'obstacle a la lliure circulació que va originar la seva col·locació, i això sigui quin sigui el període de temps en què no resulten necessàries, especialment en hores nocturnes i dies festius.

Tant l'adquisició com la col·locació, conservació i especialment la retirada de la senyalització, abalisament i, si és el cas, defensa d'obres a què fa referència aquesta ordre seran a compte del Contractista que realitza les obres o activitats que les motiven.

Quan no siguin degudament retirats o modificats els elements segons el que s'ha indicat anteriorment, la Unitat encarregada de la conservació i explotació de la via, bé directament o per un constructor, podrà retirar la senyalització, abalisament i, si escau, defensa, passant l'oportú càrrec de despeses al Contractista causant, qui no podrà reprendre les obres sense abonar-les ni sense restablir-les.

En cas d'impagament, es podrà actuar segons disposa el Reglament General de Recaptació.

Els elements per a senyalització d'obra tindran la forma i el colorit que s'indica a la norma 8.3-IC, i quant a la resta de característiques complirà el que indica aquest plec per a senyalització vertical i altres unitats assimilables.

Les dimensions dels senyals circulars seran de seixanta centímetres (60 cm) com a mínim de diàmetre, i les triangulars de noranta centímetres (90 cm) de costat com a mínim. El senyal TP-18 es complementarà amb una balisa lluminosa intermitent rotativa .

La senyalització d'obres s'abonarà al preu que per a aquesta unitat, es fixa per a tota l'obra tant espacialment com temporalment, a la partida alçada de cobrament íntegre inclosa al pressupost del projecte. Aquesta partida s'abonarà en les certificacions mensuals prorratejada els mesos en què s'executi.

El preu també estarà afectat pel coeficient d'adjudicació derivats de la licitació.

Si durant algun període mensual s'hagués produït una manifesta negligència en les mesures de senyalització per part del Contractista, i prèvia admonició al Llibre d'Ordres, no serà abonada a la Certificació la fracció de la corresponent unitat, ni, per descomptat, serà rescabalat a les ulteriors.

Els elements de senyalització seran de primer ús quan s'apliquin a l'obra.

Els preus inclouen el personal, tant per muntatge i desmuntatge com de regulació del trànsit, senyalització i qualsevol element precís durant la totalitat de l'obra i durant el termini de garantia.

Vindrà igualment obligat el Contractista a disposar mitjans diferents o addicionals als indicats quan així ho ordeni el Director de les obres, i no és objecte d'abonament ni causa de reclamació ni indemnització.

La part dels mitjans de regulació que pugui quedar sense incloure en els preus específics de senyalització d'obres, s'entendrà inclosa en el preu de cadascuna de les unitats d'obra per a l'execució, la preparació o la utilització de les quals s'apliquen.

El Contractista senyalitzarà degudament les rases obertes, impedirà l'accés a elles a persones alienes a l'obra i les emplenarà com més aviat millor i tancarà tota zona perillosa i establirà la vigilància suficient, especialment de nit. Fixarà suficientment els senyals en la seva posició apropiada perquè no puguin ser sostrets o canviats i mantindrà un servei continu de vigilància que s'ocupi de la seva reposició immediata, si escau. Assegurarà el manteniment del trànsit en tot moment durant l'execució de les obres.

104.11. CONSERVACIÓ DE LES OBRES EXECUTADES

L'adjudicatari queda compromès a conservar, a costa seva, fins que siguin rebudes, totes les obres que integren aquest projecte. Així mateix, queda obligat a conservar les obres durant el termini de garantia. No s'han previst partides alçades referents a neteja i acabament de les obres durant el termini d'execució ni a manteniment i conservació durant el període de garantia perquè aquests conceptes estan inclosos en els preus corresponents de les diferents unitats d'obra.

104.13. EXECUCIÓ DE LES OBRES NO ESPECIFICADES EN AQUEST PLEC

L'execució de les unitats d'obra del present projecte, les especificacions de les quals no figuren en aquest Plec es realitzarà d'acord amb allò que ordeni l'Enginyer Director de les Obres, dins de la bona pràctica per a obres similars.

104.15. SEGURETAT I SALUT A LA FEINA

L'adjudicatari haurà de complir totes les disposicions que estiguin vigents en matèria de seguretat i salut en el treball, i totes les normes de bona pràctica que siguin aplicables en aquestes matèries, així com allò que s'ha indicat especialment en aquest plec. Per a l'abonament de les mesures per a la Seguretat i Salut es complirà el que indica l'article corresponent del Plec de Prescripcions Tècniques de l'Estudi de Seguretat i Salut, de compliment obligat a l'obra.

104.16. INDEMNITZACIONS

Seran a compte del Contractista les indemnitzacions a què hi hagués lloc per perjudicis ocasionats a tercers, per interrupció de serveis públics o particulars, danys causats en béns per obertura de rases o desviació de lleres, habilitació de camins provisionals, tallers, dipòsits de maquinària i materials , accidents en abocadors, i totes les operacions que requereixi l'execució de les obres, tant si es deriven d'una actuació normal com si hi ha culpabilitat o negligència per part de l'adjudicatari. Queden naturalment exclosos, els supòsits en què aquestes indemnitzacions queden expressament assumides per l'Administració en aquest projecte.

L'adjudicatari està obligat a reposar els elements de la carretera i en particular de la senyalització vertical, danyada o suprimida durant l'execució de les obres.

104.17. PERMISOS I LLICÈNCIES

L'adjudicatari haurà d'obtenir per si i a costa seu tots els permisos i llicències necessaris per a l'execució de les obres. Correran del vostre compte les taxes pertinents.

## ARTICLE 106.- MESURAMENT I ABONAMENT

106.1. MESURAMENT DE LES OBRES

La Direcció de l'obra realitzarà mensualment i de la manera que estableixi aquest Plec de Prescripcions Tècniques Particulars, el mesurament de les unitats d'obra executades durant el període de temps anterior. El Contractista o el seu delegat poden presenciar la realització d'aquests mesuraments. Per a les obres o parts d'obra les dimensions i les característiques de les quals hagin de quedar posteriorment i definitivament ocultes, el Contractista està obligat a avisar la Direcció amb la suficient antelació, a fi que aquesta pugui realitzar els corresponents mesuraments i presa de dades, aixecant els plànols que les defineixin, la conformitat dels quals subscriurà el Contractista o el seu delegat.

A falta d'avís anticipat, l'existència del qual correspon provar al Contractista, aquest està obligat a acceptar les decisions de l'Administració sobre el particular.

Quan al present Plec s'indiqui que el mesurament i/o abonament serà per unitats realment executades, s'entendrà això estès tan sols a les unitats correctament executades i acabades, i sempre amb el límit superior de les parts d'obra definides en plànols, no admetent-se excessos sobre aquests que no estiguin expressament aprovats per la Direcció de les obres.

Això és aplicable, a títol d'exemple, a gruixos o amples de capes de ferm.

106.2. ABONAMENT DE LES OBRES

No s'abonaran unitats no acabades, sinó tan sols en la mesura que càpiga la seva interpretació com a bestreta per materials, en les condicions previstes a la normativa vigent, i segons la valoració que es pugui deduir del quadre de preus número 2.

No s'han d'abonar operacions intermèdies en l'execució de les unitats d'obra.

Les eventuals bestretes per amuntegament de materials s'han d'abonar segons valoració deduïda del quadre de preus número 2, i no s'ha de procedir a la bestreta quan el material en qüestió no estigui expressament diferenciat en aquest quadre.

106.3. DESPESES DE CARÀCTER GENERAL A CÀRREC DEL CONTRACTISTA

Excepte indicació expressa en contra, seran a compte del Contractista les despeses següents:

- Replanteig general, les seues comprovacions i els seus replantejaments parcials.
- Despeses de construcció, desmuntatge i posterior retirada de tota mena de construccions auxiliars, de personal, maquinària i resta d'equips i consumibles.
- Despeses de lloguer i adquisició de terrenys per a dipòsits de maquinària i materials; els cànons d'extracció, els de protecció de materials i de la pròpia obra contra tot deteriorament, dany o incendi i la retirada de les deixalles i les escombraries
- Despeses de construcció i conservació de camins provisionals per al desviament del trànsit i per al servei de les obres .
- Despeses de desguàs i manteniment del drenatge de l'obra.
- Senyals de trànsit i els altres recursos necessaris per proporcionar seguretat dins les obres
- Despeses de neteja i retirada per fi de l'obra d'instal·lacions, materials, eines, etc.
- Despeses de neteja general de l'obra.
- Despeses de muntatge, conservació i retirada d'instal·lacions per a subministrament d'aigua i energia.
- Despeses de demolició de les instal·lacions provisionals.
- Despeses de retirada dels materials rebutjats.
- Despeses per a la correcció de les deficiències observades i posades de manifest pels corresponents assaigs i proves.
- Despeses de reparació de les avaries produïdes en instal·lacions de tercers.

- Despeses d'assajos contrast a realitzar per al control de la qualitat dels materials i de les unitats d'obra executades, fins a un màxim de l'un coma cinc (1.5%) per cent del Pressupost d'Execució (per Contracta) del Projecte, d'acord amb l'article 35 del PCAG
- Tots els costos necessaris per formalitzar les sol·licituds, contactes i obtenció de permisos i coordinació amb altres organismes/tercers, com el propi FGC, Departaments de Circulació i Mobilitat i Policia Local de l'Ajuntament de Manresa, coordinació i gestió en cas necessari de serveis afectat, i tot els que siguin necessàries per la completa i correcte execució de les obres aniran a càrrec del contractista.
- Tots els mitjans auxiliars i mitjans d'elevació, enllumenat, costos de nocturnitat, aportació de perfils homologats per als treball dins d'àmbit de FGC o per al treballs que tot i que es realitzin físicament fora de l'àmbit afectin a la línia ferroviària, i/o qualssevol altra cost necessari per a la completa execució de les obres s'han repercutit íntegrament en cada un dels preus contractuals del pressupost projecte constructiu i per tant no seran objecte d'abonament independent.
- Els treballs es realitzaran si així ho autoritza el director de les Obres en horari diürn o bé en horari nocturn en cas que FGC, DO ho estableixin. En cas de realitzar els treballs en horari nocturn, i si així és necessari i ho estableix bé DO o bé FGC, es realitzaran els treballs en banda de manteniment que estableixi FGC, per al tram de la línia metropolitana en el que s'ubica el pont.
- S'aportaran els perfils específics següents: Protector de Via, Responsable de Brigada i Pilot de catenària, en nombre i termini que sigui necessari per a la completa execució de les obres. Tots els costos associats s'han repercutit íntegrament en cada un dels preus contractuals del pressupost projecte constructiu i per tant no seran objecte d'abonament independent.

En el cas de rescissió, sigui quina sigui la causa o causes que el motivi, el Contractista no podrà retirar, per cap pretext, cap element del material d'instal·lacions, ja que FGC podrà optar per retenir-lo, indicant al Contractista que el desitja adquirir, amb la amb l'autorització prèvia del pèrit o per conveni amb el Contractista. El Contractista haurà de retirar tot el que resta en el termini de tres mesos i s'entendrà com abonat el que no retiri en aquest termini.

# PART 2A.- MATERIALS BÀSICS

## 2.1.- LÍQUIDS

### 2.1.1.- AIGUA

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Aigües utilitzades per a algun dels usos següents:
- Elaboració de formigó
- Elaboració de morter
- Elaboració de pasta de guix
- Reg de plantacions
- Conglomerats de grava-ciment, terra-ciment, grava-emulsió, etc.
- Humectació de bases o subbases
- Humectació de peces ceràmiques, de ciment, etc.

CARACTERÍSTIQUES GENERALS:

Poden utilitzar-se les aigües potables i les sancionades com a acceptables per la pràctica.

Es poden utilitzar aigües de mar o salines, anàlogues per a la confecció o curació de formigons sense armadura. Per a la confecció de formigó armat o pretensat es prohibeix l'ús d'aquestes aigües, llevat que es realitzin estudis especials.

Es podrà utilitzar aigua reciclada provinent del rentat dels camions formigonera a la pròpia central de formigó, sempre que compleixi les especificacions anteriors i la seva densitat sigui <= 1,3 g/m3 i la densitat total sigui <=1,1 g/cm3

L'aigua a utilitzar ja sigui al curat com al pastat del formigó, no ha de contenir cap substància perjudicial en quantitats que puguin afectar les propietats del formigó o la protecció de l'armat.

Si s'ha d'utilitzar per a la confecció o el curat de formigó o de morter i si no hi ha antecedents de la seva utilització o hi ha algun dubte sobre aquest, es verificarà que compleix totes i cadascuna de les característiques següents:

- Potencial d'hidrogen pH (UNE 83952): >= 5

- Total de substàncies dissoltes (UNE 83957): <= 15 g/ l ( 15.000 ppm)
- Sulfats, expressats en SO4- (UNE 83956)
  - Ciment SR: <= 5 g/ l ( 5.000 ppm)
  - Altres tipus de ciment: <= 1 g/ l ( 1.000 ppm)
- Ió clor, expressat en Cl- (UNE 7178)
- Aigua per a formigó armat: <= 3 g/ l ( 3.000 ppm)
- Aigua per a formigó pretesat: <= 1 g/ l ( 1.000 ppm)
- Aigua per a formigó en massa amb armadura de fissuració: <= 3 g/ l ( 3.000 ppm)
- Hidrats de carboni (UNE 7132): 0
- Substàncies orgàniques solubles en èter (UNE 7235): <= 15 g/ l ( 15.000 ppm)

Ió clor total aportat per components del formigó no superarà:

- Pretensat: <= 0,2% pes de ciment
- Armat: <= 0,4% pes de ciment
- En massa amb armadura de fissuració: <= 0,4% pes de ciment

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament i emmagatzematge: De manera que no se n'alterin les condicions.

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

Reial Decret 1247/2008, del 18 de juliol, pel qual s'aprova la Instrucció de Formigó Estructural (EHE-08).

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

OPERACIONS DE CONTROL:

Abans de l'inici de l'obra i si no es tenen antecedents de l'aigua que s'utilitzarà, o se'n tenen dubtes, s'analitzarà l'aigua per determinar:

- Potencial d'hidrogen pH (UNE 83952)
- Contingut de substàncies dissoltes (UNE 83957)
- Contingut de sulfats, expressats en SO4 (UNE 83956)
- Contingut d'ió Cl- (UNE 7178)
- Contingut d'hidrats de carboni (UNE 7132)
- Contingut de substàncies orgàniques solubles en èter (UNE 7235)

En cas d'utilitzar aigua potable de la xarxa de subministrament, no serà obligatori realitzar els assaigs anteriors.

En altres casos, la DF o el Responsable de la recepció en el cas de centrals de formigó preparat o de prefabricats, disposarà la realització dels assaigs a laboratoris contemplats a l'apartat 78.2.2.1 de l'EHE, per comprovar el compliment de les especificacions de l'article 27 de l'EHE.

CRITERIS DE PRESA DE MOSTRES:

Els controls es realitzaran segons les instruccions de la DF i la norma EHE, i es realitzarà la presa de mostres segons la UNE 83951.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

No s'acceptarà l'aigua que no compleixi les especificacions, ni pel pastat ni pel curat.

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## 2.2.- ÀRIDS

### 2.2.1.- TERRA

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Terres naturals procedents d'excavació i aportació.

S'han considerat els tipus següents:

- Terra seleccionada
- Terra adequada
- Terra tolerable
- Terra sense classificar

TERRA SENSE CLASSIFICAR:

La composició granulomètrica i el seu tipus seran els adequats al seu ús i als que es defineixin a la partida d'obra on intervinguin o, si no consta, els que estableixi explícitament la DF.

TERRA SELECCIONADA:

Contingut de matèria orgànica (UNE 103204): < 0,2%

Contingut sals solubles en aigua, inclòs guix (NLT 114): < 0,2%

Grandària màxima: <= 100 mm

Material que passa pel tamís 0,40 UNE: < =15%

o en cas contrari, complirà:

- Material que passa pel tamís 2 UNEIX: < 80%
- Material que passa pel tamís 0,40 UNEIX: < 75%
- Material que passa pel tamís 0,080 UNEIX: < 25%
- Límit líquid (UNE 103-103): < 30%
- Índex de plasticitat (UNE 103-103 i 103-104): < 10

Índex CBR (UNE 103502):

- Coronació de terraplè: >= 5
- Nucli o fonament de terraplè: >= 3
- En farciment localitzat amb compactació al 95% PN: >=3

TERRA ADEQUADA:

Contingut de matèria orgànica (UNE 103204): < 1%

Contingut sals solubles en aigua, inclòs guix (NLT 114): < 0,2%

Grandària màxima: <= 100 mm

Material que passa pel tamís 2 UNEIX: < 80%

Material que passa pel tamís 0,080 UNEIX: < 35%

Límit líquid (UNE 103103): < 40

Si el límit líquid és > 30, complirà:

- Índex de plasticitat (UNE 103-103 i 103-104): > 4

Índex CBR (UNE 103502):

- Coronació de terraplè: >= 5
- Nucli o fonament de terraplè: >= 3
- En farcits localitzats amb compactació al 95% PN: >= 10
- En farcits localitzats per a trasdós d'obra de fàbrica: >= 20

TERRA TOLERABLE:

Compliran alguna de les dues condicions granulomètriques següents (UNE 103101):

- Material que passa pel tamís 20 UNEIX: > 70%
- Material que passa pel tamís 0,08 UNEIX: >= 35%

Contingut en matèria orgànica (UNE 103204): < 2%

Contingut en guix (NLT 115): < 5%

Contingut en sals solubles diferents del guix (NLT 114): < 1%

Límit líquid (UNE 103103): < 65%

Si el límit líquid és > 40, complirà:

- Índex de plasticitat (UNE 103-103 i 103-104): > 73% (Límit líquid-20)

Seient en assaig de col·lapse (NLT 254): < 1%

Mostra preparada segons assaig PN (UNE 103-500) a 0,2 MPa

Inflament lliure (UNE 103-601): < 3%

Mostra preparada segons assaig PN (UNE 103-500)

Índex CBR (UNE 103502):

- En nucli o fonament de terraplè > = 3

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament i emmagatzematge: Se subministrarà en camió bolquet i es distribuirà en munts uniformes a tota l'àrea de treball, procurant estendre-les al llarg de la mateixa jornada, de manera que no se n'alterin les condicions.

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

* Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).

* Ordre FOM/1382/2002 de 16 de maig, per la qual s'actualitzen determinats articles del plec de prescripcions tècniques generals per a obres de carreteres i ponts relatius a la construcció d'esplanacions, drenatges i fonaments (PG-3).

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

OPERACIONS DE CONTROL A TERRAPLENS

Abans de començar el terraplè, quan hi hagi canvi de procedència del material, o amb la freqüència indicada durant la seva execució, es realitzaran amb una freqüència d'1 cada 5.000 m3 els assaigs d'identificació del material següents:

- Assaig granulomètric (UNE 103101)
- Determinació dels límits d' Atterberg ( UNE 103103 i UNE 103104)
- Matèria orgànica (UNE 103204).
- Assaig Pròctor Normal (UNE 103500)
- Assaig CBR (UNE 103502)

OPERACIONS DE CONTROL A FARCITS

Abans de començar el farciment, quan hi hagi canvi de procedència del material, o amb la freqüència indicada durant la seva execució, es realitzaran els següents assaigs d'identificació del material cada 2500 m3:

- Assaig granulomètric (UNE 103101)
- Determinació dels límits d' Atterberg ( UNE 103103 i UNE 103104)
- Contingut de matèria orgànica (UNE 103204)
- Contingut de sals solubles (inclòs el guix) (NLT 114)
- Assaig Pròctor Normal (UNE 103500)
- Assaig CBR (UNE 103502)

Cada 750 m3 durant l'execució del farciment, es realitzarà un assaig Pròctor Modificat (UNE 103501) com a referència al control de compactació.

CRITERIS DE PRESA DE MOSTRES:

Se seguiran les instruccions de la DF i els criteris de les normes de procediment indicades a cada assaig.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

Els resultats dels assaigs d'identificació han de complir estrictament les especificacions indicades. En cas contrari, no s'autoritzarà l'ús del material corresponent en l'execució.

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**2.2.2.- GRAVA DE CANTERA**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Àrids utilitzats per a algun dels usos següents:

- Confecció de formigons
- Confecció de barreges grava-ciment per a paviments
- Material per a drenatges
- Material per a paviments

El seu origen pot ser:

- Àrids naturals, procedents d'un jaciment natural
- Àrids naturals, obtinguts per picada de roques naturals
- Àrids procedents d'escòries siderúrgiques refredades per aire

Els àrids naturals poden ser:

- De pedra granítica
- De pedra calcària

CARACTERÍSTIQUES GENERALS:

El contractista sotmetrà a l'aprovació de la DF les pedreres o dipòsits origen dels àrids, aportant tots els elements justificatius que consideri convenients o que li siguin requerits pel director d' obra, entre d'altres:

– Classificació geològica.

– Estudi de morfologia.

- Aplicacions anteriors.

La DF podrà rebutjar totes les procedències que, segons el seu criteri, obligarien a un control massa freqüent dels materials extrets.

CARACTERÍSTIQUES GENERALS DELS ÀRIDS RECICLATS

Els àrids procedents de reciclatge d'enderrocs no contindran en cap cas restes procedents de construccions amb patologies estructurals, com ara ciment aluminós, àrids amb sulfurs, sílice amorfa o corrosió de les armadures.

Els grànuls tindran forma arrodonida o polièdrica.

La composició granulomètrica estarà en funció del seu ús i serà la definida a la partida d'obra en què intervingui, o si no consta, la fixada explícitament per la DF.

Estaran nets i seran resistents i de granulometria uniforme.

No tindran pols, brutícia, argila, margues o altres matèries estranyes.

Diàmetre mínim: 98% retingut tamís 4 (UNE-EN 933-2)

Els àrids reciclats han de complir les especificacions de l'article 28 de l'EHE. A més, els que provinguin de formigons estructurals sans, o de resistència elevada, seran adequats per a la fabricació de formigó reciclat estructural, complint una sèrie de requisits:

- Dimensió mínima permesa = 4 mm
- Terrons d'argila per a un formigó amb menys del 20% d'àrid reciclat: <= 0,6%
- Terrons d'argila per a un formigó amb 100% d'àrid reciclat: <= 0,25%
- Absorció d'aigua per a un formigó amb menys del 20% d'àrid reciclat: <= 7%
- Absorció d'aigua per a un formigó amb més del 20% d'àrid reciclat: <= 5%
- Coeficient de Los Angeles: <= 40
- Continguts màxims d'impureses:
- Material ceràmic: <= 5% del pes
- Partícules lleugeres: <= 1% del pes
- Asfalt: <= 1% del pes
- Altres: <= 1,0 % del pes

En els valors de les especificacions no esmentades, es mantenen els establerts a l'article 28 de l'EHE.

ARITS PROCEDENTS D'ESCÒRIES SIDERURGIQUES

Contingut de silicats inestables: Nul

Contingut de compostos fèrrics: Nul

GRAVA PER A LA CONFECCIÓ DE FORMIGONS:

S'anomena grava la barreja de les diferents fraccions d'àrid gruixut que s'utilitzen en la confecció del formigó

Designació: d/D - IL - N

d/D: Fracció granulomètrica, d tamany mínim i D tamany màxim

IL: Presentació, R rodat, T triturat (matxaqueig) i M barreja

N: Naturalesa de l'àrid (C, calcari; S, silici; G, granític ; O, ofita; B, basalt; D, dolomític; Q, traqueta; I, fonolita; V, diversos; A, artificial i R, reciclat

La mida màxima D d'un àrid gruixut (grava) utilitzat per a la confecció de formigó serà menor que les dimensions següents:

- 0,8 de la distància lliure horitzontal entre beines o armadures que formin grup, o entre un parament de la peça i una beina o armadura que formi un angle >45º (amb la direcció del formigonat)
- 1,25 de la distància entre un parament de la peça i una beina o armadura que formi un angle <=45º (amb la direcció del formigonat)
- 0,25 de la dimensió mínima de la peça que es formigona amb les excepcions següents:
- Lloses superiors de forjats, amb TMA < 0,4 del gruix mínim
- Peces d'execució molt cuidada i elements en què l'efecte de la paret de l'encofrat sigui reduït (forjats encofrats a una sola cara), amb TMA < 0,33 del gruix mínim

Quan el formigó passi entre diverses armadures, l'àrid gruixut serà el mínim valor entre el primer punt i el segon del paràgraf anterior.

Tot l'àrid serà d'una mida inferior al doble del límit més petit aplicable a cada cas.

Contingut de matèria orgànica (UNE-EN 1744-1): Color més clar que el patró

Fins que passen pel tamís 0,063 (UNE-EN 933-2):

- Per graves calcàries i granítiques: <= 1,5 en pes
- Àrids, reciclats de formigó o prioritàriament naturals: < 3%
- Per a àrids reciclats mixts: < 5%

L'índex de lloses per a un àrid gruixut segons UNE-EN 933-3: <= 35%

Material retingut pel tamís 0,063 (UNE_EN 933-2) i que sura en un líquid de pes específic 20 kN/m3 (UNE EN 1744-1):

- anats naturals <= 1% en pes

Compostos de sofre expressats en SO3 i referits a àrid sec (UNE-EN 1744-1):

- Àrids naturals: <= 1% en pes
- Àrids d'escòries siderúrgiques: <= 2% en pes
- Àrids reciclats mixts: <= 1% en pes
- Àrids amb sulfurs de ferro oxidables en forma de pirrotina: <= 0,1% en pes
- Altres àrids: <= 0,4% en pes

Sulfats solubles en àcids, expressats en SO3 i referits a àrid sec (UNE-EN 1744-1):

- Àrids naturals: <= 0,8% en pes
- Àrids d'escòries siderúrgiques: <= 1% en pes

Clorurs expressats en Cl- i referits àrid sec (UNE-EN 1744-1):

- Formigó armat o massa amb armadura de fissuració: <= 0,05% en massa
- Formigó pretensat: <= 0,03% en massa

Ió clor total aportat per components del formigó no superarà:

- Pretensat: <= 0,2% pes de ciment
- Armat: <= 0,4% pes de ciment
- En massa amb armadura de fissuració: <= 0,4% pes de ciment

Contingut de pirita o altres sulfats: 0%

Contingut d'ió Cl-:

- Àrids reciclats mixts: < 0,06%

El contingut de matèria orgànica que sura en un líquid de pes específic 2 segons UNE-EN 1744-1(Apart.) 14.2 serà <= 1% per a àrids gruixuts.

Contingut de materials no petris (tela, fusta, paper...):

- Àrids reciclats procedents de formigó o mixtos: < 0,5%
- Altres àrids: Nul

Contingut de restes d'asfalt:

- Àrid reciclat mixt o procedent de formigó: < 0,5%
- Altres àrids: Nul

Reactivitat:

- Àlcali-sílice o àlcali-silicat (Mètode químic UNE 146-507-1 EX o Mètode accelerat UNE 146-508 EX): Nul·la
- Àlcali-carbonat (Mètode químic UNE 146-507-2): Nul·la

Estabilitat (UNE-EN 1367-2):

- Pèrdua de pes amb sulfat magnèsic: <= 18%

Absorció d'aigua:

- Àrids gruixuts naturals (UNE-EN 1097-6): < 5%
- Àrids reciclats procedents de formigó: < 10%
- Àrids reciclats mixts: < 18%
- Àrids reciclats prioritàriament naturals: < 5%

Pèrdua de pes amb cinc cicles de sulfat de magnesi segons UNE-EN 1367-2:

- Àrids gruixuts naturals: <= 18%

Els àrids no presentaran reactivitat potencial amb els àlcalis del formigó. Per comprovar-ho, en primer lloc es realitzarà una anàlisi petrogràfica per obtenir el tipus de reactivitat que, si escau, puguin presentar. Si d'aquest estudi es dedueix la possibilitat de reactivitat àlcali sílice o àlcali silicat, es realitzarà l'assaig descrit a la UNE 146.508 EX. Si el tipus de reactivitat potencial és d'àlcali carbonat, cal fer l'assaig segons la UNE 146.507 EX part 2.

Els àrids no han de ser reactius amb el ciment. No s'utilitzaran àrids procedents de roques toves, friables, poroses, etc., ni les que continguin nòduls de guix, compostos ferrosos, sulfurs oxidables, etc., en quantitats superiors contemplades a l'EHE

GRAVA PER A DRENATGES:

L'àrid ha de procedir d'un jaciment natural, del pica-pica de roques naturals, o del reciclatge d'enderrocs.

No heu de presentar restes d'argila, margues o altres materials estranys.

La mida màxima dels grànuls serà de 76 mm (tamís 80 UNE) i el tamisat ponderal acumulat pel tamís 0,080 UNE serà <= 5%. La composició granulomètrica serà fixada explícitament per la DF en funció de les característiques del terreny a drenar i del sistema de drenatge.

Plasticitat: No plàstic

Coeficient de desgast (Assaig "Los Angeles" UNE-EN 1097-2): <= 40

Equivalent de sorra (UNE-EN 933-8): > 30

Condicions generals de filtratge:

- F15/d85: < 5
- F15/d15: < 5
- F50/d50: < 5

(Fx = grandària superior de la fracció x% en pes del material filtrant, dx = grandària superior de la proporció x% del terreny a drenar)

Així mateix, el coeficient d'uniformitat del filtre serà:

- F60/F10: < 20

Condicions de la granulometria en funció del sistema previst d'evacuació de l'aigua:

- Per a tubs perforats: F85/Diàmetre de l'orifici: > 1
- Per a tubs amb juntes obertes: F85/ Obertura de la junta: > 1,2
- Per a tubs de formigó porós: F85/d15 de l'àrid del tub: > 0,2
- Si es drena per mechinals: F85/ diàmetre del mechinal: > 1

Quan no sigui possible trobar un material granular amb aquestes condicions, es faran filtres granulars compostos per diverses capes. La més gruixuda es col·loca al costat del sistema d'evacuació. Aquesta complirà les condicions de filtre respecte a la següent, i així successivament fins a arribar al farciment o terreny natural. Es podrà recórrer a l'ús de filtres geotèxtils

Quan el terreny natural estigui constituït per materials amb graves i bitlles a efectes de compliment de les condicions anteriors, s'atendrà únicament a la corba granulomètrica de la seva fracció inferior a 25 mm.

Si el terreny no és cohesiu i està compost per sorra fina i llims, el material drenant ha de complir, a més de les condicions generals de filtre, la condició: F15 < 1 mm.

Si el terreny natural és cohesiu, compacte i homogeni, sense restes de sorra o llims, les condicions de filtre 1 i 2 s'han de substituir per: 0,1 mm > F15 > 0,4 mm

En els drens cecs, el material de la zona permeable central haurà de complir les condicions següents:

- Mida màxima de l'àrid: Entre 20 mm i 80 mm
- Coeficient d'uniformitat: F60/F10 < 4

Si s'utilitzen àrids reciclats, es comprovarà que l'inflament (assaig CBR (NLT-111)) sigui inferior al 2% (UNE 103502).

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

CONDICIONS GENERALS:

Subministrament i emmagatzematge: De manera que no se n'alterin les condicions.

Cada partida de grava s'ha de descarregar en una zona preparada de terra sec

Les graves de diferents tipus s'han d'emmagatzemar per separat

Els àrids s'han d'emmagatzemar de manera que quedin protegits davant de la contaminació, i evitant-ne la possible segregació, sobretot durant el transport. Es recomana emmagatzemar-los sota la teulada per evitar els canvis de temperatura de l'àrid.

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

GRAVA PER A LA CONFECCIÓ DE FORMIGONS:

Reial Decret 1247/2008, del 18 de juliol, pel qual s'aprova la Instrucció de Formigó Estructural (EHE-08).

UNE-EN 12620:2003 Àrids per a formigó.

GRAVA PER A PAVIMENTS:

* Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).

GRAVA PER A DRENATGES:

Orde FOM/298/2016, de 15 de febrer, per la qual s'aprova la norma 5.2-IC drenatge superficial de la Instrucció de Carreteres.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ:

El lliurament d'àrid en obra haurà d'anar acompanyat d'un full de subministrament proporcionat pel subministrador, en què han de constar com a mínim les dades següents:

- Identificació del subministrador
- Número del certificat de marcatge CE o indicació d'autoconsum
- Número de sèrie del full de subministrament
- Data del lliurament
- Nom del peticionari
- Designació de l'àrid segons l'article 28.2 de l'EHE
- Quantitat d'àrid subministrat
- Identificació del lloc de subministrament

El fabricant ha de proporcionar informació relativa a la granulometria i a les toleràncies de l'àrid subministrat.

El subministrador posarà a disposició de la DF si aquesta ho sol·licita la documentació següent, que acredita el marcatge CE, segons el sistema d'avaluació de conformitat aplicable, d'acord amb el que disposa l'apartat 7.2.1 del CTE:

- Productes per a carreteres i altres treballs d'obres públiques i edificació de Funció: Aplicacions que exigeixen requisits de seguretat molt estrictes*. * Requisits que han de ser definits per lleis, reglaments i normes administratives nacionals de cada estat membre,
- Productes per a edificis, fabricació de productes de formigó prefabricat, carreteres i altres treballs d'obres públiques de Funció: Aplicacions que exigeixen requisits de seguretat molt estrictes*. * Requisits que han de ser definits per lleis, reglaments i normes administratives nacionals de cada estat membre:
- Sistema 2+: Declaració de Prestacions
- Productes per a edificis, fabricació de productes de formigó prefabricat, carreteres i altres treballs d'obres públiques de funció: aplicacions que no exigeixen requisits de seguretat molt estrictes*. * Requisits que han de ser definits per lleis, reglaments i normes administratives nacionals de cada estat membre,
- Productes per a carreteres i altres treballs d'obres públiques i edificació de funció: aplicacions que no exigeixen requisits de seguretat molt estrictes*. * Requisits que han de ser definits per lleis, reglaments i normes administratives nacionals de cada estat membre:
- Sistema 4: Declaració de prestacions

El símbol de marcatge de conformitat CE ha d'estampar-se conforme la Directiva 93/68CE i ha d'estar visible sobre el producte o sobre etiqueta, embalatge o documentació comercial i ha d'anar acompanyat de la informació següent:

- Número d'identificació de l'organisme de certificació
- Nom o marca d'identificació i adreça del fabricant
- Les dues darreres xifres de l'any d'impressió del marcatge
- Referència a la norma (UNE-EN 12620)
- Descripció del producte (nom genèric, material, ús previst)
- Designació del producte
- Informació de les característiques essencials aplicables

A la documentació del marcatge hi haurà de constar:

- Nom del laboratori que realitza els assaigs
- Data d'emissió del certificat
- Garantia que el tracte estadístic és l'exigit al marcatge
- Estudi de fins que en justifiqui experimentalment l'ús, en cas que hi hagi àrids que no compleixin l'article 28.4.1.

OPERACIONS DE CONTROL:

Els àrids han de disposar del marcatge CE, de manera que la comprovació de la idoneïtat per al seu ús es farà mitjançant un control documental del marcatge per determinar el compliment de les especificacions del projecte i de l'article 28 de l'EHE.

En el cas dels àrids d'autoconsum, el Constructor o el Subministrador han d'aportar un certificat d'assaig, com a màxim tres mesos d'antiguitat, realitzat en un laboratori de control dels que preveu l'article 78.2.2.1 de l'EHE, que verifiqui el compliment de les especificacions de l'àrid subministrat amb l'article 28 de l'EHE.

La DF podrà valorar el nivell de garantia del distintiu, i en cas de no disposar de prou informació, podrà determinar l'execució de comprovacions mitjançant assaigs.

La DF, a més, valorarà si realitzar una inspecció a la planta de fabricació, si pot ser, abans del subministrament de l'àrid, per comprovar la idoneïtat per a la seva fabricació. En cas necessari, la DF podrà realitzar els assaigs següents per verificar la conformitat de les especificacions:

- Índex de lloses (UNE-EN 933-3).
- Terrons d'argila (UNE 7133)
- Partícules toves (UNE 7134)
- Coeficient de forma (UNE EN 933-4)
- Material retingut pel tamís 0.063 UNE (UNE EN 933-2) i que sura en un líquid de pes específic 2 (UNE EN 1744-1).
- Compostos de sofre (SO3)- respecte a l'àrid sec (UNE-EN 1744-1).
- Contingut d'ió Cl- (UNE-EN 1744-1)
- Assaig petrogràfic
- Reactivitat potencial amb els àlcalis del ciment (UNE 146-507 i UNE 146-508).
- Estabilitat, resistència a l'atac del sulfat magnèsic i sulfat sòdic (UNE-EN 1367-2).
- Absorció d'aigua (UNE-EN 1097-6).
- Resistència al desgast Los Angeles (UNE-EN 1097-2).
- Assaig d'identificació per raigs X.
- Assaig granulomètric (UNE-EN 933-2)

OPERACIONS DE CONTROL EN GRAVA PER A DRENATGES:

Les tasques de control a realitzar són les següents:

– Inspecció visual del material i recepció del certificat de procedència i qualitat corresponent.

- Abans de començar el farciment, quan hi hagi canvi de procedència del material, o cada 2000 m3 durant la seva execució, es realitzaran els assaigs d'identificació del material següents:
- Assaig granulomètric del material filtrant (UNE EN 933-1)
- Assaig granulomètric del material adjacent (UNE 103101)
- Desgast de "Los Angeles" (UNE EN 1097-2)

Es demanarà un certificat de procedència del material, que en cas d'àrids naturals ha de contenir:

- Classificació geològica
- Estudi de morfologia
- Aplicacions anteriors
- Assajos d'identificació del material

CRITERIS DE PRESA DE MOSTRES:

Els controls es faran segons les instruccions de la DF i la norma EHE.

CRITERIS DE PRESA DE MOSTRES EN GRAVA PER A DRENATGES:

Se seguiran les instruccions de la DF i els criteris de les normes de procediment indicades a cada assaig.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

No s'acceptarà la grava que no compleixi totes les especificacions indicades al plec. Si la granulometria no s'ajusta a la utilitzada per a l'establiment de les dosificacions aprovades, s'hauran de projectar i aprovar noves fórmules de treball.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT EN GRAVA PER A DRENATGES:

Els resultats dels assaigs d'identificació han de complir estrictament les especificacions indicades. En cas contrari, no s'autoritzarà l'ús del material corresponent en l'execució del rebliment.

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**2.2.3.- SORRA**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Sorra procedent de roques calcàries, roques granítiques, marbres blancs i durs o sorres procedents del reciclatge de residus de la construcció o demolicions en una planta legalment autoritzada per al tractament d'aquest tipus de residus.

S'han considerat els tipus següents:

- Sorra de marbre blanc
- Sorra per a confecció de formigons, d'origen:

Sorra per a confecció de formigons, d'origen:

- De pedra calcària
- De pedra granítica
- Sorra per a la confecció de morters
- Sorra per farciment de rases amb canonades
- Sorres procedents del reciclatge de residus de la construcció i demolicions

CARACTERÍSTIQUES GENERALS:

El contractista sotmetrà a l'aprovació de la DF les pedreres o dipòsits origen dels àrids, aportant tots els elements justificatius que consideri convenients o que li siguin requerits pel director d' obra, entre d'altres:

– Classificació geològica.

– Estudi de morfologia.

- Aplicacions anteriors.

La DF podrà rebutjar totes les procedències que, segons el seu criteri, obligarien a un control massa freqüent dels materials extrets.

Els grànuls tindran forma arrodonida o polièdrica.

La composició granulomètrica serà l'adequada al seu ús, o si no hi consta, la que estableixi explícitament la DF.

No tindrà margues o altres materials estranys.

Contingut de pirites o altres sulfurs oxidables: 0%

Contingut de matèria orgànica (UNE-EN 1744-1): Color més clar que el patró

Contingut de terrossos d'argila (UNE 7133): <= 1% en pes

Els àrids no han de ser reactius amb el ciment. No s'utilitzaran àrids procedents de roques toves, friables, poroses, etc., ni les que continguin nòduls de guix, compostos ferrosos, sulfurs oxidables, etc., en quantitats superiors contemplades a l'EHE

Els àrids reciclats han de complir les especificacions de l'article 28 de l'EHE. A més, els que provinguin de formigons estructurals sans, o de resistència elevada, seran adequats per a la fabricació de formigó reciclat estructural, complint una sèrie de requisits:

- Dimensió mínima permesa = 4 mm
- Terrons d'argila per a un formigó amb menys del 20% d'àrid reciclat: <= 0,6%
- Terrons d'argila per a un formigó amb 100% d'àrid reciclat: <= 0,25%
- Absorció d'aigua per a un formigó amb menys del 20% d'àrid reciclat: <= 7%
- Absorció d'aigua per a un formigó amb més del 20% d'àrid reciclat: <= 5%
- Coeficient de Los Angeles: <= 40
- Continguts màxims d'impureses:
- Material ceràmic: <= 5% del pes
- Partícules lleugeres: <= 1% del pes
- Asfalt: <= 1% del pes
- Altres: <= 1,0 % del pes

En els valors de les especificacions no esmentades, es mantenen els establerts a l'article 28 de l'EHE.

SORRA DE MARBRE BLANC:

Barreja amb àrids blancs diferents del marbre: 0%

SORRA PER A LA CONFECCIÓ DE FORMIGONS:

S'anomena sorra la barreja de les diferents fraccions d'àrid fi que s'utilitzen per a la confecció del formigó

Designació: d/D - IL - N

d/D: Fracció granulomètrica, d tamany mínim i D tamany màxim

IL: Presentació, R rodat, T triturat (matxaqueig) i M barreja

N: Naturalesa de l'àrid (C, calcari; S, silici; G, granític ; O, ofita; B, basalt; D, dolomític; Q, traqueta; I, fonolita; V, diversos; A, artificial i R, reciclat

Grandària dels grànuls (Tamís 4 UNE-EN 933-2): <= 4 mm

Material retingut pel tamís 0,063 (UNE_EN 933-2) i que sura en un líquid de pes específic 20 kN/m3 (UNE EN 1744-1): <= 0,5% en pes

Compostos de sofre expressat en SO3 i referits a àrid sec (UNE-EN 1744-1): <= 1% en pes

Reactivitat potencial amb els àlcalis del ciment (UNE 146507-2)

Sulfats solubles en àcid, expressats en SO3 i referits a l'àrid sec (UNE-EN 1744-1): <= 0,8 en pes

Clorurs expressats en Cl- i referits a l'àrid sec (UNE-EN 1744-1):

- Formigó armat o en massa amb armadures de fissuració: <= 0,05% en pes
- Formigó pretensat: <= 0,03% en pes

Ió clor total aportat per components del formigó no superarà:

- Pretensat: <= 0,2% pes de ciment
- Armat: <= 0,4% pes de ciment
- En massa amb armadura de fissuració: <= 0,4% pes de ciment

Estabilitat (UNE-EN 1367-2):

- Pèrdua de pes amb sulfat sòdic: <= 10%
- Pèrdua de pes amb sulfat magnèsic: <= 15%

Pèrdua de pes amb sulfat magnèsic (UNE-EN 1367-2) quan el formigó estigui sotmès a una classe d'exposició H o F, i l'àrid fi tingui una absorció d'aigua >1%: <= 15%

Coeficient de friabilitat (UNE 83115)

- Per a formigons d'alta resistència: < 40
- Formigons en massa o armats amb Fck<=30 N/mm2: < 50

Els àrids no presentaran reactivitat potencial amb els àlcalis del formigó. Per comprovar-ho, en primer lloc es realitzarà una anàlisi petrogràfica per obtenir el tipus de reactivitat que, si escau, puguin presentar. Si d'aquest estudi es dedueix la possibilitat de reactivitat àlcali sílice o àlcali silicat, es realitzarà l'assaig descrit a la UNE 146.508 EX. Si el tipus de reactivitat potencial és d' àlcali carbonat , s'ha de fer l'assaig segons la UNE 146.507 EX part 2.

La corba granulomètrica de l'àrid fi estarà compresa dins del fus següent:

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Material retingut acumulat, en % en pes, als tamisos

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Límits 4 mm 2 mm 1 mm 0,5 mm 0,25 mm 0,125 mm 0,063 mm

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Superior 0 4 16 40 70 77 ( 1)

Inferior 15 38 60 82 94 100 100

+---------- ----------

(1) Aquest valor varia en funció del tipus i l'origen de l'àrid.

SORRA DE PEDRA GRANÍTICA PER A LA CONFECCIÓ DE FORMIGONS:

Contingut màxim de fins que passen pel tamís 0,063 mm (UNE-EN 933-1):

- Àrid gruixut:
- Qualsevol tipus: <= 1,5% en pes
- Àrid fi:
- Àrid arrodonit: <= 6% en pes
- Àrid de picada no calcari per a obres sotmeses a exposició IIIa, b, c, IV o una altra classe específica: <= 6% en pes
- Àrid de picada no calcari per a obres sotmeses a exposició I, IIa ,bo cap classe específica d'exposició: <= 10% en pes

Equivalent de sorra (EAV )( UNE_EN 933-8):

- Per a obres en ambients I, IIa, b o cap classe específica d'exposició: >= 70
- Altres casos: >= 75

Absorció d'aigua (UNE-EN 1097-6): <= 5%

SORRA DE PEDRA CALIZA PER A LA CONFECCIÓ DE FORMIGONS:

Contingut màxim de fins que passen pel tamís 0,063 mm (UNE-EN 933-1):

- Àrid gruixut:
- Qualsevol tipus: <= 1,5% en pes
- Àrid fi:
- Àrid arrodonit: <= 6% en pes
- Àrid de picada calcari per a obres sotmeses a exposició IIIa, b ,c, IV o alguna classe específica: <= 10% en pes

- Àrid de picada calcari per a obres sotmeses a exposició I, IIa ,bo cap classe específica d'exposició: <= 16% en pes

Valor blau de metilè( (UNE 83130):

- Per a obres sotmeses a exposició I, IIa ,bo cap classe específica d'exposició: <= 0,6% en pes
- Resta de casos: <= 0,3% en pes

SORRA PER A LA CONFECCIÓ DE MORTERS:

La composició granulomètrica quedarà dins dels límits següents:

| Tamís UNEIX 7-050 mm | Percentatge en pes que passa pel tamís | Condicions |
|---|---|---|
| 5,00 | A | A= 100 |
| 2,50 | B | 60 <= B <= 100 |
| 1,25 | C | 30 <= C <= 100 |
| 0,63 | D | 15 <= D <= 70 |
| 0,32 | E | 5 <= E <= 50 |
| 0,16 | F | 0 <= F <= 30 |
| 0,08 | G | 0 <= G <= 15 |
| Altres Condicions | | C - D <= 50<br>D - E <= 50<br>C - E <= 70 |

Mesura dels grànuls: <= 1/3 de l'espessor de la junta

Contingut de matèries perjudicials: <= 2%

ARITS PROCEDENTS DEL RECICLATGE DE RESIDUS DE LA CONSTRUCCIÓ I DEMOLICIONS:

El material ha de procedir duna planta legalment autoritzada per al tractament de residus de la construcció.

El material no serà susceptible de cap mena de meteorització o d'alteració física o química sota les condicions més desfavorables que presumiblement es puguin donar al lloc d'ocupació.

No han de donar lloc, amb l'aigua, a dissolucions que puguin causar danys a estructures, capes de ferms, o contaminar el sòl o corrents d'aigua.

S'ha considerat que el seu ús serà per a farcits de rases amb canonades.

Per a qualsevol altra utilització es requereixi l'acceptació expressa de la direcció facultativa i la justificació mitjançant els assaigs pertinents que es compleixen les condicions requerides per a l'ús a què es pretén destinar.

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament i emmagatzematge: De manera que no se n'alterin les condicions.

Cada remesa de sorra es descarregarà en una zona, ja preparada, de terra sec.

Les sorres de diferents tipus s'han d'emmagatzemar per separat.

Els àrids s'han d'emmagatzemar de manera que quedin protegits davant de la contaminació, i evitant-ne la possible segregació, sobretot durant el transport. Es recomana emmagatzemar-los sota la teulada per evitar els canvis de temperatura de l'àrid i en un terreny sec i net destinat a la recollida dels àrids.

Les sorres d'un altre tipus s'han d'emmagatzemar per separat.

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

SORRA PER A LA CONFECCIÓ DE FORMIGONS:

Reial Decret 1247/2008, del 18 de juliol, pel qual s'aprova la Instrucció de Formigó Estructural (EHE-08).

SORRA PER A LA CONFECCIÓ DE MORTERS:

Reial Decret 1247/2008, del 18 de juliol, pel qual s'aprova la Instrucció de Formigó Estructural (EHE-08).

UNE-EN 12620:2003 Àrids per a formigó.

Document Bàsic de Seguretat estructural Fàbrica DB-SE-F, part II del CTE, aprovat pel Reial Decret 314/2006.

SORRES PER A ALTRES USOS:

No hi ha normativa de compliment obligat.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ:

El lliurament d'àrid en obra haurà d'anar acompanyat d'un full de subministrament proporcionat pel subministrador, en què han de constar com a mínim les dades següents:

- Identificació del subministrador
- Número del certificat de marcatge CE o indicació d'autoconsum
- Número de sèrie del full de subministrament
- Nom del planter
- Data del lliurament
- Nom del peticionari
- Designació de l'àrid segons l'article 28.2 de l'EHE
- Quantitat d'àrid subministrat
- Identificació del lloc de subministrament

El fabricant ha de proporcionar informació relativa a la granulometria i a les toleràncies de l'àrid subministrat.

El subministrador posarà a disposició de la DF si aquesta ho sol·licita la documentació següent, que acredita el marcatge CE, segons el sistema d'avaluació de conformitat aplicable, d'acord amb el que disposa l'apartat 7.2.1 del CTE:

- Productes per a carreteres i altres treballs d'obres públiques i edificació de funció: aplicacions que exigeixen requisits de seguretat molt estrictes*. * Requisits que han de ser definits per lleis, reglaments i normes administratives nacionals de cada estat membre,
- Productes per a edificis, fabricació de productes de formigó prefabricat, carreteres i altres feines d'obres públiques de Funció: Aplicacions que exigeixen requisits de seguretat molt estrictes*. * Requisits que han de ser definits per lleis, reglaments i normes administratives nacionals de cada estat membre:
- Sistema 2+: Declaració de Prestacions
- Productes per a edificis, fabricació de productes de formigó prefabricat, carreteres i altres treballs d'obres públiques de funció: aplicacions que no exigeixen requisits de seguretat molt estrictes*. * Requisits que han de ser definits per lleis, reglaments i normes administratives nacionals de cada estat membre,
- Productes per a carreteres i altres treballs d'obres públiques i edificació de funció: aplicacions que no exigeixen requisits de seguretat molt estrictes*. * Requisits que han de ser definits per lleis, reglaments i normes administratives nacionals de cada estat membre:
- Sistema 4: Declaració de prestacions

El símbol de marcatge de conformitat CE ha d'estampar-se conforme la Directiva 93/68CE i ha d'estar visible sobre el producte o sobre etiqueta, embalatge o documentació comercial i ha d'anar acompanyat de la informació següent:

- Número d'identificació de l'organisme de certificació
- Nom o marca d'identificació i adreça del fabricant
- Les dues darreres xifres de l'any d'impressió del marcatge
- Referència a la norma (UNE-EN 12620)
- Descripció del producte (nom genèric, material, ús previst)
- Designació del producte
- Informació de les característiques essencials aplicables

A la documentació del marcatge hi haurà de constar:

- Nom del laboratori que realitza els assaigs
- Data d'emissió del certificat
- Garantia que el tracte estadístic és l'exigit al marcatge
- Estudi de fins que en justifiqui experimentalment l'ús, en cas que hi hagi àrids que no compleixin l'article 28.4.1.

L'àrid reciclat haurà d'incloure a la documentació:

- Naturalesa del material
- Planta productora de l'àrid i empresa transportista de la runa
- Presència d'impureses
- Detalls de la procedència
- Una altra informació que resulti rellevant

OPERACIONS DE CONTROL:

Els àrids han de disposar del marcatge CE, de manera que la comprovació de la idoneïtat per al seu ús es farà mitjançant un control documental del marcatge per determinar el compliment de les especificacions del projecte i de l'article 28 de l'EHE.

En el cas dels àrids d'autoconsum, el Constructor o el Subministrador han d'aportar un certificat d'assaig, com a màxim tres mesos d'antiguitat, realitzat en un laboratori de control dels que preveu l'article 78.2.2.1 de l'EHE, que verifiqui el compliment de les especificacions de l'àrid subministrat amb l'article 28 de l'EHE.

La DF podrà valorar el nivell de garantia del distintiu, i en cas de no disposar de prou informació, podrà determinar l'execució de comprovacions mitjançant assaigs.

La DF, a més, valorarà si realitzar una inspecció a la planta de fabricació, si pot ser, abans del subministrament de l'àrid, per comprovar la idoneïtat per a la seva fabricació. En cas necessari, la DF podrà realitzar els assaigs següents per verificar la conformitat de les especificacions:

- Matèria orgànica (UNE-EN 1744-1).
- Terrons d'argila (UNE 7133).
- Material retingut pel tamís 0.063 UNE (UNE EN 933-2) i que sura en un líquid de pes específic 2 (UNE EN 1744-1).
- Compostos de sofre (SO3)- respecte a l'àrid sec (UNE-EN 1744-1).
- Sulfats solubles en àcid (UNE-EN 1744-1).
- Contingut d'Ió CL- (UNE-EN 1744-1).
- Assaig petrogràfic
- Reactivitat potencial amb els àlcalis del ciment (UNE 146-507 i UNE 146-508).
- Equivalent de sorra (UNE-EN 933-8).
- Absorció d'aigua (UNE-EN 1097-6).
- Assaig d'identificació per raigs X.
- Pèrdua de pes amb sulfat magnèsic (UNE-EN 1367-2)
- Assaig granulomètric (UNE-EN 933-2)
- Coeficient de friabilitat (UNE 83115)

Una vegada s'hagi realitzat l'amuntegament, es realitzarà una inspecció visual, i si és necessari, es prendran mostres per fer els assajos corresponents.

Es podrà acceptar la sorra que no compleixi els requisits sempre que mitjançant rentat, cribratge o barreja, s'assoleixin les condicions exigides.

CRITERIS DE PRESA DE MOSTRES:

Els controls es faran segons les instruccions de la DF i la norma EHE.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

No s'acceptarà la sorra que no compleixi totes les especificacions indicades al plec de condicions. Si la granulometria no s'ajusta a la utilitzada per a l'establiment de les dosificacions aprovades, s'hauran de projectar i aprovar noves fórmules de treball.

No s'utilitzaran àrids fins que tinguin un equivalent de sorra inferior a:

- 70, en obres sotmeses a les classes I, IIa o IIb, i no sotmeses a les classes específiques d'exposició
- 75, en els altres casos

En el cas de les sorres procedents del pica-pica de roques calcàries o de roques dolomítiques que no compleixin amb l'especificació de l'equivalent de sorra, es podran acceptar si l'assaig del blau de metilè (UNE-EN 933-9) compleix el següent:

- Per a obres amb classe general d'exposició I, IIa o IIb (i sense classe específica): <= 0,6% en pes
- Resta de casos: <= 0,3% en pes

Si el valor del blau de metilè fos superior als valors anteriors, i es presentin dubtes de la presència d'argila als fins, es podrà realitzar un assaig de raigs X per a la seva detecció i identificació: es podrà emprar l'àrid fi si les argiles són del tipus caolinita o illita, i si les propietats del formigó amb aquest àrid són les mateixes que les d'un que tingui els mateixos components però sense els fins.

Es podran utilitzar sorres rodades, o procedents de roques de picada, o escòries siderúrgiques adequades, en la fabricació de formigó d'ús no estructural.

## 2.3.- MORTERS DE COMPRA

### 2.3.1.- ADHESIUS

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Barreja d'un o més conglomerants amb àrids escollits i additius especials.

S'han considerat els tipus següents:

- Morter adhesiu

CARACTERÍSTIQUES GENERALS:

No tindreu grumolls ni principis d'aglomeració.

ADHESIU PER A RAJOLES CERÀMIQUES:

Barreja de conglomerants càrregues minerals i additius orgànics que donen com a resultat una pasta apta per fixar revestiments ceràmics a terres i parets situats a exterior o interior.

S'han considerat els tipus següents:

- Adhesiu de ciment (C): Barreja de conglomerants hidràulics, càrregues minerals i additius orgànics, que s'han de barrejar amb aigua just abans del seu ús.
- Adhesiu en dispersió (D): Barreja de conglomerant orgànic en forma de polímer en dispersió aquosa, additius orgànics i càrregues minerals, que es presenta llesta per al seu ús.

- Adhesiu de resines reactives (R): Barreja de resines sintètiques, additius orgànics i càrregues minerals l'enduriment de les quals resulta d'una reacció química, es pot presentar en forma d'un o més components.

S'han considerat les classes següents en funció de les característiques addicionals:

- 1: Normal
- 2. Millorat (compleix els requisits per a les característiques addicionals)
- F: Fregament ràpid
- T: Amb lliscament reduït
- E: Amb temps obert prolongat (només per a adhesius cimentosos millorats i adhesius en dispersió millorats).

ADHESIU CIMENTÓS (C):

Característiques dels adhesius de forjat normal:

- Adherència inicial (UNE-EN 1348): >= 0,5 N/mm2
- Adherència després d'immersió en aigua (UNE-EN 1348): >= 0,5 N/mm2
- Adherència després d'envelliment amb calor (UNE-EN 1348): >= 0,5 N/mm2
- Adherència després de cicles gel-desgel (UNE-EN 1348): >= 0,5 N/mm2
- Temps obert: adherència (EN 1346): >= 0,5 N/mm2 (després de >= 20 min)

Els adhesius de forjat ràpid, compliran, a més:

- Adherència inicial (UNE-EN 1348): >= 0,5 N/mm2 (abans de les 24 h)
- Temps obert: adherència (EN 1346): >= 0,5 N/mm2 (després de >= 10 min)

Característiques especials:

- Lliscament (UNE-EN 1308): <= 0,5 mm

característiques addicionals:

- Alta adherència inicial (UNE-EN 1348): >= 1 N/mm2
- Alta adherència després d'immersió en aigua (UNE-EN 1348): >= 1 N/mm2
- Alta adherència després d'envelliment amb calor (UNE-EN 1348): >= 1 N/mm2
- Alta adherència inicial després de cicles de gel-desgel (UNE-EN 1348): >= 1 N/mm2
- Temps obert ampliat: adherència (UNE-EN 1346): >= 0,5 N/mm2 (després de 30 min)

ADHESIUS EN DISPERSIÓ (D):

Característiques fonamentals:

- Adherència inicial (UNE-EN 1324): >= 1 N/mm2
- Adherència després d'envelliment amb calor (UNE-EN 1324): >= 1 N/mm2
- Temps obert: adherència (EN 1346): >= 0,5 N/mm2 (després d'almenys 20 min)

Característiques especials:

- Lliscament (UNE-EN 1308): <= 0,5 mm

característiques addicionals:

- Adherència després d'immersió en aigua (UNE-EN 1324): >= 0,5 N/mm2
- Adherència a alta temperatura (UNE-EN 1324): >= 1 N/mm2
- Temps obert ampliat: adherència (UNE-EN 1346): >= 0,5 N/mm2 (després de 30 min)

ADHESIUS DE RESINES REACTIVES (R):

Característiques fonamentals:

- Adherència inicial (UNE-EN 12003): >= 2 N/mm2
- Adherència després d'immersió en aigua (UNE-EN 12003): >= 2 N/mm2
- Temps obert: adherència (EN 1346): >= 0,5 N/mm2 (després de >= 20 min)

Característiques especials:

- Lliscament (UNE-EN 1308): <= 0,5 mm

característiques addicionals:

- Adherència després del xoc tèrmic (UNE-EN 12003): >= 2 N/mm2

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament: en envasos tancats hermèticament.

Emmagatzematge: En el seu envàs d'origen i en llocs secs, sense contacte directe amb el terra i protegit de la intempèrie, de manera que no se n'alterin les condicions inicials.

Temps màxim d'emmagatzematge:

- Morter adhesiu: 1 any

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

ADHESIU PER A RAJOLES CERÀMIQUES:

UNE-EN 12004:2001 Adhesius per a rajoles ceràmiques. Definicions i especificacions.

UNE-EN 12004/A1:2002 Adhesius per a rajoles ceràmiques. Definicions i especificacions.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ EN ADHESIUS PER A RAJOLES CERÀMIQUES:

El subministrador posarà a disposició de la DF si aquesta ho sol·licita la documentació següent, que acredita el marcatge CE, segons el sistema d'avaluació de conformitat aplicable, d'acord amb el que disposa l'apartat 7.2.1 del CTE:

- Productes per a usos per a la construcció:
- Sistema 3: Declaració de prestacions

A l'embalatge o a l'albarà de lliurament constaran les dades següents:

- Nom del producte
- Marca del fabricant i lloc d'origen
- Data i codi de producció, caducitat i condicions d'emmagatzematge
- Referència a la norma UNE-EN 12004
- Tipus d'adhesiu, designat segons l'apartat 6 de la norma UNE-EN 12004
- Marca CE de conformitat amb allò que disposen els Reials Decrets 1630/1992 de 29 de desembre i 1328/1995 de 28 de juliol
- Instruccions d'ús:
- Proporcions de mescla
- Temps de maduració: interval de temps des del moment d'elaborar la barreja fins al moment en què aquesta llista per al seu ús
- Vida útil: interval de temps màxim en què el material es pot utilitzar després d'elaborar la barreja
- Mode d'aplicació
- Temps obert
- Temps que ha de transcórrer fins al rejuntat i permetre la circulació
- Àmbit d'aplicació

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**2.3.2.- MORTER POLIMÈRIC**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Barreja d'un o més conglomerants amb àrids escollits i additius especials.

S'han considerat els tipus següents:

- Morter polimèric de ciment amb resines sintètiques i fibres

CARACTERÍSTIQUES GENERALS:

No tindreu grumolls ni principis d'aglomeració.

MORTER POLIMERIC:

El morter polimèric és un producte a base de ciment, resines sintètiques, fum de sílice i fibres de poliamida, d'alta resistència mecànica, que s'utilitza per a la reparació i la regularització d'elements de formigó.

Granulometria: 0-2 mm

Resistència a compressió a 28 dies: 5 - 6 kN/m2

Resistència a flexotracció a 28 dies: 90 - 120 kg/m2

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament: en envasos tancats hermèticament.

Emmagatzematge: En el seu envàs d'origen i en llocs secs, sense contacte directe amb el terra i protegit de la intempèrie, de manera que no se n'alterin les condicions inicials.

Temps màxim d'emmagatzematge:

- Morter amb resines sintètiques o morter polimèric: 6 mesos

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

MORTER SEC, NIVELLACIÓ, REFRACTARI, POLIMÈRIC O DE RESINES:

No hi ha normativa de compliment obligat.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ EN MORTER SEC, NIVELLACIÓ, REFRACTARI, POLIMÈRIC O DE RESINES:

A l'envàs figuraran les dades següents:

- Nom del fabricant o marca comercial
- Instruccions d'utilització
- Composició i característiques del morter

### 2.3.3.- MORTER SINTÈTIC EPOXI

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Barreja d'un o més conglomerants amb àrids escollits i additius especials.

S'han considerat els tipus següents:

- Morter sintètic de resines epoxi

CARACTERÍSTIQUES GENERALS:

No tindreu grumolls ni principis d'aglomeració.

MORTER SINTETIC DE RESINES EPOXI:

El morter sintètic de resines epoxi és un morter obtingut a partir d'una barreja d'àrids inerts i d'una formulació epoxi en forma de dos components bàsics: una resina i un enduridor.

La formulació de l'epoxi serà determinada per l'ús a què es destini el morter i la temperatura ambient i superficial del lloc on es col·loqui. Aquesta formulació serà aprovada per la DF.

Grandària màxima de l'àrid: <= 1/3 de l'espessor mitjà de la capa de morter

Grandària mínima de l'àrid: >= 0,16 mm

Proporció àrid/resina (en pes) (Q): 3 <= Q <= 7

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament: en envasos tancats hermèticament.

Emmagatzematge: En el seu envàs d'origen i en llocs secs, sense contacte directe amb el terra i protegit de la intempèrie, de manera que no se n'alterin les condicions inicials.

Temps màxim d'emmagatzematge:

- Morter amb resines sintètiques o morter polimèric: 6 mesos

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

MORTER SEC, NIVELLACIÓ, REFRACTARI, POLIMÈRIC O DE RESINES:

No hi ha normativa de compliment obligat.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ EN MORTER SEC, NIVELLACIÓ, REFRACTARI, POLIMÈRIC O DE RESINES:

A l'envàs figuraran les dades següents:

- Nom del fabricant o marca comercial
- Instruccions d'utilització
- Composició i característiques del morter

## 2.4.- ADHESIUS

### 2.4.1.- ADHESIU D'APLICACIÓ A DUES CARES

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Adhesius que requereixen estendre's a les dues superfícies que s'uniran.

S'han considerat els tipus següents:

- De cautxú sintètic en dissolució, compatible o no amb el poliestirè, o amb el PVC
- De cloroprè
- De resines epoxi bicomponent

ADHESIU DE CAUTXÚ SINTETIC:

Serà de fàcil aplicació, tindrà una bona estabilitat dimensional per als canvis de temperatura i una gran força adhesiva inicial.

Si és compatible amb el poliestirè, no tindrà dissolvents i components que hi reaccionin químicament.

Si és per a PVC, serà resistent als àcids, als àlcalis, a l'aigua i als olis.

Temps de preassecat en condicions normals: 10 - 20 min

Temps útil de treball: 15-30 min

Densitat a 20°C (D): 0,8 <= D <= 0,9 g/cm3

Rendiment: Aprox. 300 g/m2

ADHESIU DE CLOROPRÈ:

Adhesiu de contacte amb base de policloroprè amb dissolució d'hidrocarburs i dissolvents polars.

Serà de fàcil aplicació, tindrà una bona estabilitat dimensional per als canvis de temperatura i una gran força adhesiva inicial.

Contingut de sòlids: 26%

Densitat: 0,83

Resistència a la calor: 160°C

ADHESIU DE RESINES EPOXI BICOMPONENT:

Adhesiu a base d'un aglomerant de resines epoxi que catalitzen en ser barrejades amb un activador.

La barreja preparada després de 3 minuts d'agitació no pot tindre coàguls, closques ni dipòsits durs.

Característiques de la pel·lícula líquida:

- Temperatura d'inflamació: > 20°C
- Rendiment: > 1 kg/m2
- Temperatura mínima d'enduriment: 15°C
- Vida útil de la mescla a 20°C: > 3 h

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament: En envasos hermèticament tancats.

A cada envàs figurarà les dades següents:

- Identificació del fabricant
- Nom comercial del producte
- Identificació del producte
- Data de caducitat
- Pes net o volum del producte
- Instruccions d'ús
- Limitacions d'ús (temperatura, materials, etc.)
- Toxicitat i inflamabilitat
- Temps d'assecat
- Rendiment

Per adhesius de dos components:

- Proporció de la barreja
- Temps d'inducció de la mescla
- Vida de la barreja

Emmagatzematge: Al seu envàs, en locals ventilats, sense contacte amb el terreny.

Temperatura d'emmagatzematge:

- De cautxú: 5°C - 30°C
- De cloroprè: 10°C - 25°C

Temps màxim d'emmagatzematge:

- De cautxú: <= 6 mesos a partir de la data de fabricació
- De cloroprè: 1 any

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

No hi ha normativa de compliment obligat.

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**2.4.2. - ADHESIU D'APLICACIÓ UNILATERAL**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Adhesius que només requereixen aplicació a una de les cares dels elements a unir.

S'han considerat els tipus següents:

- En dispersió aquosa
- Aquós en dispersió vinílica
- En solució alcohòlica
- De poliuretà bicomponent
- De poliuretà (un sol component)
- De PVC
- De resines epoxi
- Bipolímer acrílic en dispersió aquosa per a col·locació de plaques de poliestirè

EN DISPERSIÓ AQUOSA:

Adhesiu de resines sintètiques per a la col·locació de paviments de PVC i revestiments tèxtils.

Serà de fàcil aplicació, tindrà una gran força adhesiva inicial i no serà inflamable ni tòxic.

Densitat a 20°C: <= 1,24 g/cm3

Contingut sòlid: Aprox. 70%

Rendiment: 250-350 g/m2

AQUÓS EN DISPERSIÓ VINILICA:

Adhesiu per a la col·locació de revestiments murals i papers vinílics.

No serà inflamable ni tòxic.

Densitat: 1,01 g/cm3

Rendiment: Aprox. 200 g/m2

Temperatura de treball: >= 5°C

EN SOLUCIÓ ALCOHOLICA:

Adhesiu de resines sintètiques en solució alcohòlica, per a la col·locació de paviments tèxtils lleugers.

Serà de fàcil aplicació i tindrà una gran força adhesiva inicial.

Densitat a 20°C: 1,5 g/cm3

Contingut sòlid: 84 - 86%

Rendiment: Aprox. 450 g/m2

DE POLIURETÀ BICOMPONENT:

Adhesiu de poliuretà bicomponent, per a la col·locació de paviments de goma.

Serà de fàcil aplicació, exempt de dissolvents i no inflamable.

DE POLIURETÀ (UN NOMÉS COMPONENT):

Adhesiu format per un aglomerant a base de resines hidroxilades soles o modificades, que catalitzen en ser barrejades amb un isocianat.

Característiques de la pel·lícula líquida:

- La barreja preparada, després de 3 minuts d'agitació (INTA 163.203), no presenta coàguls, pells ni dipòsits durs
- Temperatura d'inflamació (INTA 160.232 A): >= 30°C
- Rendiment per a una capa superior a 150 micres: > 1 m2/kg
- Temperatura d'enduriment: >= 15°C
- Temps d'aplicació a 20 °C: > 3 h

Resistència química de la pel·lícula seca:

- Àcid cítric 10%: 15 dies
- Àcid làctic 5%: 15 dies
- Àcid acètic 5%: 15 dies
- Oli de cremar: Cap modificació
- Xilol: Cap modificació
- Clorur sòdic 10%: 15 dies
- Aigua: 15 dies

PVC:

Adhesiu preparat per a la unió de materials de PVC.

Serà de fàcil aplicació i tindrà una gran força adhesiva inicial.

Tindrà bona estabilitat dimensional als canvis de temperatura i no produirà olors molestes.

Temps de preassecat en condicions normals: <= 1 min

Resistència a la compressió: > 10 N/mm2

Resistència a la tracció: > 18 N/mm2

DE RESINES EPOXI:

Adhesiu de resines epoxi bicomponent, per a la col·locació de paviments de goma i revestiment de PVC.

Serà resistent a la humitat, calor, olis, dissolvents, àcids i àlcalis diluïts.

La barreja dels dos components es farà amb la mateixa proporció.

Temps d'aplicació a 20 ° C: 3-4 h

BIPOLIMER ACRÍLIC EN DISPERSIÓ AQUOSA:

Adhesiu de pasta aquosa, format per càrregues minerals i additius i com a lligant principal, un copolímer acrílic en dispersió.

Serà apte per barrejar-se amb el ciment.

Extracte sec a 105°C: 75-78

Contingut de cendres a 450°C: 65 - 68

Toleràncies:

- Densitat: ± 0,1%
- Extracte sec: ± 3%
- Contingut de cendres: ± 3%

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament: En envasos hermèticament tancats.

A cada envàs figurarà les dades següents:

- Identificació del fabricant
- Nom comercial del producte
- Identificació del producte
- Data de caducitat
- Pes net o volum del producte

- Instruccions d'ús
- Limitacions d'ús (temperatura, materials, etc.)
- Toxicitat i inflamabilitat
- Temps d'assecat
- Rendiment

Per adhesius de dos components:

- Proporció de la barreja
- Temps d'inducció de la mescla
- Vida de la barreja

Per adhesius de PVC, el fabricant facilitarà les dades següents:

- Color
- Densitat
- Viscositat
- Contingut sòlid

Emmagatzematge: Al seu envàs, en locals ventilats, sense contacte amb el terreny.

Temperatura d'emmagatzematge:

- Dispersió aquosa, dispersió vinílica: >= 10°C
- Solució alcohòlica, poliuretà, PVC, resines epoxi: 5°C - 30°C

Per adhesiu aquós en dispersió vinílica el temps màxim d'emmagatzematge és 1 any a partir de la data de fabricació.

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

No hi ha normativa de compliment obligat.

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## 2.5.- ACER I METALL EN PERFILS

### 2.5.1.- PERFIL D'ACER PER A ESTRUCTURES

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Perfils d'acer per a usos estructurals, formats per peça simple o composta i tallats a mida o treballats al taller.

S'han considerat els tipus següents:

- Perfils d'acer laminat en calent, de les sèries IPN, IPE, HEA, HEB, HEM o UPN, d'acer S275JR, S275J0, S275J2, S355JR, S355J0 o S355J2, segons UNE-EN 10025-2
- Perfils d'acer laminat en calent de les sèries L, LD, rodó, quadrat, rectangular o planxa, d'acer S275JR, S275J0, S275J2, S355JR, S355J0 o S355J2, segons UNE-EN 10025-2
- Perfils buits d'acer laminat en calent de les sèries rodó, quadrat o rectangular, d'acer S275J0H o S355J2H, segons UNE-EN 10210-1
- Perfils buits conformats en fred de les sèries rodó, quadrat o rectangular d'acer S275J0H o S355J2H, segons UNE-EN 10219-1
- Perfils conformats en fred de les sèries L, LD, U, C, Z, u Omega, d'acer S235JRC, segons UNE-EN 10025-2
- Perfils d'acer laminat en calent, en planxa, d'acer amb resistència millorada a la corrosió atmosfèrica S355J0WP o S355J2WP, segons UNE-EN 10025-5

S'han considerat els tipus d'unió següents:

- Amb soldadura
- Amb cargols

S'han considerat els acabats de protecció següents (no aplicable als perfils d'acer amb resistència millorada a la corrosió atmosfèrica):

- Una capa d'imprimació antioxidant
- Galvanitzat

CARACTERÍSTIQUES GENERALS:

No presentarà defectes interns o externs que en perjudiquin la utilització correcta.

PERFILS D'ACER LAMINAT EN CALENT:

El fabricant garantirà que la composició química i les característiques mecàniques i tecnològiques de l'acer utilitzat en la fabricació de perfils, seccions i planxes compleixen les determinacions de les normes de condicions tècniques de subministrament següents:

- Perfils d'acer laminat en calent: UNE-EN 10025-1 i UNE-EN 10025-2
- Perfils d'acer laminat en calent amb resistència millorada a la corrosió atmosfèrica: UNE-EN 10025-1 i PNE-EN 10025-5

Les dimensions i les toleràncies dimensionals i de forma seran les indicades en les normes següents:

- Perfil IPN: UNE-EN 10024
- Perfil IPE, HEA, HEB i HEM: UNE-EN 10034
- Perfil UPN: UNE-EN 10279
- Perfil L i LD: UNE-EN 10056-1 i UNE-EN 10056-2
- Perfil T: UNE-EN 10055
- Rodó: UNE-EN 10060
- Quadrat: UNE-EN10059
- Rectangular: UNE-EN 10058
- Planxa: EN 10029 o UNE-EN 10051

PERFILS PERFORATS:

El fabricant garantirà que la composició química i les característiques mecàniques i tecnològiques de l'acer utilitzat en la fabricació de perfils compleixen les determinacions de les normes de condicions tècniques de subministrament següents:

- Perfils buits d'acer laminat en calent: UNE-EN 10210-1
- Perfils buits conformats en fred: UNE-EN 10219-1

Les toleràncies dimensionals han de complir les especificacions de les normes següents:

- Perfils buits d'acer laminat en calent: UNE-EN 10210-2
- Perfils buits conformats en fred: UNE-EN 10219-2

PERFILS CONFORMATS EN FRED:

El fabricant ha de garantir que la composició química i les característiques mecàniques i tecnològiques de l'acer utilitzat en la fabricació de perfils i seccions compleixen les determinacions de les normes de condicions tècniques de subministrament del producte de partida.

Les toleràncies dimensionals i de la secció transversal han de complir les especificacions de la norma UNE-EN 10162.

PERFILS TREBALLATS A TALLER AMB SOLDADURA:

El material d'aportació utilitzat serà apropiat als materials a soldar i al procediment de soldadura.

Les característiques mecàniques del material d'aportació seran superiors a les del material base.

En acers de resistència millorada a la corrosió atmosfèrica, la resistència a la corrosió del material d'aportació serà equivalent a la del material base.

Els procediments autoritzats per realitzar unions soldades són:

- Per arc elèctric manual elèctrode revestit
- Per arc amb fil tubular, sense protecció gasosa
- Per arc submergit amb fil/filferro
- Per arc submergit amb elèctrode nu
- Per arc amb gas inert
- Per arc amb gas actiu
- Per arc amb fil tubular, amb protecció de gas actiu
- Per arc amb fil tubular, amb protecció de gas inert
- Per arc amb elèctrode de volfram i gas inert
- Per arc de connectors

Les soldadures es faran per soldadors certificats per un organisme acreditat i qualificats segons la UNE-EN 287-1.

Abans de començar a soldar es verificarà que les superfícies i les vores a soldar són apropiades al procés de soldadura i que estan lliures de fissures.

Totes les superfícies a soldar es netejaran de qualsevol material que pugui afectar negativament la qualitat de la soldadura o perjudicar el procés de soldadura. Es mantindran seques i lliures de condensacions.

S'evitarà la projecció d'espurnes erràtiques de l'arc. Si es produeix, cal sanejar la superfície d'acer.

S'evitarà la projecció de soldadura. Si es produeix ha de ser suprimida.

Els components a soldar estaran correctament col·locats i fixos en la seva posició mitjançant dispositius apropiats o soldadures de punteig, de manera que les unions a soldar siguin accessibles i visibles per al soldador. No s'hi introduiran soldadures addicionals.

L'armat dels components estructurals es farà de manera que les dimensions finals estiguin dins de les toleràncies establertes.

Les soldadures provisionals s'han d'executar seguint les especificacions generals. S'eliminaran totes les soldadures de punteig que no s'incorporin a les soldadures finals.

Quan el tipus de material de l'acer i/o la velocitat de refredament puguin produir un enduriment de la zona tèrmicament afectada, es considera la utilització del preescalfament. Aquest s'estendrà 75 mm a cada component del metall base.

No s'accelerarà el refredament de les soldadures amb medis artificials.

Els cordons de soldadura successius no produiran osques.

Els defectes de soldadura no es taparan amb soldadures posteriors. S'eliminaran de cada passada abans de fer la següent.

Després de fer un cordó de soldadura i abans de fer el següent, cal netejar l'escòria mitjançant una piqueta i un raspall.

L'execució dels diferents tipus de soldadures es farà d'acord amb els requisits establerts a l'apartat 10.3.4 del DB-SE A i l'article 77 de l'EAE per a obres d'edificació o d'acord amb l'article 640.5.2 del PG3 i l'article 77 de l'EAE per a obres d'enginyeria civil.

Es reduiran al mínim el nombre de soldadures a efectuar a l'obra.

Les operacions de tall es faran amb serra, cisalla i oxitall automàtic. S'admet l'oxitall manual només quan el procediment automàtic no es pugui practicar.

S'accepten els talls practicats amb oxitall si no presenten irregularitats significatives i s'eliminen restes d'escòria.

Es poden utilitzar procediments de conformació en calent o en fred sempre que les característiques del material no quedin per sota dels valors especificats.

Per al conformat en calent se seguiran les recomanacions del productor siderúrgic. El doblegat o conformat no es realitzarà a l'interval de calor blava (250ºC a 380ºC).

El conformat en fred es farà respectant les limitacions indicades a la norma del producte. No s'admeten els cops de martell.

Els angles entrants i entalles tindran un acabat arrodonit amb un radi mínim de 5 mm.

Toleràncies de fabricació:

- En obres d'edificació: Límits establerts a l'apartat 11.1 del DB-SE A
- En obres d'enginyeria civil: Límits establerts a l'article 640.12 del PG3

PERFILS TREBALLATS A TALLER AMB CARGOLS:

S'utilitzaran cargols normalitzats d'acord amb les normes recollides a la taula 29.2.b de l'EAE.

Els cargols avellanats, cargols calibrats, perns articulats i els cargols hexagonals d'injecció s'han d'utilitzar seguint les instruccions del fabricant i han de complir els requisits addicionals que estableix l'article 29.2 de l'EAE.

La situació dels cargols a la unió serà tal que redueixi la possibilitat de corrosió i pandeig local de les xapes, i faciliti el muntatge i les inspeccions.

El diàmetre nominal mínim dels cargols serà de 12 mm.

La rosca pot estar inclosa al pla de tall, excepte en el cas que els cargols s'utilitzin com a calibrats.

Després de prémer l'espiga del cargol ha de sobresortir de la rosca de la femella. Entre la superfície de suport de la femella i la part no roscada de l'espiga hi haurà, com a mínim:

- En cargols pretesats: 4 filets complets més la sortida de la rosca
- En cargols sense pretensar: 1 filet complet més la sortida de la rosca

Les superfícies dels caps de cargols i femelles estaran perfectament planes i netes.

Als cargols col·locats en posició vertical, la femella estarà situada per sota del cap del cargol.

En els forats rodons normals i amb cargols sense pretensar no cal utilitzar volanderes. Si s'utilitzen aniran sota el cap dels cargols, seran aixamfranades i el xamfrà estarà situat cap al cap del cargol.

En els cargols pretesats, les volanderes seran planes endurides i aniran col·locades de la següent forma:

- Cargols 10.9: sota el cap del cargol i de la femella
- Cargols 8.8: sota l'element que gira

Els forats per als cargols es faran amb trepant mecànica. S'admet un altre procediment sempre que proporcioni un acabat equivalent.

Es permet l'execució de forats mitjançant punxonat sempre que es compleixin els requisits establerts a l'apartat 10.2.3 del DB-SE A en obres d'edificació o els establerts a l'apartat 640.5.1.1 del PG3 en obres d'enginyeria civil.

Es recomana que, sempre que sigui possible, es tallin d'una sola vegada els buits que travessen dues peces o més.

Els forats allargats es realitzaran mitjançant una sola operació de punxonat, o amb la perforació o punxonat de dos forats i posterior oxitall.

Després de perforar les peces i abans d'unir-les s'eliminaran les rebaves.

Els cargols i les femelles no s'han de soldar, llevat que ho expliciti el plec de condicions tècniques particulars.

S'han de col·locar el nombre suficient de cargols de muntatge per assegurar la immobilitat de les peces armades i el contacte íntim de les peces d'unió.

Les femelles es muntaran de manera que la seva marca de designació sigui visible després del muntatge.
En els cargols sense pretensar, cada conjunt de cargol, rosca i volandera(es) s'estrenyé fins arribar a l'apretat de gom a gom" sense sobretensar els cargols. En grups de cargols aquest procés es farà progressivament començant pels cargols situats al centre. Si és necessari es faran cicles addicionals de collament.
Abans de començar el pretesat, els cargols pretesats d'un grup s'estrenyen d'acord amb allò indicat per als cargols sense pretensar. Perquè el pretesat sigui uniforme es faran cicles addicionals de collament.
Es retiraran els conjunts de cargol pretesat, rosca i volandera(es) que després d'estrènyer fins al pretesat mínim s'afluixin.
L'estrenyiment dels cargols pretesats es farà mitjançant un dels procediments següents:
- Mètode de la clau dinamomètrica.
- Mètode de la femella indicadora.
- Mètode combinat.

Les operacions de tall es faran amb serra, cisalla i oxitall automàtic. S'admet l'oxitall manual només quan el procediment automàtic no es pugui practicar.
S'accepten els talls practicats amb oxitall si no presenten irregularitats significatives i s'eliminen restes d'escòria.
Es poden utilitzar procediments de conformació en calent o en fred sempre que les característiques del material no quedin per sota dels valors especificats.
Per al conformat en calent se seguiran les recomanacions del productor siderúrgic. El doblegat o conformat no es realitzarà a l'interval de calor blava (250ºC a 380ºC).
El conformat en fred es farà respectant les limitacions indicades a la norma del producte. No s'admeten els cops de martell.
Els angles entrants i entalles tindran un acabat arrodonit amb un radi mínim de 5 mm.
Toleràncies de fabricació:
- En obres d'edificació: Límits establerts a l'apartat 11.1 del DB-SE A
- En obres d'enginyeria civil: Límits establerts als apartats 640.5 i 640.12 del PG3

PERFILS PROTEGITS AMB IMPRIMACIÓ ANTIOXIDANT:
La capa d'imprimació antioxidant cobrirà uniformement totes les superfícies de la peça.
No presentarà fissures, borses ni altres desperfectes.
Abans d'aplicar la capa d'imprimació, les superfícies a pintar han d'estar preparades adequadament d'acord amb les normes UNE-EN ISO 8504-1, UNE-EN ISO 8504-2 i UNE-EN ISO 8504-3.
Prèviament al pintat es comprovarà que les superfícies compleixen els requisits donats pel fabricant per al producte que cal aplicar.
La pintura d'imprimació s'utilitzarà seguint les instruccions del fabricant. No s'utilitzarà si heu superat el temps de vida útil o el temps d'enduriment després de l'obertura del recipient.
Si s'aplica més d'una capa, s'utilitzarà per a cadascuna un color diferent.
Després de l'aplicació de la pintura, les superfícies es protegiran de l'acumulació d'aigua durant un cert temps.
No es faran servir materials de protecció que perjudiquin la qualitat de la soldadura a menys de 150 mm de la zona a soldar.
Les soldadures i el metall base adjacent no es pintaran sense haver eliminat prèviament l'escòria.
La zona sense revestir situada al voltant del perímetre de la unió amb cargols no es tracta fins que no s'hagi inspeccionat la unió.

PERFILS GALVANITZATS:
El recobriment de zinc serà homogeni i continu a tota la superfície.
No s'apreciaran esquerdes, exfoliacions ni despreniments del recobriment.
La galvanització es farà d'acord amb les normes UNE-EN ISO 1460 o UNE-EN ISO 1461, segons correspongui.
Se segellaran totes les soldadures abans d'efectuar un decapat previ a la galvanització.
Si el component prefabricat té espais tancats es disposaran forats de venteig o purga.
Abans de pintar-les, les superfícies galvanitzades es netejaran i tractaran amb pintura anticorrosiva amb diluent àcid o amb sorrejat escombrador.

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE
Subministrament: de manera que no pateixin deformacions ni esforços no previstos.
Emmagatzematge: Seguint les instruccions del fabricant. En llocs secs, sense contacte directe amb el terra i protegits de la intempèrie, de manera que no se n'alterin les condicions.
No s'han de fer servir si s'ha superat la vida útil al magatzem especificada pel fabricant.

3.- UNITAT I CRITERI D'AMIDAMENT
kg de pes necessari subministrat a l'obra, calculat segons les especificacions de la DT, d'acord amb els criteris següents:

- El pes unitari pel seu càlcul ha de ser el teòric
- Per poder fer servir un altre valor diferent del teòric, cal l'acceptació expressa de la DF

Aquests criteris inclouen les pèrdues de material corresponents a retallades.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

NORMATIVA GENERAL:

UNE-EN 10025-1:2006 Productes laminats en calent d'acers per a estructures. Part 1: Condicions tècniques generals de subministrament.

UNE-EN 10025-2:2006 Productes laminats en calent d'acers per a estructures. Part 2: Condicions tècniques de subministrament dels acers estructurals no aliats.

UNE-EN 10210-1:1994 Perfils buits per a construcció, acabats en calent, d'acer no aliat de gra fi. Part 1: condicions tècniques de subministrament.

UNE-EN 10219-1:1998 Perfils buits per a construcció conformats en fred d'acer no aliat i de gra fi. Part 1: Condicions tècniques de subministrament.

UNE-EN 10162:2005 Perfils d'acer conformats en fred. Condicions tècniques de subministrament. Toleràncies dimensionals i de la secció transversal.

OBRES D'EDIFICACIÓ:

Reial Decret 751/2011, del 27 de maig, pel qual s'aprova la Instrucció d'Acer Estructural (EAE).

Reial decret 314/2006, de 17 de març, pel qual s'aprova el Codi tècnic de l'edificació part 2. Document bàsic d'acer DB-SE-A.

* UNE-ENV 1090-1:1997 Execució d'estructures d'acer. Part 1: Regles generals i regles per a edificació.

OBRES D'ENGINYERIA CIVIL:

Reial Decret 751/2011, del 27 de maig, pel qual s'aprova la Instrucció d'Acer Estructural (EAE).

* Ordre FOM/475/2002 de 13 de febrer, per la qual s'actualitzen determinats articles del Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts relatius a Formigons i Acer (PG-3).

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ EN PERFILS D'ACER LAMINAT I PERFILS D'ACER BUITS:

Cada producte haurà d'estar marcat de forma clara i indeleble amb la informació següent:

- El tipus, la qualitat i, si és aplicable, la condició de subministrament mitjançant la designació abreujada
- Un número que identifiqui la bugada (aplicable únicament en el cas d'inspecció per bugades) i, si és aplicable, la mostra
- El nom del fabricant o la marca comercial
- La marca de l'organisme de control extern (quan sigui aplicable)
- Portaran el marcatge CE de conformitat amb el que disposen els reials decrets 1630/1992 de 29 de desembre i 1328/1995 de 28 de juliol.

La marca estarà situada en una posició propera a un dels extrems de cada producte o a la secció transversal de tall.

Quan els productes se subministrin en paquets, el marcatge es farà amb una etiqueta adherida al paquet o sobre el primer producte del mateix.

PERFILS D'ACER LAMINAT EN CALENT:

El subministrador posarà a disposició de la DF si aquesta ho sol·licita la documentació següent, que acredita el marcatge CE, segons el sistema d'avaluació de conformitat aplicable, d'acord amb el que disposa l'apartat 7.2.1 del CTE:

- Productes per a ús en estructures metàl·liques o en estructures mixtes metall i formigó:
- Sistema 2+: Declaració de Prestacions

El símbol normalitzat CE (d'acord amb la directiva 93/68/CEE) es col·locarà sobre el producte acompanyat per:

- El número d'identificació de l'organisme de certificació
- El nom o marca comercial i adreça declarada del fabricant
- Els dos darrers dígits de l'any d'impressió del marcatge
- El número del certificat de conformitat CE o del certificat de producció a fàbrica (si escau)
- Referència a la norma EN 10025-1
- Descripció del producte: nom genèric, material, dimensions i ús previst
- Informació de les característiques essencials indicades de la manera següent:
- Designació del producte d'acord amb la norma corresponent de toleràncies dimensionals, segons el capítol 2 de la norma EN 10025-1
- Designació del producte d'acord amb l'apartat 4.2 de les normes EN 10025-2 a EN 10025-6

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ EN PERFILS D'ACER CONFORMATS:

Hauran d'estar marcats individualment o sobre el paquet amb una marca clara i indeleble que contingui la informació següent:

- Dimensions del perfil o número del pla de disseny
- Tipus i qualitat de l'acer
- Referència que indiqui que els perfils han estat fabricats i assajats segons UNE-EN 10162; si cal, el marcatge CE
- Nom o logotip del fabricant
- Codi de producció
- Identificació del laboratori d'assajos extern (quan sigui aplicable)
- Codi de barres, segons ENV 606, quan la informació mínima anterior es faciliti en un text clar

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ EN PERFILS PERFORATS:

Cada perfil haurà d'estar marcat de forma clara i indeleble amb la informació següent:
- La designació abreujada
- El nom o les sigles (marca de fàbrica) del fabricant
- En cas d'inspecció i assaigs específics, un número d'identificació, per exemple el número de comanda, que permeti relacionar el producte o la unitat de subministrament i el document corresponent (únicament aplicable als perfils buits conformats en fred)

Quan els productes se subministrin en paquets, el marcatge es farà amb una etiqueta adherida al paquet.

OPERACIONS DE CONTROL:

El control de recepció de material verificarà que les característiques dels materials són coincidents amb allò establert a la DT. Aquest control complirà allò especificat a l'apartat 7.2 del CTE.

Control de documentació: documents d'origen (full de subministrament i etiquetatge), certificat de garantia del fabricant, si escau, (signat per persona física) i els documents de conformitat o autoritzacions administratives exigides, inclosa la documentació corresponent al marcatge CE quan sigui pertinent.

Control mitjançant distintius de qualitat i avaluacions d'idoneïtat: En cas que el fabricant disposi d'alguna marca de qualitat, aportarà la documentació corresponent

Control de recepció mitjançant assaigs: Si el material disposa d'una marca legalment reconeguda a un país de la CEE (Marcat CE, AENOR, etc.) es podrà prescindir dels assaigs de control de recepció de les característiques del material garantides per la marca, i la DF sol·licitarà en aquest cas, els resultats dels assaigs corresponents al subministrament rebut. En qualsevol cas, la DF podrà sol·licitar assaigs de control de recepció si ho creu convenient.

Inspecció visual del material a la recepció. Es controlaran les característiques geomètriques com a mínim sobre un 10% de les peces rebudes. El subministrament del material es realitzarà amb la inspecció requerida (UNE-EN 10204).

A efectes de control d'apilament, la unitat d'inspecció complirà les condicions següents:
- Correspondència amb el mateix tipus i el grau d'acer.
- Procedència de fabricant
- Pertany a la mateixa sèrie en funció de l'espessor màxim de la secció:
- Sèrie lleugera: e <= 16mm
- Sèrie mitjana: 16 mm <= i <= 40 mm
- Sèrie pesada: e > 40 mm

En el cas de realitzar-se el control mitjançant assaigs, s'efectuaran les comprovacions següents:
- Les unitats d'inspecció seran fraccions de cada grup afí, amb un pes màxim de 20 t per lot.
- Per a cada lot, es realitzaran els assaigs següents:
- Determinació quantitativa de sofre (UNE 7-019)
- Determinació quantitativa fòsfor (UNE 7-029)
- Determinació del contingut de nitrogen (UNE 36-317-1)
- Determinació quantitativa del contingut de carboni (UNE 7014)
- En una mostra d'acer laminat, per a cada lot, es realitzaran, a més, els assaigs següents:
- Determinació quantitativa de manganès (UNE 7027)
- Determinació gravimètrica de silici (UNE 7028)
- Assaig a flexió pel xoc d'una proveta de planxa d'acer (UNE 7475-1)
- Determinació de la duresa brinell d'una proveta (UNE-EN-ISO 6506-1)
- En una mostra de perfils d'acer buits, per a cada lot, es realitzaran a més, els assaigs següents:
- Assaig d'esclafament (UNE-EN ISO 8492)
- En el cas de perfils galvanitzats, es comprovarà la massa i gruix del recobriment (UNE-EN ISO 1461, UNE-EN ISO 2178).

OPERACIONS DE CONTROL A UNIONS SOLDADES:

Recepció del certificat de qualitat de les característiques dels elèctrodes.

Abans de començar a obra, i sempre que canvieu el tipus de material d'aportació:

- Preparació d'una proveta mecanitzada, soldades amb material d'aportació previst, i assaig a tracció (UNE-EN ISO 15792-2). Abans d'aquest assaig, es realitzarà una radiografia de la soldadura realitzada (UNE-EN 1435), per tal de constatar que el cordó està totalment ple de material d'aportació.
- Assaig de tracció del metall aportat (UNE-EN ISO 15792-2) 1 proveta
- Assaig de resiliència del metall aportat (UNE-EN ISO 15792-2) 1 proveta

CRITERIS DE PRESA DE MOSTRES:

Les mostres per als assaigs químics s'han de prendre de la unitat d'inspecció segons els criteris establerts a la norma UNE-EN ISO 14284.

En perfils laminats i conformats les mostres per als assaigs mecànics es prendran segons els criteris establerts a les UNEIX EN 10025-2 a UNEIX 10025-6. Les localitzacions de les mostres seguiran els criteris establerts a l'annex A de la UNEIX EN 10025-1.

Per a la preparació de les provetes s'aplicaran els requisits establerts a la UNE-EN ISO 377.

Per a la preparació de provetes per a assaig de tracció s'aplicarà la UNE-EN 10002-1.

En perfils laminats, per a la preparació de provetes per a assaig a flexió per xoc (resiliència) s'aplicarà la norma UNE 10045-1. També són aplicables els requeriments següents:

- Gruix nominal >12 mm: mecanitzar provetes de 10x10 mm
- Gruix nominal <= 12 mm: l'amplada mínima de la proveta serà de 5 mm

Les mostres i provetes estaran marcades de manera que es reconeguin els productes originals, així com la seva localització i orientació del producte.

Les mostres i els criteris de conformitat per a perfils buits queden establerts a la norma UNE-EN 10219-1 seguint els paràmetres de la taula D.1.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

No s'acceptaran perfils que no estiguin amb les garanties corresponents i que no vagin marcats adequadament.

Si els resultats de tots els assaigs de recepció d'un lot compleixen allò prescrit, aquest és acceptable.

Si algun resultat no compleix amb allò prescrit, però s'ha observat en el corresponent assaig alguna anomalia no imputable al material (com a defecte en la mecanització de la proveta, irregular funcionament de la maquinària d'assaig...) l'assaig es considerarà nul i es repetirà correctament amb una nova proveta.

Si algun resultat no compleix allò prescrit havent-ho realitzat correctament, se'n realitzaran 2 contra assaigs segons UNE-EN 10021, sobre provetes preses de dues peces diferents del lot que s'està assajant.

Si ambdós resultats ( dels contra assaigs) compleixen allò prescrit, la unitat d'inspecció serà acceptable, en cas contrari es rebutjarà.

Quan se sobrepassi alguna de les toleràncies especificades en algun control geomètric, es rebutjarà la peça incorrecta. A més, s'augmentarà el control, a l'apartat incomplet, fins a un 20% d'unitats. Si encara hi ha irregularitats, es faran les oportunes correccions i/o rebutjos i es farà el control sobre el 100 % de les unitats amb les oportunes actuacions segons el resultat.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT A UNIONS SOLDADES:

El material d'aportació complirà les condicions mecàniques indicades.

A les provetes preparades amb soldadures, la línia de trencament ha de quedar fora de la zona d'influència de la soldadura.

## 2.7.- MATERIALS PER A PROTECCIONS DE VIALITAT

### 2.7.1. - CAPTAFARS PER A BARRERA DE SEGURETAT

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Elements de diferent forma, color i mida, instal·lats amb caràcter permanent sobre la calçada o fora de la plataforma, per tal de reforçar la capacitat de guia òptica que proporcionen els elements de senyalització tradicional.

S'han considerat els tipus següents:

- Panell direccional per abalisament de corbes
- Fita d'aresta
- Fita de vèrtex
- Balisa cilíndrica
- Captafars verticals
- Captafars per a senyalització horitzontal
- Fita quilomètrica o hectomètrica
- Fita miriamètrica

CARACTERÍSTIQUES GENERALS:

L'element serà resistent i estable davant de la intempèrie i les radiacions ultraviolades.

Presentarà un color uniforme a tota la seva superfície.

Estarà exempt de rebaves, fissures, grans i altres defectes superficials.

Tots els elements que constitueixen l'element seran compatibles entre ells.

Seran capaços de reflectir la major part de la llum incident, a la mateixa direcció, però en sentit contrari.

FITA D'ARISTA, FITA DE VÈRTICE, BALISA CILÍNDRICA I CAPTAFARS VERTICAL:

El substrat (zona no retroreflectant) ha de complir les característiques de visibilitat (coordenades cromàtiques i factor de luminància) indicades a l'epígraf 6.3.1 de la norma UNE-EN 12899-3.

Les característiques físiques i resistents del substrat seran les especificades a l'epígraf 6.4.1 de la norma UNE-EN 12899-3.

Els dispositius retroreflectants han de complir les característiques sobre coordenades cromàtiques (visibilitat diürna i visibilitat nocturna), factor de luminància, coeficient de retroreflexió i característiques de visibilitat indicades a l'epígraf 6.3.2 de la norma UNE-EN 12899-3.

Les característiques físiques i resistents dels dispositius retroreflectants seran les especificades a l'epígraf 6.4.2 de la norma UNE-EN 12899-3.

Les característiques essencials establertes a la norma UNE-EN 12899-3 (taula ZA.3) han de complir els valors declarats pel fabricant, assajats segons la norma corresponent, dins el límit de tolerància indicat si escau.

CAPTAFARS VERTICAL:

Compost per un cos i un dispositiu retroreflectant.

El cos del captafar vertical pot estar fabricat amb qualsevol material i ha de complir els requisits de la norma UNE 135366.

Segons la norma UNE-EN 12899-3, es classifiquen en tipus D4.

Els dispositius retroreflectants emprats seran qualsevol dels indicats a la norma UNE-EN 12899-3, encara que es recomana utilitzar dispositius de tipus R1 classe RA2 com a mínim.

Les seves dimensions seran tals que permetin la seva instal·lació adequada.

El pes del captafars, sense considerar elements d'ancoratge aliens al cos, no és superior a 0,5 kg.

Ha de ser capaç de reflectir la major part de la llum incident.

No presentarà abonyegaments, punts d'oxidació, ratllades a la làmina reflectora ni desperfectes a la seva superfície.

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament i emmagatzematge: De manera que no se n'alterin les condicions.

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

NORMATIVA GENERAL:

Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).

Ordre FOM/2523/2014, de 12 de desembre, per la qual s'actualitzen determinats articles del Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts, relatius a materials bàsics, a ferms i paviments, i a senyalització, abalisament i sistemes de contenció de vehicles (PG-3).

CAPTAFARS VERTICAL:

UNE-EN 12899-3:2010 Senyals verticals fixes de circulació. Part 3: Delineadors i dispositius retroreflectants.

* UNE 135366:2011 Senyalització vertical. Captafars verticals. Característiques i mètodes dassaig.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ:

Les fites d'aresta, fites de vèrtex, balises cilíndriques i captafars verticals han de disposar del marcatge CE, segons l'Annex ZA de la norma UNE-EN 12899-3.

El subministrador posarà a disposició de la DF si aquesta ho sol·licita, la documentació següent, que acredita el marcatge CE, segons el sistema d'avaluació de conformitat aplicable:

- Fites d'aresta, fites de vèrtex, balises cilíndriques i captafars verticals:
- Informació, guia, avís i canalització d'usuaris de carreteres:
- Sistema 1+: Declaració de prestacions

Sobre l'element d'abalisament o a l'albarà de lliurament constaran les dades següents:

- Marca CE de conformitat amb el que disposa la Directiva 93/68/CEE. El símbol normalitzat del marcatge CE s'acompanyarà de la informació següent:
- Número d'identificació de l'organisme de certificació
- Nom, marca comercial i adreça registrada del fabricant
- Els dos darrers dígits de l'any en què es va fixar el marcatge CE
- Número de certificat de conformitat CE o del certificat de control de producció a fàbrica si escau

- Referència a la norma EN 12899-1, EN 12899-3 o EN 1463-1, si és el cas
- Descripció del producte: nom genèric, material, dimensions i ús previst
- Identificació de les característiques del producte, en el cas dels captafars per a senyalització horitzontal (tipus de captafars, tipus de retroreflector, retroreflectància, etc.)
- Informació de les característiques essencials de la taula ZA.1 de la norma UNE-EN 12899-1, UNE 12899-3 o UNE 1463-1, segons escaigui

OPERACIONS DE CONTROL:

El control de recepció de material verificarà que les característiques dels materials són coincidents amb allò establert a la DT.

Control de documentació: documents d'origen (full de subministrament i etiquetatge), certificat de garantia del fabricant, si escau, (signat per persona física) i els documents de conformitat o autoritzacions administratives exigides, inclosa la documentació corresponent al marcatge CE quan sigui pertinent.

Control de recepció mitjançant assaigs: Si el material disposa d'una marca legalment reconeguda a un país de la CEE (Marcat CE, AENOR, etc.) es podrà prescindir dels assaigs de control de recepció de les característiques del material garantides per la marca, i la DF sol·licitarà en aquest cas, els resultats dels assaigs corresponents al subministrament rebut. En qualsevol cas, la DF podrà sol·licitar assaigs de control de recepció si ho creu convenient.

Abans de la instal·lació dels elements d'abalisament, la DO podrà comprovar-ne la qualitat mitjançant la realització dels següents assaigs de comprovació:

- Fites d'aresta, fites de vèrtex, balises cilíndriques i captafars verticals: assaigs de característiques visuals, segons l'apartat 6.3 de la norma UNE-EN 12899-3.

CRITERIS DE PRESA DE MOSTRES:

Se seguiran els següents criteris:

- Fites d'aresta, fites de vèrtex, balises cilíndriques i captafars verticals: els establerts a l'apartat 703.7.2.2 de l'article 703 del PG3.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

Si efectuats els assaigs corresponents sobre la mostra representativa, no es compleixen els requisits exigits, s'han de rebutjar tots els materials d'un mateix tipus arreplegats.

Els apilaments rebutjats es poden presentar a una nova inspecció, sempre que el subministrador acrediti que s'han eliminat totes les partides defectuoses o se n'han corregit els defectes.

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**2.7.2.- SENYAL TRIANGULAR**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Elements per col·locar verticalment, destinats a informar i ordenar la circulació en vies utilitzades per vehicles i/o vianants.

S'han considerat els elements següents:

- Senyals de contingut fix, que són els que tenen un contingut preestablert pel
- Catàleg de senyals verticals de circulació publicat per la Direcció General de
- Carreteres; únicament varien la seva mida i els números que inclouen en alguns casos.

S'han considerat els materials següents:

- Alumini anoditzat.
- Acer galvanitzat

S'han considerat els acabats següents:

- Amb pintura no reflectora
- Amb làmina retroreflectant.

CARACTERÍSTIQUES GENERALS:

La placa senyal estarà formada per estampació d'una planxa d'alumini o d'acer galvanitzat, amb els elements de reforç i ancoratge necessaris per ancorar-los, i recoberta amb l'acabat que li sigui propi, pintura no reflectora o amb una làmina retroreflectant.

La utilització de materials duna altra naturalesa haurà de ser aprovada per la DF.

La superfície metàl·lica serà neta, llisa, no porosa, exempta de corrosió i resistent a la intempèrie.

No presentarà esgarrapades, abonyegaments ni altres defectes superficials.

El substrat dels senyals i cartells verticals de circulació han de complir el que indica la norma UNE-EN 12899-1.

No s'admetran les classes següents (d'acord amb la UNE-EN 12899-1):

- P1 per a la perforació de la cara del senyal (cara del senyal amb perforacions a la seva superfície a una distància no inferior a cent cinquanta mil·límetres (150 mm)).
- E1 per a les vores de la placa del senyal (les vores del senyal no estan protegides, el substrat és una placa plana).
- SP0 per a la protecció de la superfície de la placa del senyal (sense cap protecció de la superfície del senyal davant de la corrosió).

Tindran les dimensions, colors i composició indicades a la DT, d'acord amb el Capítol VI/Secció 4a del Reglament General de Circulació, així com a la vigent Norma 8.1-IC "Senyalització vertical" de la Instrucció de Carreteres.

Les estructures i els elements d'acer han de ser conformes amb la Norma EN 1993-1-1.

Les estructures i els elements d'alumini han de ser conformes amb la Norma EN 1999-1-1.

Les característiques dels senyals i cartells seran les especificades a la Taula 701.1. del PG 3/75 MOD 11-OM

No s'admetrà l'ús de les classes següents:

- Pressió de vent: Classe WL2
- Pressió deguda a la neu: Classe DSL0
- Càrregues puntuals: Classe PL0
- Deformació temporal màxima a flexió: Classe TDB4
- Deformació temporal màxima a torsió: Classe TDT0

Només s'admetran els senyals i cartells verticals de circulació per als quals els coeficients parcials de seguretat per a càrregues emprats siguin de la classe PAF2.

ACABAT AMB LÀMINA RETROREFLECTANT:

Els materials retroreflectants constituïts per microesferes de classe RA1 i classe RA2 seran conformes amb les característiques visuals (coordenades cromàtiques, factor de luminància, coeficient de retroreflexió, durabilitat) i de resistència a la caiguda d'una massa, de la norma UNE-EN 12899 -1.

Els materials microprismàtics de classe RA1, RA2 i RA3 han de complir les característiques de les normes UNE-EN 12899-1 i UNE 135340.

ACABAT AMB PINTURA NO RETROREFLECTANT:

Estarà exempta de corrosió, i no presentar defectes que impedeixin la seva visibilitat o identificació correctes, com abonyegaments, etc.

La pel·lícula seca de pintura presentarà un aspecte uniforme, brillant, exempta de grans i de qualsevol altra imperfecció superficial

Els colors estaran dins dels límits cromàtics i de factor de luminància especificats a la norma UNE 135331

Brillantor especular a 60°C: > 50%

Adherència (assaig 4.4): <= 1, No apareixeran dents de serra

Resistència a l'impacte (assaig 4.5): Sense trencament

Resistència a la immersió en aigua (assaig 4.6):

- Immediatament després de l'assaig: Sense butllofes, arrugues ni estovaments
- A les 24 hores: Brillantor especular >= 90% brillantor abans de l'assaig

Resistència a la boira salina: Complirà especificacions art. 3.7

Resistència a la calor i al fred (assaig 4.8 i 4.9):

- No hi haurà butllofes, pèrdua d'adherència o defectes apreciables

Envelliment artificial: Complirà les condicions art. 3.9.

Envelliment natural: complirà les condicions de l'article 3.10

Tots aquests valors es comprovaran d'acord amb la UNE 135331.

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament: Embalades individualment o agrupades en embalatge rígid de fusta o metàl·lic. A l'exterior hi ha de figurar el símbol de les plaques i el nombre d'unitats.

Emmagatzematge: Assentades en horitzontal en llocs secs, ventilats i sense contacte directe amb el terra.

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

NORMATIVA GENERAL:

* Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).
* Ordre FOM/2523/2014, de 12 de desembre, per la qual s'actualitzen determinats articles del Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts, relatius a materials bàsics, a ferms i paviments, i a senyalització, abalisament i sistemes de contenció de vehicles (PG-3).
* Ordre FOM/534/2014, de 20 de març, per la qual s'aprova la norma 8.1-IC senyalització vertical de la Instrucció de Carreteres.
* UNE-EN 12899-1:2009 Senyals verticals fixes de circulació. Part 1: Senyals fixes.
* UNE 135331:2011 Senyalització vertical. Senyals metàl·lics permanents. Zona no retroreflectant. Pintures. Característiques i mètodes dassaig.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ:

El fabricant ha de facilitar la informació del producte. Quan aquesta no es pugui marcar sobre el producte, ha d'estar a la documentació que l'acompanya. En aquest cas, el producte ha de tenir un codi d'identificació.

Tots els productes i components dels senyals verticals fixos de circulació han d'estar marcats al revers de forma clara i duradora amb la informació següent:

- Símbol del marcatge CE
- Número d'identificació de l'organisme de certificació
- Nom o marca distintiva d'identificació i adreça registrada del fabricant
- Els 2 darrers dígits de l'any en què es fixa el marcatge
- Número de certificat de conformitat CE o del certificat de control de producció a fàbrica si escau
- Referència a la norma europea: EN 12899-1:2007
- Descripció del producte: nom genèric, material, dimensions i ús previst
- Informació sobre aquelles característiques essencials que siguin procedents recollides a les taules ZA.1 a ZA.6 de la norma EN 12899-1:2007, indicades segons l'apartat ZA.3 de la mateixa norma

El fabricant o subministrador ha de facilitar la informació següent:

- Instruccions de muntatge i instal·lació del senyal
- Dades sobre qualsevol limitació de la ubicació del senyal
- Instruccions d'ús i manteniment i neteja del senyal, incloent-hi les instruccions per al canvi de làmpades si fos el cas

El fabricant facilitarà a la DO, amb cada subministrament, un albarà amb documentació annexa contenint, entre altres, les dades següents:

- Nom i adreça de l'empresa subministradora
- Data de subministrament
- Identificació de la fàbrica que ha produït el material
- Identificació del vehicle que el transporta
- Quantitat subministrada i designació de la marca comercial

OPERACIONS DE CONTROL:

La DO podrà comprovar sobre una mostra representativa dels materials subministrats, que la marca, referència i característiques dels mateixos es correspon amb la declarada a la documentació que els acompanya , en especial les dimensions dels senyals i cartells verticals, així com la retroreflexió del material.

CRITERIS DE PRESA DE MOSTRES:

La presa de mostres es farà d'acord amb les indicacions de lOrdre FOM/2523/2014.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

No sutilitzaran materials que no arribin acompanyats del corresponent certificat de qualitat del fabricant, d'acord amb les especificacions del plec.

Els assaigs d'identificació han de resultar conformes a les especificacions. En cas d'incompliment, es repetirà l'assaig corresponent sobre les mostres reservades, i s'acceptarà el subministrament si els dos resultats són satisfactoris.

Es considera unitat defectuosa aquella que presenta algun incompliment a les operacions de control definides.

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**2.7.3. - PERFIL LONGITUDINAL P/BARRERA DE SEGURETAT FLEXIBLE**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Barreres per a proteccions de vialitat.

S'han considerat els tipus següents:

- Perfil longitudinal de secció doble ona per a barrera de seguretat flexible
- Perfil longitudinal de secció doble ona i de secció plana trapezoïdal per a sistemes de protecció de motociclistes

PERFILS DOBLE ONDA PER A BARRERES DE SEGURETAT FLEXIBLES:

Element de la barrera que entra en contacte amb el vehicle, absorbeix mitjançant deformació plàstica part de la seva energia cinètica, i el recondueix a la circulació de manera suau. Destinat a impedir la col·lisió dels vehicles amb una mica més perillós que la mateixa barrera.

Obtingut a partir de bobina d'acer laminada en calent, mitjançant un procés de conformació en fred i una galvanització posterior en calent.

Fabricat amb acer tipus S235JR segons UNE-EN 10025.

Amb aptitud química a la galvanització: contingut de silici i fòsfor limitats (Si<=0,03% i Si+2,5P<=0,09%)

L'acer estarà protegit contra la corrosió mitjançant galvanitzat en calent segons UNE-EN ISO 1461.

La qualitat del zinc utilitzat al galvanitzat estarà d'acord amb la UNE-EN 1179.

Gruix del recobriment galvanitzat (UNE-EN ISO 1461): >= 70 micres

Massa del recobriment galvanitzat (UNE-EN ISO 1461): >= 505 g/m2

No presentarà abonyegaments, punts d'oxidació ni desperfectes a la seva superfície.

El recobriment dels elements serà llis, homogeni i sense discontinuïtats a la capa de zinc.

Estarà exempt de taques, inclusions de flux, cendres o motes.

No presentarà exfoliacions apreciables a primera vista ni bombolles, ratlles, picades o punts sense galvanitzar.

Les dimensions i toleràncies del perfil es correspondran amb les indicades a la figura 1 de la UNE 135121.

Desenvolupament del perfil: 473 mm

Gruix nominal: 3 mm

Longitud útil del perfil: 4 m

Toleràncies:

- Gruix: ± 0,1 mm
- Desenvolupament del perfil: +6, -3 mm

PERFILS LONGITUDINALS PER A SISTEMES DE PROTECCIÓ DE MOTOCICLISTES:

Element que instal·lat sobre una barrera de seguretat garanteix la protecció dels motociclistes, evitant l'impacte directe contra el pal i el pas del cos a través del buit entre dos pals consecutius.

Fabricat amb xapa d'acer laminada en calent, tipus S 235 JR segons UNE-EN 10025 i galvanitzat en calent per immersió segons la norma UNE-EN ISO 1461.

## 2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

PERFILS PER A BARRERES DE SEGURETAT FLEXIBLES I PERFILS PER A SISTEMES DE PROTECCIÓ DE MOTOCICLISTES:

Subministrament: Els perfils aniran marcats amb la identificació del fabricant. El marcatge haurà de ser llegible a simple vista i indeleble.

Emmagatzematge: En zones a cobert. Si no és possible, s'han d'emmagatzemar amb un pendent mínim de l'1,5 % en el sentit longitudinal del perfil i amb una separació mínima de 4 cm entre els perfils i el terreny.

En cas de subministrar-se paletitzats i plastificats, es retiraran els plàstics.

L'amuntegament es realitzarà en zones llises, netes i pavimentades.

No s'han d'emmagatzemar durant un període superior a 12 mesos.

## 3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

## 4.- NORMATIVA DE COMPLIMENT OBLIGATORI

PERFILS PER A BARRERES DE SEGURETAT FLEXIBLES:

* Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).
* Ordre FOM/2523/2014, de 12 de desembre, per la qual s'actualitzen determinats articles del Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts, relatius a materials bàsics, a ferms i paviments, i a senyalització, abalisament i sistemes de contenció de vehicles (PG-3).
* UNE 135121:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Tanca de perfil de doble ona. Materials, geometria, dimensions i assaigs.
* UNE 135124:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Condicions de manipulació i emmagatzematge. Procediments de muntatge i metodologia de control.

BARRERES DE CONTROL D'ACCÉS I PERFILS PER A SISTEMES DE PROTECCIÓ DE MOTOCICLISTES:

No hi ha normativa de compliment obligat.

## 5.- CONDICIONS DE CONTROL DE RECEPCIÓ

OPERACIONS DE CONTROL EN PERFILS LONGITUDINALS PER A BARRERES DE SEGURETAT FLEXIBLES:

Les tasques de control a realitzar són les següents:

- Inspecció visual del material subministrat amb observació de les marques que identifiquen el fabricant, i recepció del corresponent certificat de qualitat on es garanteixin les condicions indicades al plec. Atenció especial a laspecte superficial del galvanitzat.
- Cada 256 m de barrera flexible (lot de control), es realitzaran els següents controls sobre peces escollides a l'atzar:
- Control indirecte de l'espessor de la barrera mitjançant el pes dels perfils (el pes teòric d'una peça de barrera de 2,90 mm de gruix i 473 mm de desenvolupament, descomptant forats i incloent-hi el galvanitzat, és de 48,1 kg) . Es pesaran individualment 25 peces corresponents al lot.
- Comprovació del recobriment: assaigs d'adherència i massa del recobriment (mètodes no destructius) sobre 10 peces del lot (assajos d'adherència conforme UNE 37501 i de recobriment conforme UNE EN ISO 1461)
- Comprovació de les característiques geomètriques del perfil sobre 10 peces del lot (5 mides a cada peça)

- Cada 2000 m de barrera flexible (lot de control), es realitzaran els següents controls sobre peces escollides a l'atzar:

- Identificació del tipus d'acer de la barrera (AP-11) segons UNE-EN 10111 (1 determinació).

En cas que el material disposi de la Marca AENOR, o una altra de legalment reconeguda en un país de la UE, es podrà prescindir dels assajos de control de recepció. La DF sol·licitarà, en aquest cas, els resultats dels assaigs corresponents al subministrament rebut, segons control de producció establert a la marca de qualitat del producte.

CRITERIS DE PRESA DE MOSTRES EN PERFILS LONGITUDINALS PER A BARRERES DE SEGURETAT FLEXIBLES:

Els controls es realitzaran segons les instruccions de la DF i els criteris indicats a les normes de procediment corresponents.

Les comprovacions geomètriques dels perfils es faran sobre la barrera abans de galvanitzar. El control de l'alçada del perfil i la longitud total de la barrera es pot fer, sobre aquesta, una vegada galvanitzada.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT EN PERFILS LONGITUDINALS PER A BARRERES DE SEGURETAT FLEXIBLES:

No s'acceptarà l'ús de materials que no arribin acompanyats del certificat de qualitat corresponent del fabricant.

El resultat del control indirecte de l'espessor serà satisfactori si el pes mitjà dels perfils resulta superior al valor de referència i, a més, es compleixi que: Q = (x - P) / s > 0,94

X = Pes mitjà dels perfils dels lots

P = Pes de referència

s = Desviació estàndard (n-1), s^2 = s ( xi x ) ^2/(n-1)

sent xi el pes individual de cada perfil i el nombre de perfils de la mostra.

En cas d'incompliment es podrà, a criteri de la DF, ampliar la mostra d'assaig (analitzar més peces), i el lot s'acceptarà si es verifica la condició anterior.

L'aspecte visual del recobriment i el resultat dels assaigs d'adherència han de ser conformes a les especificacions del plec. La mitjana de les 10 determinacions de la massa del galvanitzat ha de ser superior al valor especificat, i tots els valors individuals s'han de mantenir per sobre del 95% d'aquesta especificació.

Si el valor mitjà de les 5 determinacions de característiques geomètriques corresponents a una peça, no resulta conforme a la norma UNE 135-121, es rebutjarà aquesta peça i se n'ampliarà el control fins a un total de 25 peces per lot. En cas dobservar noves deficiències, es passarà a controlar aquest aspecte sobre la totalitat de peces del lot.

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**2.7.4.- POST DE BARRERA DE SEGURETAT**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Materials auxiliars per a proteccions de vialitat.

S'han considerat els elements següents:

- Pal de perfil en C i tubular per a barreres de seguretat flexibles

POSTES PER A BARRERES DE SEGURETAT FLEXIBLES:

Element que suporta la barrera i que s'insereix al terreny.

Fabricat amb acer tipus S235JR segons UNE-EN 10025.

Amb aptitud química a la galvanització: contingut de silici i fòsfor limitats (Si<=0,03% i Si+2,5P<=0,09%)

L'acer estarà protegit contra la corrosió mitjançant galvanitzat en calent segons UNE-EN ISO 1461.

La qualitat del zinc utilitzat al galvanitzat estarà d'acord amb la UNE-EN 1179.

Gruix del recobriment galvanitzat (UNE-EN ISO 1461): >= 70 micres

Massa del recobriment galvanitzat (UNE-EN ISO 1461): >= 505 g/m2

No presentarà abonyegaments, punts d'oxidació ni desperfectes a la seva superfície.

El recobriment dels elements serà llis, homogeni i sense discontinuïtats a la capa de zinc.

Estarà exempt de taques, inclusions de flux, cendres o motes.

No presentarà exfoliacions apreciables a primera vista ni bombolles, ratlles, picades o punts sense galvanitzar.

Dimensions i toleràncies de pals tipus C: UNE 135122.

Dimensions i toleràncies de pals tubulars: UNE 135123.

Gruix nominal pal tipus C: 4 mm

Gruix nominal pal tubular: 3 mm

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

POSTES PER A BARRERES DE SEGURETAT FLEXIBLES:

Subministrament: Els perfils aniran marcats amb la identificació del fabricant. El marcatge haurà de ser llegible a simple vista i indeleble.

Emmagatzematge: En zones a cobert. Si no és possible, s'han d'emmagatzemar amb un pendent mínim de l'1,5 % en el sentit longitudinal del perfil i amb una separació mínima de 4 cm entre els perfils i el terreny.
En cas de subministrar-se paletitzats i plastificats, es retiraran els plàstics.
L'amuntegament es realitzarà en zones llises, netes i pavimentades.

3.- UNITAT I CRITERI D'AMIDAMENT
BANDEROLA, PÒRTIC, POST I ACCESSORIS PER A BARRERA FLEXIBLE:
Unitat de mesura: la indicada a la descripció de l'element
Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI
NORMATIVA GENERAL:
* Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).
* Ordre FOM/2523/2014, de 12 de desembre, per la qual s'actualitzen determinats articles del Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts, relatius a materials bàsics, a ferms i paviments, i a senyalització, abalisament i sistemes de contenció de vehicles (PG-3).
POSTES DE PERFIL EN C, SEPARADORS, PECES ANGULARS, TOPES FINALS, TERMINALS EN FORMA DE CUA DE PEIX I PART PROPORCIONAL D'ELEMENTS DE FIXACIÓ PER A BARRERES DE SEGURETAT FLEXIBLES:
* UNE 135122:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Elements accessoris de les barreres metàl·liques. Materials, geometria, dimensions i assaigs.
* UNE 135124:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Condicions de manipulació i emmagatzematge. Procediments de muntatge i metodologia de control.
POSTES DE PERFIL TUBULAR I CONNECTOR DE POST TUBULAR:
* UNE 135123:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Elements accessoris de la barrera metàl·lica simple amb pal tubular. Materials, geometria, dimensions i assaigs.
* UNE 135124:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Condicions de manipulació i emmagatzematge. Procediments de muntatge i metodologia de control.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ
OPERACIONS DE CONTROL:
Els punts de control més destacables són els següents:
- Inspecció visual del material subministrat amb observació de les marques que identifiquen el fabricant, i recepció del corresponent certificat de qualitat on es garanteixin les condicions indicades al plec. Atenció especial a laspecte superficial del galvanitzat.
OPERACIONS DE CONTROL EN POSTES PER A BARRERES DE SEGURETAT:
Els punts de control més destacables són els següents:
- Cada 256 m de barrera de seguretat es realitzaran les comprovacions següents:
- Determinació de la massa per unitat de superfície duna pel·lícula de galvanitzat segons la norma UNE-EN ISO 1461.
- Comprovació del recobriment: assaigs d'adherència i massa del recobriment (mètodes no destructius) (assajos d'acord amb UNE-EN ISO 1461)
– Comprovació de les característiques geomètriques dels pals.
- Cada 2000 kg, o fracció, de suports de les mateixes característiques (lot de control), es realitzaran els assaigs següents:
- Característiques mecàniques: resistència a tracció, límit elàstic i allargament de ruptura (UNE-EN 10025).
En cas que el material disposi de la Marca AENOR, o una altra de legalment reconeguda en un país de la UE, es podrà prescindir dels assajos de control de recepció. La DF sol·licitarà, en aquest cas, els resultats dels assaigs corresponents al subministrament rebut, segons control de producció establert a la marca de qualitat del producte.
CRITERIS DE PRESA DE MOSTRES:
Se seguiran les instruccions de la DF i els criteris de les normes de procediment indicades a cada assaig.
INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:
No s'acceptarà l'ús de materials que no arribin acompanyats del certificat de qualitat corresponent del fabricant.
Els resultats dels assaigs d'identificació compliran les condicions del plec. En cas d'incompliment en una comprovació, es repetirà l'assaig sobre dues mostres més del mateix lot, acceptant el conjunt, quan aquestes siguin satisfactòries.

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**2.7.5.- ELEMENTS DE FIXACIÓ PER A BARRERA DE SEGURETAT**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Materials auxiliars per a proteccions de vialitat.

S'han considerat els elements següents:

- Part proporcional d'elements de fixació per a barreres de seguretat

PARTS PROPORCIONALS D'ELEMENTS DE FIXACIÓ PER A BARRERES DE SEGURETAT:

Conjunt d'elements de fixació d'acer, formats mitjançant estampació i galvanitzats en calent, necessaris per fixar un metre de barrera de seguretat.

Compliran les condicions de la norma UNE 135122.

S'utilitzarà acer de tipus S235JR, segons UNE-EN 10025. En elements d'unió (cargols) no definits per cap norma s'utilitzaran acers de característiques similars als normalitzats.

Recobriment galvanitzat en calent segons la norma UNE-EN ISO 10684.

Les superfícies seran llises, no presentaran fissures, rebaves ni altres defectes superficials.

Els fils de la rosca dels cargols no tindran defecte de material ni petjades de ferramenta.

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

PARTS PROPORCIONALS D'ELEMENTS:

Subministrament: Empaquetats en caixes. A l'exterior hi figuraran les característiques de l'element de fixació i el nombre d'unitats que conté.

Emmagatzematge: En el propi embalatge, de manera que no se n'alterin les característiques.

3.- UNITAT I CRITERI D'AMIDAMENT

PART PROPORCIONAL D'ELEMENTS DE FIXACIÓ PER A BARRERES DE SEGURETAT:

Unitat d'elements necessaris per fer la unió d'una barrera al tram contigu i al suport.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

NORMATIVA GENERAL:

* Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).

* Ordre FOM/2523/2014, de 12 de desembre, per la qual s'actualitzen determinats articles del Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts, relatius a materials bàsics, a ferms i paviments, i a senyalització, abalisament i sistemes de contenció de vehicles (PG-3).

POSTES DE PERFIL EN C, SEPARADORS, PECES ANGULARS, TOPES FINALS, TERMINALS EN FORMA DE CUA DE PEIX I PART PROPORCIONAL D'ELEMENTS DE FIXACIÓ PER A BARRERES DE SEGURETAT FLEXIBLES:

* UNE 135122:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Elements accessoris de les barreres metàl·liques. Materials, geometria, dimensions i assaigs.

* UNE 135124:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Condicions de manipulació i emmagatzematge. Procediments de muntatge i metodologia de control.

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**2.7.6.- ACCESSORIS PER A BARRERA DE SEGURETAT**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Materials auxiliars per a proteccions de vialitat.

S'han considerat els elements següents:

- Accessoris o peces especials per a barreres de seguretat flexibles
- Separador per a barrera metàl·lica simple
- Separador per a barrera metàl·lica doble
- Connector de pal tubular
- Terminal en forma de cua de peix aixafada per a barreres de seguretat
- Peça per a sustentació del sistema de protecció de motociclistes
- Peça angular per a extrem de barrera metàl·lica
- Topall final per a barrera metàl·lica simple

ACCESSORIS O PECES ESPECIALS PER A BARRERES DE SEGURETAT FLEXIBLES:

Accessori necessari per a la instal·lació de les barreres, així com per assegurar-ne el funcionament correcte.

Fabricat amb acer tipus S235JR segons UNE-EN 10025.

Amb aptitud química a la galvanització: contingut de silici i fòsfor limitats (Si<=0,03% i Si+2,5P<=0,09%)

L'acer estarà protegit contra la corrosió mitjançant galvanitzat en calent segons UNE-EN ISO 1461.

La qualitat del zinc utilitzat al galvanitzat estarà d'acord amb la UNE-EN 1179.

Gruix del recobriment galvanitzat (UNE-EN ISO 1461): >= 70 micres

Massa del recobriment galvanitzat (UNE-EN ISO 1461): >= 505 g/m2

No presentarà abonyegaments, punts d'oxidació ni desperfectes a la seva superfície.

El recobriment dels elements serà llis, homogeni i sense discontinuïtats a la capa de zinc.

Estarà exempt de taques, inclusions de flux, cendres o motes.

No presentarà exfoliacions apreciables a primera vista ni bombolles, ratlles, picades o punts sense galvanitzar.
Dimensions i toleràncies de separador, terminal cua de peix, peça angular i topall final : UNE 135122.
Dimensions i toleràncies de connector de pal tubular: UNE 135123.
Gruix nominal: 3 mm

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE
ACCESSORIS PER A BARRERES DE SEGURETAT FLEXIBLES:
Subministrament: Marcats amb la identificació del fabricant. El marcatge haurà de ser llegible a simple vista i indeleble.
Emmagatzematge: En zones a cobert. En llocs secs i ventilats sense contacte directe amb el terra.
Els paquets han d'anar paletitzats i no s'han d'apilar.
En cas de subministrar-se plastificats, es retiraran els plàstics.
L'amuntegament es realitzarà en zones llises, netes i pavimentades.
No s'han d'apilar en més de dues alçades.

3.- UNITAT I CRITERI D'AMIDAMENT
BANDEROLA, PÒRTIC, POSTE I ACCESSORIS PER A BARRERA FLEXIBLE:
Unitat de mesura: la indicada a la descripció de l'element
Criteri de mesura: quantitat necessària subministrada a l'obra
4.- NORMATIVA DE COMPLIMENT OBLIGATORI
NORMATIVA GENERAL:
* Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).
* Ordre FOM/2523/2014, de 12 de desembre, per la qual s'actualitzen determinats articles del Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts, relatius a materials bàsics, a ferms i paviments, i a senyalització, abalisament i sistemes de contenció de vehicles (PG-3).
POSTES DE PERFIL EN C, SEPARADORS, PECES ANGULARS, TOPES FINALS, TERMINALS EN FORMA DE CUA DE PEIX I PART PROPORCIONAL D'ELEMENTS DE FIXACIÓ PER A BARRERES DE SEGURETAT FLEXIBLES:
* UNE 135122:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Elements accessoris de les barreres metàl·liques. Materials, geometria, dimensions i assaigs.
* UNE 135124:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Condicions de manipulació i emmagatzematge. Procediments de muntatge i metodologia de control.
POSTES DE PERFIL TUBULAR I CONNECTOR DE POST TUBULAR:
* UNE 135123:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Elements accessoris de la barrera metàl·lica simple amb pal tubular. Materials, geometria, dimensions i assaigs.
* UNE 135124:2012 Barreres metàl·liques de seguretat per a contenció de vehicles. Condicions de manipulació i emmagatzematge. Procediments de muntatge i metodologia de control.

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## 2.8.- TUBS I ACCESSORIS PER A DRENATGE

### 2.8.1.- MATERIALS AUXILIARS PER A EVACUACIÓ D'AIGÜES RESIDUALS

1.- DEFINICIÓ I CARACTERÍSTIQUES DELS ELEMENTS

Brides per a la subjecció o suspensió dels tubs d'evacuació d'aigües pluvials o residuals als paraments de suport, en forma d'abraçadora encastable de xapa d'acer, galvanitzada.
CARACTERÍSTIQUES GENERALS:
L'abraçadora ha de constar de dues parts que s'uneixin pel pla diametral, mitjançant una brida i un cargol o dos cargols galvanitzats.
Una de les parts de la brida ha de portar una pota d'ancoratge per encastar l'obra.
El recobriment de zinc ha de ser llis, sense discontinuïtats, exfoliacions o altres defectes.
L'abraçadora no ha de tenir rugositats ni rebaves.
Diàmetre de l'abraçadora (D): 5 <= D <= 50 cm
Ample: >= 1,5 cm
Gruix: >= 0,05 cm
Recobriment de protecció (galvanització): >= 275 g/m2
Puresa del zinc de recobriment: >= 98,5%
Les condicions de galvanització s'han de verificar d'acord amb UNE 7-183 i UNE 37-501.

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament: Empaquetades en caixes. A cada brida o albarà de lliurament han d'existir les dades següents:
- Nom del fabricant o marca comercial
- Diàmetre del tub que abraça
Emmagatzematge: En llocs secs i ventilats, protegits dimpactes.

3.- UNITAT I CRITERIS D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element
Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

No hi ha normativa de compliment obligat.

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**2.8.2.- ACCESSORIS GENÈRICS PER A DESAGÜES, BAIXANTS I COL·LECTORS**

1.- DEFINICIÓ I CARACTERÍSTIQUES DELS ELEMENTS
Conjunt d'accessoris (colzes, derivacions, reduccions, etc.) i elements especials (materials per a la unió entre tubs o entre tubs i accessoris) per a desguassos i baixants.
S'han considerat els elements següents:
- Accessoris i elements especials per a tubs de PVC-U de paret massissa
- Accessoris i elements especials per a tubs de PVC-U de paret estructurada
- Elements especials per a baixants de fosa grisa
- Elements especials per a baixants de planxa galvanitzada amb unió plegada
CARACTERÍSTIQUES GENERALS:
El material, la seva qualitat i les característiques físiques, mecàniques i dimensionals seran compatibles amb les del tub, no fent disminuir les del mateix en cap de les seves aplicacions.

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE
Subministrament: A l'albarà de lliurament han de constar les següents característiques d'identificació:
- Material
- Tipus
- Diàmetres
Emmagatzematge: En llocs protegits contra els impactes, la pluja, les humitats i els raigs del sol.

3.- UNITAT I CRITERIS D'AMIDAMENT
Unitat composta pel conjunt de peces necessàries per muntar 1m de tub.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI
PVC-U PARET ESTRUCTURADA:
* UNE-EN 1453-1:2000 Sistemes de canalització en materials plàstics amb tubs de paret estructurada per evacuació d'aigües residuals (a baixa i a alta temperatura) a l'interior de l'estructura dels edificis. Policlorur de vinil no plastificat (PVC-U). Part 1: Requisits per als tubs i el sistema.

PVC-U DE PARET MASSISSA:
* UNE-EN 1329-1:1999 Sistemes de canalització en materials plàstics per evacuació d'aigües residuals (a baixa i a alta temperatura) a l'interior de l'estructura dels edificis. Policlorur de vinil no plastificat (PVC-U). Part 1: Especificacions per a tubs, accessoris i el sistema.
* UNE-EN 1401-1:1998 Sistemes de canalització en materials plàstics per a sanejament soterrat sense pressió. Policlorur de vinil no plastificat (PVC-U). Part 1: Especificacions per a tubs, accessoris i el sistema.
* UNE-EN 1456-1:2002 Sistemes de canalització en materials plàstics per sanejament soterrat o aeri amb pressió. Policlorur de vinil no plastificat (PVC-U). Part 1: Especificacions per a tubs, accessoris i el sistema.

FONDICIÓ, PLANXA GALVANITZADA I PLOM:
No hi ha normativa de compliment obligat

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**2.8.3.- TUBS I ACCESSORIS DE PVC**

1.- DEFINICIÓ I CARACTERÍSTIQUES DELS ELEMENTS
Elements elaborats per emmotllament o injecció a partir de poli (clorur de vinil) no plastificat (PVC-U) per a canalitzacions a pressió.

S'han considerat els elements següents:

- Tub rígid amb un extrem llis i bisellat i un altre esbocat.
- Peces en forma de T per a derivacions
- Peces en forma de colze per a canvis de direcció
- Peces per a reduccions de diàmetre amb unions encolades
- Maneguets de connexió per a unions

S'han considerat els tipus d'unió següents:

- Per encolar
- Per unió elàstica amb anella elastomèrica d'estanquitat

CARACTERÍSTIQUES GENERALS:

En cas que el material s'utilitzi en obra pública, l'acord de Govern de la Generalitat de Catalunya de 9 de juny de 1998 exigeix que els materials siguin de qualitat certificada o puguin acreditar un nivell de qualitat equivalent, segons les normes aplicables a els Estats membres de la Unió Europea o de l'Associació Europea de Lliure Canvi.

També en aquest cas, es procurarà que aquests materials disposin de l'etiqueta ecològica europea, regulada al Reglament 880/1992/CEE o altres distintius de la Comunitat Europea.

La superfície interna i externa ha de ser llisa, estar neta i sense escletxes, cavitats o altres defectes superficials que impedeixin assolir els requeriments necessaris per al seu ús.

El material no ha de tenir cap element estrany visible a primera vista.

Els extrems han de posar fi a un tall perpendicular a l'eix i sense rebaves.

El color ha de ser uniforme a tot el gruix de la paret.

La paret de l'element que hagi d'anar col·locat no enterrat serà opaca a la llum visible.

Ha de tenir una secció constant i uniforme, amb les toleràncies d'ovalitat definides a la taula 1 de la UNE-EN 1452-2.

Les característiques químiques determinades segons la norma UNE 53329-1 han de complir el que especifica la UNE-EN 1452-2.

Heu de superar els assaigs de resistència a l'impacte (UNE-EN 744) i de pressió interna (UNE-EN 921) tal com determina la UNE-EN 1452-2.

Han de complir la legislació sanitària vigent.

Les juntes han de ser estanques.

Els extrems llisos per a unió amb junta elastomèrica o unió encolada, seran aixamfranats, en cap cas l'extrem llis tindrà cap aresta viva.

El material de la junta d'estanquitat o l'adhesiu no tindrà cap efecte desfavorable sobre les propietats de l'element i no afectarà el conjunt, de manera que no compleixi els requisits funcionals especificats a la UNE-EN 1452-5.

Si l'element és per a una conducció d'aigua potable també heu de portar les següents inscripcions:

- Número del RSI
- Inscripció "AIGUA"

Gruix mínim de la paret (mm):

| DN | Presiones nominales PN (bar) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | PN6 | PN7,5 | PN8 | PN10 | PN12,5 | PN16 | PN20 | PN25 |
| 12 | - | - | - | - | - | - | 1,5 | - |
| 16 | - | - | - | - | - | - | 1,5 | - |
| 20 | - | - | - | - | - | 1,5 | 1,9 | - |
| 25 | - | - | - | - | 1,5 | 1,9 | 2,3 | - |
| 32 | - | - | 1,5 | 1,6 | 1,9 | 2,4 | 2,9 | - |
| 40 | - | 1,5 | 1,6 | 1,9 | 2,4 | 3,0 | 3,7 | - |
| 50 | 1,5 | 1,6 | 2,0 | 2,4 | 3,0 | 3,7 | 4,6 | - |
| 63 | 1,9 | 2,0 | 2,5 | 3,0 | 3,8 | 4,7 | 5,8 | - |
| 75 | 2,2 | 2,3 | 2,9 | 3,6 | 4,5 | 5,6 | 6,8 | - |
| 90 | 2,7 | 2,8 | 3,5 | 4,3 | 5,4 | 6,7 | 8,2 | - |
| 110 | 2,7 | 3,2 | 3,4 | 4,2 | 5,3 | 6,6 | 8,1 | 10,0 |
| 125 | 3,1 | 3,7 | 3,9 | 4,8 | 6,0 | 7,4 | 9,2 | 11,4 |
| 140 | 3,5 | 4,1 | 4,3 | 5,4 | 6,7 | 8,3 | 10,3 | 12,7 |
| 160 | 4,0 | 4,7 | 4,9 | 6,2 | 7,7 | 9,5 | 11,8 | 14,6 |
| 180 | 4,4 | 5,3 | 5,5 | 6,9 | 8,6 | 10,7 | 13,3 | 16,4 |
| 200 | 4,9 | 5,9 | 6,2 | 7,7 | 9,6 | 11,9 | 14,7 | 18,2 |
| 225 | 5,5 | 6,6 | 6,9 | 8,6 | 10,8 | 13,4 | 16,6 | - |
| 250 | 6,2 | 7,3 | 7,7 | 9,6 | 11,9 | 14,8 | 18,4 | - |
| 280 | 6,9 | 8,2 | 8,6 | 10,7 | 13,4 | 16,6 | 20,6 | - |
| 315 | 7,7 | 9,2 | 9,7 | 12,1 | 15,0 | 18,7 | 23,2 | - |
| 355 | 8,7 | 10,4 | 10,9 | 13,6 | 16,9 | 21,1 | 26,1 | - |
| 400 | 9,8 | 11,7 | 12,3 | 15,6 | 19,1 | 23,7 | 29,4 | - |
| 450 | 11,0 | 13,2 | 13,8 | 17,2 | 21,5 | 26,7 | 33,1 | - |
| 500 | 12,3 | 14,6 | 15,3 | 19,1 | 23,9 | 29,7 | 36,8 | - |
| 560 | 13,7 | 16,4 | 17,2 | 21,4 | 26,7 | - | - | - |
| 630 | 15,4 | 18,4 | 19,3 | 24,1 | 30,0 | - | - | - |
| 710 | 17,4 | 20,7 | 21,8 | 27,2 | - | - | - | - |
| 800 | 19,6 | 23,3 | 24,5 | 30,6 | - | - | - | - |
| 900 | 22,0 | 26,3 | 27,6 | - | - | - | - | - |
| 1000 | 24,5 | 29,2 | 30,6 | - | - | - | - | - |

Pressió de treball (t: temperatura servei):

- t <= 25°C: <= pressió nominal

- 25 <= t <= - 45°C: <= ft pressió nominal, on ft (coeficient de reducció definit a l'annex A de la UNE-EN 1452-2).

Densitat a 23°C (ISO 1183): >= 1350 kg/m3, <= 1460 kg/m3

Opacitat (UNE-EN 578 ) : <= 0,2% llum visible

Temperatura d'estovament Vicat (UNE EN 727): >= 80°C

Retracció longitudinal (UNE-EN 743): <= 5%

Toleràncies:

- Diàmetre exterior mitjà (mm):

| Diàmetre nominal dn | Tolerància Diàmetre |
|---|---|
| <= 50 | + 0,2 |
| 63 <= dn <= 90 | + 0,3 |
| 110 <= dn <= 125 | + 0,4 |
| 140 <= dn <= 160 | + 0,5 |
| 180 <= dn <= 200 | + 0,6 |
| 225 | + 0,7 |
| 250 | + 0,8 |
| 280 | + 0,9 |
| 315 | + 1,0 |
| 355 | + 1,1 |
| 400 | + 1,2 |
| 450 | + 1,4 |
| 500 | + 1,5 |
| 560 | + 1,7 |
| 630 | + 1,9 |
| 710 >= dn <=1000 | + 2,0 |

- La tolerància del gruix de la paret és 0,1(e)+0,2 mm. La tolerància és constant per a un interval de gruixos nominals mínims de paret de 1 mm. (e) és el valor superior daquest interval.

La verificació de les mesures es farà d'acord amb la norma EN ISO 3126.

TUBS:

El gruix de la paret ha de ser uniforme en tota la longitud del tub, amb les toleràncies definides a la taula 3 de la UNE-EN 1452-2.

Resistència hidrostàtica mínima requerida MRS (UNE-EN 921 ) : >= 25 MPa

Cada tub ha de portar marcades com a mínim cada 1 m, de manera indeleble i ben visible les dades següents:

- UNEIX EN 1452

- Nom del fabricant o marca comercial

- Sigles PVC-U

- Diàmetre nominal (dn) x gruix de paret (en) en mm

- Pressió nominal PN

- Referència de la data, lloc i àmbit de fabricació

- Número de la línia d'extrusió

ACCESSORIS:

Les cotes de muntatge han de coincidir amb els valors especificats a la UNE-EN 1452-3.

Les característiques geomètriques han de complir el que determina la UNE-EN 1452-3.

Cada accessori ha de portar marcades de forma indeleble i ben visible les dades següents:

- UNEIX EN 1452

- Designació comercial

- Diàmetre(s) nominal(s) en mm

- Designació del material

- Pressió nominal PN

- Informació del fabricant

PER UNIÓ ENCOLADA:

El diàmetre interior del filtre correspondrà al diàmetre nominal de l'element.

L'angle intern màxim de la zona d'embocadura no ha de ser superior a 0° 30'.

Diàmetre interior mitjà de l'embocadura:

| Diàmetre nominal dn (mm) | Diàmetre interior embocadura (mm) | |
|---|---|---|
| | d mín | d màx |
| dn <= 90 | dn + 0,1 | dn + 0,3 |
| 110 <= dn <= 125 | dn + 0,1 | dn + 0,4 |
| 140 <= dn <= 160 | dn + 0,2 | dn + 0,5 |
| 180 <= dn <= 200 | dn + 0,2 | dn + 0,6 |
| 225 | dn + 0,3 | dn + 0,7 |
| 250 | dn + 0,3 | dn + 0,8 |
| 280 | dn + 0,3 | dn + 0,9 |
| 315 | dn + 0,4 | dn + 1,0 |

Llarg mínim de l'embocadura:

- (0,5 dn + 6 mm) <= 12 mm: 12 mm
- resta de casos: 0,5 dn + 6 mm

UNIÓ AMB ANELLA ELASTOMÈRICA D'ESTANQUITAT:

A l'interior de l'esbocadura hi ha d'haver una junta de goma.

El material de la junta d'estanqueïtat ha de complir les especificacions de la norma UNE-EN 681-1.

Sobre la junta, o bé sobre l'embalatge, ha d'anar marcada la informació següent:

- Grandària nominal
- Identificació del fabricant
- El número de la norma UNE-EN 681, seguit del tipus d'aplicació i la classe de duresa com a sufixos
- Marca de certificació d'una tercera part
- El trimestre i l'any de fabricació
- La resistència a les baixes temperatures (L), si escau
- Resistència als olis (O), si escau
- L'abreviatura del cautxú
- Han de portar el marcatge CE de conformitat amb el que disposen els reials decrets 1630/1992 de 29 de desembre i 1328/1995 de 28 de juliol.

Diàmetre interior mitjà de l'embocadura:

- dn <= 50 mm: dn + 0,3 mm
- 63 <= dn <= 90 mm: dn + 0,4 mm
- dn >= 110 mm: 1,003 dn + 0,1 mm

Llarg d'entrada del filtre: (22 + 0,16 dn) mm

Profunditat mínima d'embocament:

- dn <= 280 : 50 mm + 0,22 dn - 2e
- dn > 280: 70 mm + 0,15 dn - 2e

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

CARACTERÍSTIQUES GENERALS:

Subministrament: Agrupats en paquets, i protegits de cops i dels raigs solars, amb les dades següents al paquet o a l'albarà:

- Denominació del producte
- Contingut net
- Nom del fabricant o raó social
- Domicili del fabricant
- Número RGS
- La inscripció "PER ÚS ALIMENTARI"

TUBS:

Emmagatzematge: En llocs protegits dimpactes, dels raigs solars i ben ventilats. S'han d'apilar horitzontalment i paral·lelament sobre superfícies planes, cal capicular les esbocadures per capes o bé situar-les en un mateix costat, i separar les capes per mitjà de separadors. L'alçada de la pila ha de ser <= 1,5 m.

UNIÓ AMB ANELLA ELASTOMÈRICA D'ESTANQUITAT:

El subministrador haurà d'aportar la documentació següent, que acredita el marcatge CE, segons el sistema d'avaluació de conformitat aplicable, d'acord amb el que disposa l'apartat 7.2.1 del CTE:

- Sistema 4: Declaració CE de conformitat del fabricant

ACCESSORIS:

Emmagatzematge: En llocs protegits

3.- UNITAT I CRITERIS D'AMIDAMENT

Unitat de mesura de l'element necessari subministrat a l'obra.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

NORMATIVA GENERAL:

Reial decret 1125/1982 de 30 d' abril . Reglamentació tecnicosanitària per a l'elaboració, la circulació i el comerç de materials polimèrics en relació amb els productes alimentaris i alimentaris.

UNE-EN 1452-1:2000 Sistemes de canalització en materials plàstics per a conducció d'aigua. Poli( clorur de vinil) no plastificat (PVC-U). Part 1: Generalitats

TUBS:

UNE-EN 1452-2:2000 Sistemes de canalització en materials plàstics per a conducció d'aigua. Poli( Clorur de Vinil) no plastificat (PVC-U). Part 2: Tubs

ACCESSORIS:

UNE-EN 1452-3:2000 Sistemes de canalització en materials plàstics per a conducció d'aigua. Poli( Clorur de Vinil) no plastificat (PVC-U). Part 3: Accessoris

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**2.8.4.- LÀMINA DE DRENATGE**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Làmina de polietilè d'alta densitat conformada amb relleu amb o sense geotèxtil incorporat.

S'han considerat els elements següents:

- Làmina amb nòduls
- Làmina amb nòduls amb geotèxtil amb un o dos filetres sintètics
- Làmina amb malla ròmbica tridimensional amb geotèxtil amb un filet sintètic

CARACTERÍSTIQUES GENERALS:

La làmina estesa presentarà un aspecte uniforme i sense defectes. Les vores seran rectes.

Serà resistent a la perforació i als esforços de tracció en el pla.

Serà permeable a l'aigua i al vapor.

Resistirà l'acció dels agents climàtics i les substàncies actives naturals del sòl.

La geometria dels nòduls o la malla ha de correspondre a les indicacions de la DT

Les làmines amb un recobriment geotèxtil en una de les cares tindran una franja d'aquest recobriment sense adherir, corresponent a l'amplada de solapament, i la resta adherida a la part superior dels nòduls.

Per a les làmines nodulars:

Resistència a tracció (UNE EN ISO 527-3): >= 600 N/60 mm

Resistència a compressió: >= 90 kN/m2

Allargament fins al trencament (UNE EN ISO 527-3): >= 50%

Permeabilitat amb gradient hidràulic 1, a 1 bar, perpendicularment al pla: Aprox. 5 l/sm

Toleràncies:

- Gruix (UNE EN 426): ± 10%
- Ample (UNE EN 426): ± 1%

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Subministrament: En bobines o rotllos, amb un embalatge opac que n'eviti el deteriorament per l'acció de la llum solar.

A cada rotlle figuraran les dades següents:

- Identificació del producte
- Nom del fabricant o marca comercial
- Dimensions
- Pes per m2
- Data de fabricació

Emmagatzematge: Els rotllos es mantindran al seu envàs, apilats en posició horitzontal amb un màxim de 5 filades posades en la mateixa direcció, entre 5°C i 35°C, en llocs protegits del sol, la pluja i la humitat.

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

No hi ha normativa de compliment obligat.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ:

En cas que el material declari contingut reciclat, el fabricant ha de mostrar, si se li demana, la documentació que acrediti aquest contingut.

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**2.8.5.- TUB DE PVC PER A DRENATGES**

1.- DEFINICIÓ I CONDICIONS DELS ELEMENTS

Tub ranurat de PVC no plastificat, injectat, per a la recollida i l'evacuació d'aigües subterrànies.

S'han considerat els tipus següents:

- Tub de volta
- Tub circular

CARACTERÍSTIQUES GENERALS:

Tant el tub com les peces especials tindran els seus extrems acabats en un tall perpendicular a l'eix i les embocadures necessàries per a la unió per encolat o junta elàstica.

No presentarà rebaves, esquerdes, grans o altres defectes superficials.

Presentarà un color uniforme a tota la seva superfície.

La superfície interior serà llisa i regular.

Pes específic (UNE 53-020) (P): 13,5 kN/m3 < P < 14,6 kN/m3

Temperatura d'estovament Vicat (UNE 53-118): >= 79°C

Resistència al xoc tèrmic (UNE 53114-2): Complirà

Coeficient de dilatació lineal a 0° C ( UNE 53126): <= 8·10^-5 >= P >= 6·10^-5 (1/ºC)

Resistència a tracció simple (UNE EN 1452-2): >= 500 kg/cm2

Allargament fins al trencament (UNE EN 1452-2): >= 80%

Absorció d'aigua (UNE EN 1452-2): <= 4 mg/cm2

Opacitat (UNE EN ISO 13468-1): 0,2%

Superfície drenant: >= 90 cm2/m; >= 3% Superfície lateral

Toleràncies:

- Diàmetre exterior: + 2 mm, - 0 mm
- Gruix en qualsevol punt: + 0,3 mm, - 0 mm

TUB CIRCULAR:

Els tubs han de ser ranurats i rígids, formats enrotllant una banda nervada amb els cantells conformats, i amb unió de la banda per a soldadura química.

La cara interior del tub serà llisa, mentre que l'exterior del tub serà nervada .

Els nervis tindran forma de “T”.

El tub ha de resistir sense deformacions les càrregues interiors i exteriors que rebrà quan estigui en servei.

Qualitat (UNE 53331 / ASTM D 1784): "D"

TUB DE BOVEDA:

Els tubs seran ranurats de PVC no plastificat, injectat, per a la recollida i desguàs d'aigües subterrànies.

El tub disposa, a la zona inferior, duna zona sense ranures per a la recollida i conducció de l’aigua, de forma trapezoïdal.

Característiques del tub:

+---------- ----------+

Diàmetre Gruix Superfície filtrant Capacitat filtrant

(mm) ( mm) (cm2/m) (ls/m)

---------- ----------

90 >= 0,8 >= 65 >= 1,5

110 >= 1,0 >= 75 >= 2,8

160 >= 1,2 >= 100 >= 5,2

+---------- ----------+

2.- CONDICIONS DE SUBMINISTRAMENT I EMMAGATZEMATGE

Emmagatzematge: Assentats en horitzontal sobre superfícies planes i a la vora de la rasa per evitar manipulacions.

3.- UNITAT I CRITERI D'AMIDAMENT

Unitat de mesura: la indicada a la descripció de l'element

Criteri de mesura: quantitat necessària subministrada a l'obra

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

No hi ha normativa de compliment obligat.

5.- CONDICIONS DE CONTROL DE RECEPCIÓ

CONDICIONS DE MARCAT I CONTROL DE LA DOCUMENTACIÓ:

A cada tub i peça especial o a l'albarà de lliurament constaran les dades següents:

- Nom del fabricant o marca comercial
- Diàmetre nominal i gruix
- Sigles PVC
- Data de fabricació
- Marca d'identificació dels controls a què ha estat sotmès el lot

OPERACIONS DE CONTROL:

Els punts de control més destacables són els següents:

- A cada subministrament:
- Inspecció visual de laspecte general dels tubs i peces per a juntes.
- Comprovació de les dades de subministrament exigides (albarà o etiqueta).
- Recepció del certificat de qualitat del fabricant, d’acord amb les condicions del plec.
- Comprovació de l'estanquitat del tub.

- Comprovació dimensional sobre un 10% de les peces rebudes (tubs i unions). Per a cada peça es realitzaran:
- 5 determinacions del diàmetre interior.
- 5 determinacions de la longitud.
- Desviació màxima respecte a la generatriu.
- 5 determinacions del gruix.
- Per a cada subministrador diferent de tubs, es realitzaran els assaigs següents:
- Resistència a la tracció simple i allargament fins al trencament (UNE EN 1452-2)
- Temperatura d'estovament Vicat (UNE EN ISO 306)
- Resistència a l'esclafament (ASTM C.497), per a cada diàmetre diferent.

En cas que el material disposi de la Marca AENOR, o una altra de legalment reconeguda en un país de la UE, es podrà prescindir dels assajos de control de recepció. La DF sol·licitarà, en aquest cas, els resultats dels assaigs corresponents al subministrament rebut, segons control de producció establert a la marca de qualitat del producte.

CRITERIS DE PRESA DE MOSTRES:

Se seguiran les instruccions de la DF i els criteris de les normes de procediment indicades a cada assaig.

INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

No s'acceptaran materials que no arribin a l'obra correctament referenciats i acompanyats del certificat de qualitat corresponent del fabricant.

Les peces que hagin patit danys durant el transport o que presentin defectes seran rebutjades a l'instant.

Es rebutjaran les peces que no superin les condicions de la inspecció visual o les comprovacions geomètriques. En aquest darrer cas, s'incrementarà el control, en primer lloc, fins al 20% de les peces rebudes, i si es continuen observant irregularitats, fins al 100% del subministrament.

En cas d'incompliment als assaigs de resistència i d'estanquitat, es repetirà el control sobre dues peces més del mateix lot, i s'acceptarà el conjunt quan els nous resultats siguin conformes a les especificacions. Si també falla una daquestes proves, es rebutjarà el lot assajat.

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# PART 3A.- ESTRUCTURA

## 3.1.- ESTRUCTURES D'ACER

### 3.1.1.- ESTRUCTURES D'ACER EN PERFILS LAMINATS

1.- DEFINICIÓ I CONDICIONS DE LA PARTIDA D'OBRA EXECUTADA

DEFINICIÓ:

Estructures de perfils normalitzats d'acer laminat o conformat, utilitzades directament o formant peces compostes.

L'execució de la partida d'obra inclou les operacions següents:

- Replanteig de mides i confecció de plànols de taller
- Preparació de perfils i peces al taller
- Subministrament i muntatge dels perfils i peces
- Pintat dels perfils i peces amb una capa d'imprimació i dues d'esmalt
- Tot el material auxiliar necessari per a la fixació i immobilització temporal i definitiva de les peces

CONDICIONS GENERALS:

Les peces han d'estar col·locades a la posició indicada a la DT, amb les modificacions aprovades en el replanteig per la DF

Cada element ha de portar les marques d'identificació suficients per definir la seva posició a l'obra.

La disposició dels diferents elements de l'estructura, les dimensions, els tipus d'acer i els perfils han de correspondre amb les indicacions de la DT i amb les modificacions aprovades per la DF

La soldadura no ha de tenir cap defecte que constitueixi seqüència en una longitud superior a 150 mm, ja sigui osca, fissura, inclusió d'escòria o porus.

No es permet emplenar amb soldadura els forats practicats a l'estructura per disposar cargols provisionals de muntatge.

Característiques dels elèctrodes:

- Resistència a tracció del metall aportat:
- Per acer A/37b >= 37 kg/mm2
- Per acer A/42b >= 42 kg/mm2
- Per acer A/52b >= 52 kg/mm2
- Allargament fins al trencament >= 22%

- Resiliència >= 5 kg/cm2

Les peces han d'estar pintades per totes les superfícies exteriors, amb una capa d'imprimació antioxidant i dues d'esmalt.

A la pintura no hi ha d'haver fissures, bosses ni altres defectes.

Ha de tenir el color, la brillantor i la textura uniformes.

El tipus de pintura i el sistema d'aplicació seran els aprovats expressament per la DF, prèvia presentació dels assaigs corresponents per part del contractista.

Comportament anticorrosiu de la pintura:

Després de cinc anys, la superfície en servei no ha de presentar cap punt de corrosió => Re1 de l'Escala Europea de Graus de Corrosió, SVENSK STANDARD SIS 185.111.

Característiques de la pel·lícula líquida:

- Amb l'envàs ple i al cap de 3 minuts d'agitació (INTA 16 32 03) no heu de tenir coàguls, pells, dipòsits durs ni flotació de pigments.
- Pigment >= 26% de mini de plom electrolític
- Puresa del mini de plom electrolític (INTA 16 12 11) >= 99,6%
- Finura de la molturació (INTA 16 02 55) < 50 micres
- Temperatura d'inflamació (INTA 16 02 32) > 25°C
- Índex d'anivellament a 23 ± 2°C i 50 ± 5% HR (INTA 16 02 89) > 3
- Temps d'assecatge a 23 ±2°C i 50 ±5% HR (INTA 16 02 29):
- Al tacte < 1 h
- Totalment seca < 6 h
- Pes específic a 23 ± 2°C, 50 ± 5% HR (INTA 16 42 03) > 1,8 kg/dm3
- Rendiment per a una capa de 30-40 micres > 4 m2/kg

Característiques de la pel·lícula seca:

- Resistència a la boira marina (INTA 16 01 01, ASTM B.117-73, oxidació marina 8 (0,1%) ASTM D.610-68) >= 150 h
- Adherència (UNE 48-032) <= 2

Especificacions per la pintura col·locada:

Heu de tenir el certificat de garantia del fabricant.

Gruix de la pel·lícula seca de revestiment >= 125 micres

Durant els quatre primers anys no s'ha de produir cap dels defectes següents en grau superior a l'indicat:

- Formació de butllofes (INTA 160.273) grau 8

freqüència 8

- Aparició d'esvorancs (INTA 160.275) 8
- Quartejat (INTA 160.271) grau 8
- Enguixat (INTA 160.271) grau 8

Si un defecte té un grau igual o superior a l'indicat, es considera error.

Si un defecte té una superfície menor a 50 cm2 i la superfície acumulada és menor a 1,1% del total no es considerarà errada.

Tot defecte amb superfície >= 1 m2 es considera error.

Manteniment de les característiques estàtiques de la pintura:

- En un termini de tres anys no s'han de presentar alteracions uniformes de color que difereixin de l'original en més de tres (3) unitats NBS
- En un termini de quatre anys no s'han de produir alteracions no uniformes de color entre dues zones properes d'exposició comparable més grans que dues (2) unitats NBS

Toleràncies d'execució:

- Les toleràncies dimensionals i en pes per a la recepció de perfils i xapes són les establertes a la NBE EA-95, article 2.1.6.3. per als perfils laminats i article 2.3.7. per als conformats.
- Tolerància total (suma de les toleràncies dels

elements que formen el conjunt estructural) <= 15 mm

- Llarg de l'element:
- D'1 m, com a màxim ± 2 mm
- D'1 a 3 m ± 3 mm
- De 3 a 6 m ± 4 mm
- De 6 a 10 m ± 5 mm
- De 10 a 15 m ± 6 mm
- De 15 a 25 m ± 8 mm
- De més de 25 m ± 10 mm
- Fletxa (L=llum) <= L/1500

<= 10 mm

- Llarg de les soldadures:

- De 15 mm, com a màxim ± 0,5 mm
- De 16 a 50 mm ± 1,0 mm
- De 51 a 150 mm ± 2,0 mm
- De més de 150 mm ± 3,0 mm

PILARS:

Si la base del pilar ha de quedar embeguda dins del formigó, no caldrà que es pinti. Si heu d'estar algun temps a la intempèrie, se la protegirà amb beurada de ciment.

Si la unió del pilar i els fonaments o altre element estructural es fa per mitjà d'una placa amb espàrrecs roscats, aquests han de ser més llargs de 80 cm; un cop aplomat, anivellat i centrat el pilar s'han d'immobilitzar les femelles amb punts de soldadura.

L'espai entre la placa i els fonaments s'ha d'emplenar amb morter pòrtland de dosificació 1:2, de granulometria < = 1/5 de l'espessor de junta.

Si els nusos són rígids han d'incorporar els trossos de jàssera corresponents fins al punt de moments flectors nuls.

Toleràncies d'execució:

- Aplomat <= H/1000

<= 25 mm

- Dimensions de les plaques base dels pilars ± 2%
- Planor de les plaques base del pilar ±0,2%
- Dimensions de rigiditzadors ± 0,2%
- Replanteig parcial dels eixos ±6 mm
- Replanteig total dels eixos ± 13 mm
- Llarg dels trossos de jàssera incorporats (LJ):
- D'1 m de jàssera, com a màxim ± 2 mm
- D'1 a 3 m de jàssera ± 3 mm
- Desviació vertical <= LJ/1000

VIGAS:

Les unions entre dues jàsseres es realitzaran per soldadura contínua de penetració completa i se situaran entre 1/4 i 1/8 de la llum amb una inclinació de 60°.

Toleràncies d'execució:

- Aplomat (D=cantillo)
- En general <= D/250
- En bigues carril <= D/500

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

El constructor ha d'elaborar un programa de muntatge que ha de ser aprovat per la DF abans d'iniciar els treballs a l'obra.

Qualsevol modificació durant els treballs serà aprovada per la DF i reflectir-se posteriorment als plànols de taller.

Si durant el transport el material ha patit desperfectes que no poden ser corregits o es preveu que després d'arreglar-los poden afectar el treball estructural, la peça ha de ser substituïda.

La secció de l'element no ha de quedar disminuïda pels sistemes de muntatge utilitzats.

No començar les unions de muntatge fins que no s'hagi comprovat que la posició dels elements de cada unió coincideix exactament amb la posició definitiva.

La soldadura a l'obra ha de ser elèctrica, manual, per arc descobert, amb elèctrode de fusible de qualitat estructural bàsica.

Les soldadures es faran protegides de la pluja i a una temperatura > 0°C. Per a temperatures < 0°C cal l'autorització de la DF

Abans de soldar s'han de netejar les superfícies per unir, de greix, òxids i pintura, i anar amb compte que quedin ben seques.

Els cordons de soldadura successius no han de produir osques.

Després de fer un cordó de soldadura i abans de fer el següent, cal netejar l'escòria mitjançant una picor i un raspall.

Els operaris han de fer el tipus de soldadura pel qual estiguin qualificats segons la UNE 14-010 o la UNE EN 287 (1).

Les condicions d'execució, disposició i ordre a realitzar les soldadures han de ser les establertes a l'article 5.2 de la NBE EA-95.

S'han de detenir els treballs de pintat quan la temperatura sigui inferior a 5 o superior a 30 o quan la humitat relativa de l'aire sigui superior al 60%. Si un cop realitzats els treballs es donen aquestes condicions, es revisarà el treball realitzat durant les darreres 24 hores i es refaran les parts afectades.

Les superfícies d'aplicació de la pintura han de ser netes i sense pols, taques ni greixos.

El sistema d'aplicació de la pintura s'ha de triar d'acord amb les instruccions del fabricant i l'autorització de la DF

S'han d'eliminar les possibles incrustacions de ciment o de calç i desgreixar-ne la superfície. A continuació cal aplicar la capa d'imprimació antioxidant.

La primera capa de pintura s'ha d'aplicar lleugerament diluïda segons les instruccions del fabricant.

No pintar sobre superfícies molt fredes, ni sobreescalfades per l'acció del sol.

Cal evitar la pols durant el temps d'assecat de les capes.

Els elements provisionals de fixació que per a l'armat i el muntatge se soldin a les barres de l'estructura, es desprenen amb bufador sense afectar les barres. Es prohibeix desprendre'ls a cops.

Quan es faci necessari tensar alguns elements de l'estructura abans de posar-la en servei, s'indicarà als Plànols i al Plec de Condicions Tècniques Particulars la manera com s'ha realitzat i els mitjans de comprovació i mesura.

3.- UNITAT I CRITERI D'AMIDAMENT

kg de pes calculat segons les especificacions de la Documentació Tècnica, d'acord amb els criteris següents:

- El pes unitari pel seu càlcul ha de ser el teòric
- Per poder utilitzar un altre valor diferent del teòric, cal l'acceptació expressa de la DF

Aquests criteris inclouen les pèrdues de material corresponents a retallades.

El preu inclou la confecció de plànols de detalls, realització de peces al taller, transport a l'obra, muntatge amb els mitjans necessaris, soldadura d'estructures complementàries de muntatge, capa d'imprimació antioxidant i dos d'esmalt.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

PG 3/75 "Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts." Amb els comentaris aprovats per les ordres del MOPTMA: OM del 31.7.86 (BOE núm. 213 del 5.9), OM del 21.1.88 (BOE núm. 29 del 3.2), OM del 8.5.89 (BOE núm. 118 del 18.5) i OM del 28.9.89 (BOE núm. 242 del 9.10).

NBE EA-95 "Estructures d'acer en edificació."

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**3.1.2.- ELEMENTS AUXILIARS PER A ESTRUCTURA METÀL·LICA**

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Formació d'elements estructurals amb perfils normalitzats d'acer utilitzats directament o formant peces compostes.

S'han considerat els elements següents:

- Elements auxiliars (elements d'encastat, de suport i rigiditzadors)

S'han considerat els tipus de perfils següents:

- Perfils d'acer laminat en calent, de les sèries IPN, IPE, HEA, HEB, HEM o UPN, d'acer S275JR, S275J0, S275J2, S355JR, S355J0 o S355J2, segons EAE-2011, UNE-EN 10
- Perfils d'acer laminat en calent de les sèries L, LD, rodó, quadrat, rectangular o planxa, d'acer S275JR, S275J0, S275J2, S355JR, S355J0 o S355J2, segons EAE-2011, UNE-EN2
- Perfils buits d'acer laminat en calent de les sèries rodó, quadrat o rectangular, d'acer S275J0H o S355J2H, segons EAE-2011, UNE-EN 10210-1
- Perfils buits conformats en fred de les sèries rodó, quadrat o rectangular d'acer S275J0H o S355J2H, segons EAE-2011, UNE-EN 10219-1
- Perfils conformats en fred de les sèries L, LD, U, C, Z, u Omega, d'acer S235JRC, segons EAE-2011, UNE-EN 10025-2

S'han considerat els acabats superficials següents:

- Pintat amb una capa d'imprimació antioxidant
- Galvanitzat

S'han considerat els tipus de col·locació següents:

- Col·locació amb soldadura
- Col·locació amb cargols
- Col·locació sobre obres de fàbrica o de formigó, recolzats o encastats

L'execució de la unitat d'obra inclou les operacions següents:

- Preparació de la zona de treball
- Replanteig i marcatge dels eixos
- Col·locació i fixació provisional de la peça
- Aplomat i anivellament definitius
- Execució de les unions, si escau
- Comprovació final de l'aplomat i dels nivells

CONDICIONS GENERALS:

Els materials utilitzats tindran la qualitat establerta a la DT. No es faran modificacions sense autorització de la DF encara que suposin un increment de les característiques mecàniques.

La peça estarà col·locada a la posició indicada a la DT, amb les modificacions aprovades per la DF.

La peça estarà correctament aplomada i anivellada.

Quan la peça sigui composta, la disposició dels diferents elements de la peça, les dimensions, el tipus d'acer i els perfils, es correspondran amb les indicacions de la DT.

Cada component de l'estructura portarà una marca d'identificació que ha de ser visible després del muntatge. Aquesta marca no estarà feta amb entalladura cisellada.

La marca d'identificació indicarà l'orientació de muntatge del component estructural quan no es dedueixi clarament de la seva forma.

Els elements de fixació i les xapes, plaques petites i accessoris de muntatge aniran embalats i identificats adequadament.

L´element estarà pintat amb una capa de protecció de pintura antioxidant, excepte si està galvanitzat.

Els cantells de les peces no tenen òxid adherit, rebaves, estries o irregularitats que dificultin el contacte amb l'element que s'unirà.

Si el perfil està galvanitzat, la col·locació de l'element no produirà desperfectes al recobriment del zinc.

L'element no es redreçarà un cop col·locat definitivament.

No es permet emplenar amb soldadura els forats que han estat practicats a l'estructura per disposar cargols provisionals de muntatge.

Toleràncies d'execució:

- En obres d'edificació: Límits establerts als apartats 11.1 i 11.2 del DB-SE A i a l'article 80 de l'EAE.
- En obres d'enginyeria civil: Límits establerts a l'article 640.12 del PG3 i a l'article 80 de l'EAE.

COL·LOCACIÓ AMB CARGOLS:

S'utilitzaran cargols normalitzats d'acord amb les normes recollides a la taula 29.2.b de l'EAE.

Els cargols avellanats, cargols calibrats, perns articulats i els cargols hexagonals d'injecció s'han d'utilitzar seguint les instruccions del fabricant i han de complir els requisits addicionals que estableix l'article 29.2 de l'EAE.

La situació dels cargols a la unió serà tal que redueixi la possibilitat de corrosió i pandeig local de les xapes, i faciliti el muntatge i les inspeccions.

El diàmetre nominal mínim dels cargols serà de 12 mm.

La rosca pot estar inclosa al pla de tall, excepte en el cas que els cargols s'utilitzin com a calibrats.

Després de prémer l'espiga del cargol ha de sobresortir de la rosca de la femella. Entre la superfície de suport de la femella i la part no roscada de l'espiga hi haurà, com a mínim:

- En cargols pretesats: 4 filets complets més la sortida de la rosca
- En cargols sense pretensar: 1 filet complet més la sortida de la rosca

Les superfícies dels caps de cargols i femelles estaran perfectament planes i netes.

Als cargols col·locats en posició vertical, la femella estarà situada per sota del cap del cargol.

En els forats rodons normals i amb cargols sense pretensar no cal utilitzar volanderes. Si s'utilitzen aniran sota el cap dels cargols, seran aixamfranades i el xamfrà estarà situat cap al cap del cargol.

En els cargols pretesats, les volanderes seran planes endurides i aniran col·locades de la següent forma:

- Cargols 10.9: sota el cap del cargol i de la femella
- Cargols 8.8: sota l'element que gira

Toleràncies d'execució:

- Folgança màxima entre superfícies adjacents:
- Si s'utilitzen cargols no pretesats: 2 mm
- Si s'utilitzen cargols pretesats: 1 mm
- Diàmetre dels forats:
- En obres d'edificació: Límits establerts a l'apartat 11.1 del DB-SE A i a l'article 76.2 de l'EAE
- En obres d'enginyeria civil: Límits establerts als apartats 640.5.1.3 i 640.5.1.4 del PG3 a l'article 76.2 de l'EAE
- Posició dels forats:
- En obres d'edificació: Límits establerts a l'apartat 11.1 del DB-SE A i a l'article 76.2
- de l'EAE

COL·LOCACIÓ AMB SOLDADURA:

El material d'aportació utilitzat serà apropiat als materials a soldar i al procediment de soldadura.

Les característiques mecàniques del material d'aportació seran superiors a les del material base.

En acers de resistència millorada a la corrosió atmosfèrica, la resistència a la corrosió del material d'aportació serà equivalent a la del material base.

El plec de prescripcions tècniques particulars definirà el sistema de protecció davant de la corrosió.

Els mètodes de protecció podran ser:

- Metal·lització, segons la UNE-EN ISO 2063.
- Galvanització en calent, segons la UNE-EN ISO 1461.

– Sistemes de pintura, segons la UNE-EN ISO 12944.

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

CONDICIONS GENERALS:

El constructor elaborarà els plànols de taller i un programa de muntatge que seran aprovats per la DF abans d'iniciar els treballs a l'obra.

Qualsevol modificació durant els treballs l'ha d'aprovar la DF i reflectir-la posteriorment als plànols de taller.

Els components estructurals es manipularan evitant que es produeixin deformacions permanents i procurant que els desperfectes superficials siguin mínims. Es protegiran als punts de subjecció.

Tot subconjunt estructural que durant les operacions de càrrega, transport, emmagatzematge i muntatge experimenti desperfectes, es repararà fins que sigui conforme.

Si durant el transport el material ha patit desperfectes que no puguin ser corregits o es prevegi que després d'arreglar-los afectarà el treball estructural, la peça serà substituïda.

Els components de l'estructura s'han d'emmagatzemar apilats sobre el terreny sense estar en contacte amb el terra i de manera que no es produeixi acumulació d'aigua.

El muntatge de l'estructura es farà d'acord amb el programa de muntatge i garantint la seguretat estructural en tot moment.

Durant les operacions de muntatge, l'estructura ha de resistir, en condicions de seguretat, les càrregues provisionals de muntatge i els efectes de les càrregues de vent.

Els arriostraments i encastaments o subjeccions provisionals es mantindran en la seva posició fins que l'avenç del muntatge permeti que puguin ser retirats de manera segura.

Les unions per a peces provisionals necessàries per al muntatge s'han de fer de manera que no debilitin l'estructura ni en disminueixin la capacitat de servei.

La secció de l'element no queda disminuïda pels sistemes de muntatge utilitzats.

Els dispositius d'ancoratge provisionals s'asseguraran per evitar que s'afluixin de manera involuntària.

Durant el procés de muntatge, el constructor garantirà que cap part de l'estructura estigui permanentment deformada o sobrecarregada per l'apilament de materials estructurals o per càrregues provisionals de muntatge.

Un cop muntada una part de l'estructura, s'alinearà el més aviat possible i immediatament després es completarà el cargolament.

No es faran unions permanents fins que una part suficient de l'estructura no estigui ben alineada, anivellada, aplomada i unida provisionalment de manera que no es produeixin desplaçaments durant el muntatge o posterior alineació de la resta de l'estructura.

La preparació de les unions que es realitzin a l'obra es faran al taller.

Els desperfectes que les operacions d'emmagatzematge i manipulació ocasionin en l'acabat superficial de l'estructura es repararan amb procediments adequats.

Es tindrà especial cura en el drenatge de cobertes i façanes, així com evitar zones on es pugui dipositar l'aigua de forma permanent.

Els elements de fixació i ancoratge disposaran de protecció adequada a la classe d'exposició ambiental.

Per a la reparació de superfícies galvanitzades s'utilitzaran productes de pintura adequats aplicats sobre àrees que estiguin dins de 10 mm de galvanització intacta.

Les parts que siguin de difícil accés després del muntatge rebran el tractament de protecció després de la inspecció i l'acceptació de la DF i abans del muntatge.

Les estructures amb planxes i peces primes conformades en fred s'han d'executar considerant els requisits addicionals de la UNE-ENV 1090-2.

Les estructures amb acers d'alt límit elàstic s'han d'executar considerant els requisits addicionals de la UNE-ENV 1090-3.

Les estructures amb gelosia de secció buida s'executaran tenint en compte els requisits addicionals de la UNE-ENV 1090-4.

COL·LOCACIÓ AMB CARGOLS:

Els forats per als cargols es faran amb trepant mecànica. S'admet un altre procediment sempre que proporcioni un acabat equivalent.

Es permet l'execució de forats mitjançant punxonat sempre que es compleixin els requisits establerts a l'apartat 10.2.3 del DB-SE A en obres d'edificació o els establerts a l'apartat 640.5.1.1 del PG3 en obres d'enginyeria civil.

Es recomana que, sempre que sigui possible, es tallin d'una sola vegada els buits que travessen dues peces o més.

Els forats allargats es realitzaran mitjançant una sola operació de punxonat, o amb la perforació o punxonat de dos forats i posterior oxitall.

Després de perforar les peces i abans d'unir-les s'eliminaran les rebaves.

Els cargols i les femelles no s'han de soldar, llevat que ho expliciti el plec de condicions tècniques particulars.

S'han de col·locar el nombre suficient de cargols de muntatge per assegurar la immobilitat de les peces armades i el contacte íntim de les peces d'unió.

Les femelles es muntaran de manera que la seva marca de designació sigui visible després del muntatge.

En els cargols sense pretensar, cada conjunt de cargol, rosca i volandera(es) s'estrenyé fins arribar a l'apretat de gom a gom" sense sobretensar els cargols. En grups de cargols aquest procés es farà progressivament començant pels cargols situats al centre. Si és necessari es faran cicles addicionals de collament.

Abans de començar el pretesat, els cargols pretesats d'un grup s'estrenyen d'acord amb allò indicat per als cargols sense pretensar. Perquè el pretesat sigui uniforme es faran cicles addicionals de collament.

Es retiraran els conjunts de cargol pretesat, rosca i volandera(es) que després d'estrènyer fins al pretesat mínim s'afluixin.

L'estrenyiment dels cargols pretesats es farà mitjançant un dels procediments següents:

- Mètode de la clau dinamomètrica.
- Mètode de la femella indicadora.
- Mètode combinat.

Les superfícies que han de transmetre esforços per fregament s'han de netejar d'olis amb netejadors químics. Després de la preparació i fins i tot l'armat i cargolat es protegiran amb cobertes impermeables.

La zona sense revestir situada al voltant del perímetre de la unió amb cargols no es tracta fins que no s'hagi inspeccionat la unió.

COL·LOCACIÓ AMB SOLDADURA:

Els procediments autoritzats per realitzar unions soldades són:

- Per arc elèctric manual elèctrode revestit
- Per arc amb fil tubular, sense protecció gasosa
- Per arc submergit amb fil/filferro
- Per arc submergit amb elèctrode nu
- Per arc amb gas inert
- Per arc amb gas actiu
- Per arc amb fil tubular, amb protecció de gas actiu
- Per arc amb fil tubular, amb protecció de gas inert
- Per arc amb elèctrode de volfram i gas inert
- Per arc de connectors

Les soldadures es faran protegides dels efectes directes del vent, de la pluja i de la neu.

A l'obra i a disposició del personal encarregat de soldar hi haurà un pla de soldadura, que inclourà, com a mínim, detall, dimensions i tipus de les unions, especificacions dels tipus d'elèctrodes i preescalfament, seqüència de soldadura, limitacions a la soldadura discontínua i comprovacions intermèdies, girs o voltes de les peces necessàries per a la soldadura, detall de les fixacions provisionals, disposicions davant de l'esquinç laminar, referència al pla d'inspecció i assaigs, i tots els requeriments per a la identificació de les soldadures.

Les soldadures es faran per soldadors certificats per un organisme acreditat i qualificats segons la UNE-EN 287-1.

La coordinació de les tasques de soldadura la realitzaran soldadors qualificats i amb experiència en el tipus d'operació que supervisen.

Abans de començar a soldar es verificarà que les superfícies i les vores a soldar són apropiades al procés de soldadura i que estan lliures de fissures.

Totes les superfícies a soldar es netejaran de qualsevol material que pugui afectar negativament la qualitat de la soldadura o perjudicar el procés de soldadura. Es mantindran seques i lliures de condensacions.

Els components a soldar estaran correctament col·locats i fixos en la seva posició mitjançant dispositius apropiats o soldadures de punteig, de manera que les unions a soldar siguin accessibles i visibles per al soldador. No s'hi introduiran soldadures addicionals.

El muntatge de l'estructura es farà de manera que les dimensions finals dels components estructurals estiguin dins de les toleràncies establertes.

Els dispositius provisionals utilitzats per al muntatge de l'estructura es retiraran sense fer malbé les peces.

Les soldadures provisionals s'han d'executar seguint les especificacions generals. S'eliminaran totes les soldadures de punteig que no s'incorporin a les soldadures finals.

Quan el tipus de material de l'acer i/o la velocitat de refredament puguin produir un enduriment de la zona tèrmicament afectada, es considera la utilització del preescalfament. Aquest s'estendrà 75 mm a cada component del metall base.

No s'accelerarà el refredament de les soldadures amb medis artificials.

Els cordons de soldadura successius no produiran osques.

Després de fer un cordó de soldadura i abans de fer el següent, cal netejar l'escòria mitjançant una piqueta i un raspall.

L'execució dels diferents tipus de soldadures es farà d'acord amb els requisits establerts a l'apartat 10.3.4 del DB-SE A i l'article 77 de l'EAE per a obres d'edificació o d'acord amb l'article 640.5.2 del PG3 i l'article 77 de l'EAE per a obres d'enginyeria civil.

No es faran servir materials de protecció que perjudiquin la qualitat de la soldadura a menys de 150 mm de la zona a soldar.

Les soldadures i el metall base adjacent no es pintaran sense haver eliminat prèviament l'escòria.

3.- UNITAT I CRITERI D'AMIDAMENT

VIGAS, BIGUETES, CORRETGES, CERXES, DINTELLS, PILARS, TRAVES, ELEMENTS D'ANCORATGE, ELEMENTS AUXILIARS:

kg de pes calculat segons les especificacions de la DT, d'acord amb els criteris següents:

- El pes unitari pel seu càlcul serà el teòric
- Per poder utilitzar un altre valor diferent del teòric, cal l'acceptació expressa de la DF.

Aquest criteri inclou les pèrdues de material corresponents a retallades.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

OBRES D'EDIFICACIÓ:

Reial Decret 751/2011, del 27 de maig, pel qual s'aprova la Instrucció d'Acer Estructural (EAE).

Reial decret 314/2006, de 17 de març, pel qual s'aprova el Codi tècnic de l'edificació part 2. Document bàsic d'acer DB-SE-A.

* UNE-ENV 1090-1:1997 Execució d'estructures d'acer. Part 1: Regles generals i regles per a edificació.

OBRES D'ENGINYERIA CIVIL:

Reial Decret 751/2011, del 27 de maig, pel qual s'aprova la Instrucció d'Acer Estructural (EAE).

Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).

5.- CONDICIONS DE CONTROL D'EXECUCIÓ I DE L'OBRA ACABADA

CONTROL D'EXECUCIÓ. OPERACIONS DE CONTROL:

Abans de l'inici de l'execució, la DF verificarà que hi ha un programa de control desenvolupat pel constructor, tant per a productes com per a l'execució.

Previ al subministrament, el constructor presentarà a la DF la següent documentació:

- Acreditació que el procés de muntatge en taller dels elements de l'estructura té distintiu de qualitat reconegut.
- Acreditació que els productes d'acer tenen distintiu de qualitat reconegut.
- En processos de soldadura, certificats d'homologació dels soldadors segons UNE-EN 2871 i del procés de soldadura segons UNE-EN ISO 15614-1.

La DF comprovarà que els productes d'acer subministrats per taller a l'obra, s'acompanyen del full de subministrament, en cas que no se'n pugui fer la traçabilitat, serà rebutjat.

Prèvia a l'execució, es fabricaran per a cada element i cada material a tallar, com a mínim quatre provetes, per part del control extern de l'entitat de control segons l'article 91.2.2.1 de l'EAE.

Es comprovarà que les dimensions dels elements elaborats al taller són les mateixes que les dels plànols de taller, considerant-se les toleràncies en el plec de condicions.

Anteriorment a la fabricació, el constructor proposarà la seqüència d'armat i soldadura; aquesta haurà de ser aprovada per la DF.

Es marcaran les peces amb pintura segons plànol de taller, per identificar-les durant el muntatge a taller i a obra.

L'autocontrol del procés de muntatge inclou com a mínim:

-Identificació dels elements.

-Situació dels eixos de simetria.

-Situació de les zones de suport contigües.

-Paral·lelisme d'ales i platabandes.

-Perpendicularitat d'ales i ànimes.

-Abombament, rectitud i planeïtat d'ales i ànimes.

-Contrafletxes.

La freqüència de comprovació serà del 100% per a elements principals i del 25% per a elements secundaris.

La DF comprovarà amb antelació al muntatge la correspondència entre el projecte i els elements elaborats al taller, i la documentació del subministrament.

El constructor elaborarà la documentació corresponent al muntatge, aquesta serà aprovada per la DF, i com a mínim inclourà:

-Memòria de muntatge.

-Plànols de muntatge.

-Programa d'inspecció.

Es comprovarà la conformitat de totes les operacions de muntatge, especialment:

-L'ordre de cada operació.

-Eines utilitzades.

-Qualificació del personal.

-Traçabilitat del sistema.

UNIONS SOLDADES:

Els soldadors han d'estar en possessió de la qualificació adequada d'acord amb l'apartat 77.4.2 de l'EAE.

Cada soldador identificaré la feina amb marques personals no transferibles.

El soldat es realitzarà segons l'apartat 77.4.1 de l'EAE, el constructor realitzarà els assaigs i les proves necessàries per establir el mètode de soldadura més adequat.

Abans de fer la soldadura, s'inspeccionaran les peces a unir segons la UNE-EN 970.

Les inspeccions les farà un inspector de soldadura de nivell 2 o persona autoritzada per la DF.

UNIONS CARGOLADES:

Es comprovaran els parells de collament aplicats als cargols.

En el cas de cargols pretesats es comprovarà que l'esforç aplicat és superior al mínim establert.

CONTROL D'EXECUCIÓ. CRITERIS DE PRESA DE MOSTRES:

Els controls es faran segons les indicacions de la DF.

La mesura de les longituds es farà amb regla o cinta metàl·lica, d'exactitud no menor de 0,1 mm a cada metre, i no menor que 0,1 per mil en longituds majors.

La mesura de les fletxes de les barres es realitzarà per comparació entre la directriu del perfil i la línia recta definida entre les seccions extremes materialitzada amb un filferro tensat.

UNIONS SOLDADES:

La DF determinarà les soldadures que han de ser objecte d'anàlisi.

Els percentatges indicats poden ser variats, segons criteris de la DF, en funció dels resultats de la inspecció visual realitzada i de les anàlisis anteriors.

UNIONS CARGOLADES:

La DF determinarà les unions que han de ser objecte d'anàlisi.

CONTROL D'EXECUCIÓ. INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

El taller de fabricació disposarà de control dimensional adequat.

Quan se sobrepassi alguna de les toleràncies especificades en algun control, es corregirà la implantació a l'obra. A més, s'augmentarà el control, a l'apartat incomplet, fins a un 20% d'unitats. Si es troben irregularitats, es faran les oportunes correccions i/o deixalles i es farà el control sobre el 100% de les unitats amb les oportunes actuacions segons el resultat.

UNIONS SOLDADES:

La qualificació dels defectes observats a les inspeccions visuals i a les realitzades per mètodes no destructius, es farà d'acord amb les especificacions fixades al Plec de Condicions Particulars de l'obra.

CONTROL DE L'OBRA ACABADA. OPERACIONS DE CONTROL:

Inspecció visual de la unitat acabada.

A l'estructura acabada es realitzaran les comprovacions i proves de servei previstes en el projecte i/o ordenades per DF conjuntament amb les exigides per la normativa vigent.

UNIONS SOLDADES:

A l'estructura acabada es realitzaran les comprovacions i proves de servei previstes en el projecte i/o ordenades per DF conjuntament amb les exigides per la normativa vigent.

Es controlaran tots els cordons de soldadura.

Les soldadures que durant el procés de fabricació resultin inaccessibles seran inspeccionades amb anterioritat.

A l'autocontrol de les soldadures es comprovaran com a mínim:

-Inspecció visual de tots els cordons.

-Comprovacions mitjançant assaigs no destructius segons la taula 91.2.2.5 de l'EAE.

Es realitzaran els següents assaigs no destructius segons la norma EN12062

-Líquids penetrants (LP) segons UNE-EN 1289.

-Partícules magnètiques (PM) segons UNE-EN 1290.

-Ultrasons (US), segons UNE-EN 1714.

-Radiografies (RX), segons UNE-EN 12517.

A tots els punts on hi hagi creus de cordons de soldadura es realitzarà una radiografia addicional.

Es realitzarà una inspecció mitjançant partícules magnètiques o líquids penetrants del 15% del total de la longitud de les soldadures en angle.

Es realitzarà una inspecció radiogràfica i ultrasònica de les soldadures al màxim en planxes i unions en T quan aquestes siguin al màxim.

Els criteris d'acceptació de les soldadures es basaran a la UNE-EN ISO 5817.

UNIONS CARGOLADES:

La freqüència de comprovació serà del 100% per a elements principals com a bigues, i del 25% per a elements secundaris com a rigiditzadors.

CONTROL DE L'OBRA ACABADA. CRITERIS DE PRESA DE MOSTRES:

Els controls es faran segons les indicacions de la DF.

CONTROL DE L'OBRA ACABADA. INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

Correcció per part del contractista de les irregularitats observades.

UNIONS SOLDADES:

No s'acceptaran soldadures que no compleixin les especificacions.

No s'acceptaran unions soldades que no compleixin els assajos no destructius.

No s'acceptaran soldadures realitzades per soldadors no qualificats.

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**3.1.3.- REPARACIÓ I REFORÇ D'ESTRUCTURA METÀL·LICA**

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Reparació i reforçament d'elements estructurals amb perfils normalitzats d'acer, utilitzats directament o formant peces compostes.

S'han considerat els elements següents:

- Elements auxiliars (elements d'encastat, de suport i rigiditzadors)

S'han considerat els tipus de perfils següents:

- Perfils d'acer laminat en calent, de les sèries IPN, IPE, HEA, HEB, HEM o UPN, d'acer S275JR, S275J0, S275J2, S355JR, S355J0 o S355J2, segons EAE-2011, UNE-EN 10
- Perfils d'acer laminat en calent de les sèries L, LD, rodó, quadrat, rectangular o planxa, d'acer S275JR, S275J0, S275J2, S355JR, S355J0 o S355J2, segons EAE-2011, UNE-EN2
- Perfils buits d'acer laminat en calent de les sèries rodó, quadrat o rectangular, d'acer S275J0H o S355J2H, segons EAE-2011, UNE-EN 10210-1
- Perfils buits conformats en fred de les sèries rodó, quadrat o rectangular d'acer S275J0H o S355J2H, segons EAE-2011, UNE-EN 10219-1
- Perfils conformats en fred de les sèries L, LD, U, C, Z, u Omega, d'acer S235JRC, segons EAE-2011, UNE-EN 10025-2

S'han considerat els acabats superficials següents:

- Pintat amb una capa d'imprimació antioxidant
- Galvanitzat

S'han considerat els tipus de col·locació següents:

- Col·locació amb soldadura
- Col·locació amb cargols
- Col·locació sobre obres de fàbrica o de formigó, recolzats o encastats

L'execució de la unitat d'obra inclou les operacions següents:

- Preparació de la zona de treball
- Replanteig i marcatge dels eixos
- Col·locació i fixació provisional de la peça
- Aplomat i anivellament definitius
- Execució de les unions, si escau
- Comprovació final de l'aplomat i dels nivells

CONDICIONS GENERALS:

Els materials utilitzats tindran la qualitat establerta a la DT. No es faran modificacions sense autorització de la DF encara que suposin un increment de les característiques mecàniques.

La peça estarà col·locada a la posició indicada a la DT, amb les modificacions aprovades per la DF.

La peça estarà correctament aplomada i anivellada.

Quan la peça sigui composta, la disposició dels diferents elements de la peça, les dimensions, el tipus d'acer i els perfils, es correspondran amb les indicacions de la DT.

Cada component de l'estructura portarà una marca d'identificació que ha de ser visible després del muntatge. Aquesta marca no estarà feta amb entalladura cisellada.

La marca d'identificació indicarà l'orientació de muntatge del component estructural quan no es dedueixi clarament de la seva forma.

Els elements de fixació i les xapes, plaques petites i accessoris de muntatge aniran embalats i identificats adequadament.

L´element estarà pintat amb una capa de protecció de pintura antioxidant, excepte si està galvanitzat.

Els cantells de les peces no tenen òxid adherit, rebaves, estries o irregularitats que dificultin el contacte amb l'element que s'unirà.

Si el perfil està galvanitzat, la col·locació de l'element no produirà desperfectes al recobriment del zinc.

L'element no es redreçarà un cop col·locat definitivament.

No es permet emplenar amb soldadura els forats que han estat practicats a l'estructura per disposar cargols provisionals de muntatge.

Toleràncies d'execució:

- En obres d'edificació: Límits establerts als apartats 11.1 i 11.2 del DB-SE A i a l'article 80 de l'EAE.
- En obres d'enginyeria civil: Límits establerts a l'article 640.12 del PG3 i a l'article 80 de l'EAE.

COL·LOCACIÓ AMB CARGOLS:

S'utilitzaran cargols normalitzats d'acord amb les normes recollides a la taula 29.2.b de l'EAE.
Els cargols avellanats, cargols calibrats, perns articulats i els cargols hexagonals d'injecció s'han d'utilitzar seguint les instruccions del fabricant i han de complir els requisits addicionals que estableix l'article 29.2 de l'EAE.
La situació dels cargols a la unió serà tal que redueixi la possibilitat de corrosió i pandeig local de les xapes, i faciliti el muntatge i les inspeccions.
El diàmetre nominal mínim dels cargols serà de 12 mm.
La rosca pot estar inclosa al pla de tall, excepte en el cas que els cargols s'utilitzin com a calibrats.
Després de prémer l'espiga del cargol ha de sobresortir de la rosca de la femella. Entre la superfície de suport de la femella i la part no roscada de l'espiga hi haurà, com a mínim:
- En cargols pretesats: 4 filets complets més la sortida de la rosca
- En cargols sense pretensar: 1 filet complet més la sortida de la rosca
Les superfícies dels caps de cargols i femelles estaran perfectament planes i netes.
Als cargols col·locats en posició vertical, la femella estarà situada per sota del cap del cargol.
En els forats rodons normals i amb cargols sense pretensar no cal utilitzar volanderes. Si s'utilitzen aniran sota el cap dels cargols, seran aixamfranades i el xamfrà estarà situat cap al cap del cargol.
En els cargols pretesats, les volanderes seran planes endurides i aniran col·locades de la següent forma:
- Cargols 10.9: sota el cap del cargol i de la femella
- Cargols 8.8: sota l'element que gira
Toleràncies d'execució:
- Folgança màxima entre superfícies adjacents:
- Si s'utilitzen cargols no pretesats: 2 mm
- Si s'utilitzen cargols pretesats: 1 mm
- Diàmetre dels forats:
- En obres d'edificació: Límits establerts a l'apartat 11.1 del DB-SE A i a l'article 76.2 de l'EAE
- En obres d'enginyeria civil: Límits establerts als apartats 640.5.1.3 i 640.5.1.4 del PG3 a l'article 76.2 de l'EAE
- Posició dels forats:
- En obres d'edificació: Límits establerts a l'apartat 11.1 del DB-SE A i a l'article 76.2
- de l'EAE
COL·LOCACIÓ AMB SOLDADURA:
El material d'aportació utilitzat serà apropiat als materials a soldar i al procediment de soldadura.
Les característiques mecàniques del material d'aportació seran superiors a les del material base.
En acers de resistència millorada a la corrosió atmosfèrica, la resistència a la corrosió del material d'aportació serà equivalent a la del material base.
El plec de prescripcions tècniques particulars definirà el sistema de protecció davant de la corrosió.
Els mètodes de protecció podran ser:
- Metal·lització, segons la UNE-EN ISO 2063.
- Galvanització en calent, segons la UNE-EN ISO 1461.
– Sistemes de pintura, segons la UNE-EN ISO 12944.

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ
CONDICIONS GENERALS:
El constructor elaborarà els plànols de taller i un programa de muntatge que seran aprovats per la DF abans d'iniciar els treballs a l'obra.
Qualsevol modificació durant els treballs l'ha d'aprovar la DF i reflectir-la posteriorment als plànols de taller.
Els components estructurals es manipularan evitant que es produeixin deformacions permanents i procurant que els desperfectes superficials siguin mínims. Es protegiran als punts de subjecció.
Tot subconjunt estructural que durant les operacions de càrrega, transport, emmagatzematge i muntatge experimenti desperfectes, es repararà fins que sigui conforme.
Si durant el transport el material ha patit desperfectes que no puguin ser corregits o es prevegi que després d'arreglar-los afectarà el treball estructural, la peça serà substituïda.
Els components de l'estructura s'han d'emmagatzemar apilats sobre el terreny sense estar en contacte amb el terra i de manera que no es produeixi acumulació d'aigua.
El muntatge de l'estructura es farà d'acord amb el programa de muntatge i garantint la seguretat estructural en tot moment.
Durant les operacions de muntatge, l'estructura ha de resistir, en condicions de seguretat, les càrregues provisionals de muntatge i els efectes de les càrregues de vent.
Els arriostraments i encastaments o subjeccions provisionals es mantindran en la seva posició fins que l'avenç del muntatge permeti que puguin ser retirats de manera segura.
Les unions per a peces provisionals necessàries per al muntatge s'han de fer de manera que no debilitin l'estructura ni en disminueixin la capacitat de servei.
La secció de l'element no queda disminuïda pels sistemes de muntatge utilitzats.

Els dispositius d'ancoratge provisionals s'asseguraran per evitar que s'afluixin de manera involuntària.

Durant el procés de muntatge, el constructor garantirà que cap part de l'estructura estigui permanentment deformada o sobrecarregada per l'apilament de materials estructurals o per càrregues provisionals de muntatge.

Un cop muntada una part de l'estructura, s'alinearà el més aviat possible i immediatament després es completarà el cargolament.

No es faran unions permanents fins que una part suficient de l'estructura no estigui ben alineada, anivellada, aplomada i unida provisionalment de manera que no es produeixin desplaçaments durant el muntatge o posterior alineació de la resta de l'estructura.

La preparació de les unions que es realitzin a l'obra es faran al taller.

Els desperfectes que les operacions d'emmagatzematge i manipulació ocasionin en l'acabat superficial de l'estructura es repararan amb procediments adequats.

Es tindrà especial cura en el drenatge de cobertes i façanes, així com evitar zones on es pugui dipositar l'aigua de forma permanent.

Els elements de fixació i ancoratge disposaran de protecció adequada a la classe d'exposició ambiental.

Per a la reparació de superfícies galvanitzades s'utilitzaran productes de pintura adequats aplicats sobre àrees que estiguin dins de 10 mm de galvanització intacta.

Les parts que siguin de difícil accés després del muntatge rebran el tractament de protecció després de la inspecció i l'acceptació de la DF i abans del muntatge.

Les estructures amb planxes i peces primes conformades en fred s'han d'executar considerant els requisits addicionals de la UNE-ENV 1090-2.

Les estructures amb acers d'alt límit elàstic s'han d'executar considerant els requisits addicionals de la UNE-ENV 1090-3.

Les estructures amb gelosia de secció buida s'executaran tenint en compte els requisits addicionals de la UNE-ENV 1090-4.

COL·LOCACIÓ AMB CARGOLS:

Els forats per als cargols es faran amb trepant mecànica. S'admet un altre procediment sempre que proporcioni un acabat equivalent.

Es permet l'execució de forats mitjançant punxonat sempre que es compleixin els requisits establerts a l'apartat 10.2.3 del DB-SE A en obres d'edificació o els establerts a l'apartat 640.5.1.1 del PG3 en obres d'enginyeria civil.

Es recomana que, sempre que sigui possible, es tallin d'una sola vegada els buits que travessen dues peces o més.

Els forats allargats es realitzaran mitjançant una sola operació de punxonat, o amb la perforació o punxonat de dos forats i posterior oxitall.

Després de perforar les peces i abans d'unir-les s'eliminaran les rebaves.

Els cargols i les femelles no s'han de soldar, llevat que ho expliciti el plec de condicions tècniques particulars.

S'han de col·locar el nombre suficient de cargols de muntatge per assegurar la immobilitat de les peces armades i el contacte íntim de les peces d'unió.

Les femelles es muntaran de manera que la seva marca de designació sigui visible després del muntatge.

En els cargols sense pretensar, cada conjunt de cargol, rosca i volandera(es) s'estrenyé fins arribar a l'apretat de gom a gom" sense sobretensar els cargols. En grups de cargols aquest procés es farà progressivament començant pels cargols situats al centre. Si és necessari es faran cicles addicionals de collament.

Abans de començar el pretesat, els cargols pretesats d'un grup s'estrenyen d'acord amb allò indicat per als cargols sense pretensar. Perquè el pretesat sigui uniforme es faran cicles addicionals de collament.

Es retiraran els conjunts de cargol pretesat, rosca i volandera(es) que després d'estrènyer fins al pretesat mínim s'afluixin.

L'estrenyiment dels cargols pretesats es farà mitjançant un dels procediments següents:

- Mètode de la clau dinamomètrica.
- Mètode de la femella indicadora.
- Mètode combinat.

Les superfícies que han de transmetre esforços per fregament s'han de netejar d'olis amb netejadors químics. Després de la preparació i fins i tot l'armat i cargolat es protegiran amb cobertes impermeables.

La zona sense revestir situada al voltant del perímetre de la unió amb cargols no es tracta fins que no s'hagi inspeccionat la unió.

COL·LOCACIÓ AMB SOLDADURA:

Els procediments autoritzats per realitzar unions soldades són:

- Per arc elèctric manual elèctrode revestit
- Per arc amb fil tubular, sense protecció gasosa
- Per arc submergit amb fil/filferro
- Per arc submergit amb elèctrode nu

- Per arc amb gas inert
- Per arc amb gas actiu
- Per arc amb fil tubular, amb protecció de gas actiu
- Per arc amb fil tubular, amb protecció de gas inert
- Per arc amb elèctrode de volfram i gas inert
- Per arc de connectors

Les soldadures es faran protegides dels efectes directes del vent, de la pluja i de la neu.

A l'obra i a disposició del personal encarregat de soldar hi haurà un pla de soldadura, que inclourà, com a mínim, detall, dimensions i tipus de les unions, especificacions dels tipus d'elèctrodes i preescalfament, seqüència de soldadura, limitacions a la soldadura discontínua i comprovacions intermèdies, girs o voltes de les peces necessàries per a la soldadura, detall de les fixacions provisionals, disposicions davant de l'esquinç laminar, referència al pla d'inspecció i assaigs, i tots els requeriments per a la identificació de les soldadures.

Les soldadures es faran per soldadors certificats per un organisme acreditat i qualificats segons la UNE-EN 287-1.

La coordinació de les tasques de soldadura la realitzaran soldadors qualificats i amb experiència en el tipus d'operació que supervisen.

Abans de començar a soldar es verificarà que les superfícies i les vores a soldar són apropiades al procés de soldadura i que estan lliures de fissures.

Totes les superfícies a soldar es netejaran de qualsevol material que pugui afectar negativament la qualitat de la soldadura o perjudicar el procés de soldadura. Es mantindran seques i lliures de condensacions.

Els components a soldar estaran correctament col·locats i fixos en la seva posició mitjançant dispositius apropiats o soldadures de punteig, de manera que les unions a soldar siguin accessibles i visibles per al soldador. No s'hi introduiran soldadures addicionals.

El muntatge de l'estructura es farà de manera que les dimensions finals dels components estructurals estiguin dins de les toleràncies establertes.

Els dispositius provisionals utilitzats per al muntatge de l'estructura es retiraran sense fer malbé les peces.

Les soldadures provisionals s'han d'executar seguint les especificacions generals. S'eliminaran totes les soldadures de punteig que no s'incorporin a les soldadures finals.

Quan el tipus de material de l'acer i/o la velocitat de refredament puguin produir un enduriment de la zona tèrmicament afectada, es considera la utilització del preescalfament. Aquest s'estendrà 75 mm a cada component del metall base.

No s'accelerarà el refredament de les soldadures amb medis artificials.

Els cordons de soldadura successius no produiran osques.

Després de fer un cordó de soldadura i abans de fer el següent, cal netejar l'escòria mitjançant una piqueta i un raspall.

L'execució dels diferents tipus de soldadures es farà d'acord amb els requisits establerts a l'apartat 10.3.4 del DB-SE A i l'article 77 de l'EAE per a obres d'edificació o d'acord amb l'article 640.5.2 del PG3 i l'article 77 de l'EAE per a obres d'enginyeria civil.

No es faran servir materials de protecció que perjudiquin la qualitat de la soldadura a menys de 150 mm de la zona a soldar.

Les soldadures i el metall base adjacent no es pintaran sense haver eliminat prèviament l'escòria.

3.- UNITAT I CRITERI D'AMIDAMENT

kg de pes calculat segons les especificacions de la DT, d'acord amb els criteris següents:

- El pes unitari pel seu càlcul serà el teòric
- Per poder utilitzar un altre valor diferent del teòric, cal l'acceptació expressa de la DF.

Aquest criteri inclou les pèrdues de material corresponents a retallades.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

Reial Decret 751/2011, del 27 de maig, pel qual s'aprova la Instrucció d'Acer Estructural (EAE).

* UNE-ENV 1090-1:1997 Execució d'estructures d'acer. Part 1: Regles generals i regles per a edificació.

Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).

5.- CONDICIONS DE CONTROL D'EXECUCIÓ I DE L'OBRA ACABADA

CONTROL D'EXECUCIÓ. OPERACIONS DE CONTROL:

Abans de l'inici de l'execució, la DF verificarà que hi ha un programa de control desenvolupat pel constructor, tant per a productes com per a l'execució.

Previ al subministrament, el constructor presentarà a la DF la següent documentació:

- Acreditació que el procés de muntatge en taller dels elements de l'estructura té distintiu de qualitat reconegut.

- Acreditació que els productes d'acer tenen distintiu de qualitat reconegut.
- En processos de soldadura, certificats d'homologació dels soldadors segons UNE-EN 2871 i del procés de soldadura segons UNE-EN ISO 15614-1.

La DF comprovarà que els productes d'acer subministrats per taller a l'obra, s'acompanyen del full de subministrament, en cas que no se'n pugui fer la traçabilitat, serà rebutjat.

Prèvia a l'execució, es fabricaran per a cada element i cada material a tallar, com a mínim quatre provetes, per part del control extern de l'entitat de control segons l'article 91.2.2.1 de l'EAE.

Es comprovarà que les dimensions dels elements elaborats al taller són les mateixes que les dels plànols de taller, considerant-se les toleràncies en el plec de condicions.

Anteriorment a la fabricació, el constructor proposarà la seqüència d'armat i soldadura; aquesta haurà de ser aprovada per la DF.

Es marcaran les peces amb pintura segons plànol de taller, per identificar-les durant el muntatge a taller i a obra.

L'autocontrol del procés de muntatge inclou com a mínim:

-Identificació dels elements.

-Situació dels eixos de simetria.

-Situació de les zones de suport contigües.

-Paral·lelisme d'ales i platabandes.

-Perpendicularitat d'ales i ànimes.

-Abombament, rectitud i planeïtat d'ales i ànimes.

-Contrafletxes.

La freqüència de comprovació serà del 100% per a elements principals i del 25% per a elements secundaris.

La DF comprovarà amb antelació al muntatge la correspondència entre el projecte i els elements elaborats al taller, i la documentació del subministrament.

El constructor elaborarà la documentació corresponent al muntatge, aquesta serà aprovada per la DF, i com a mínim inclourà:

-Memòria de muntatge.

-Plànols de muntatge.

-Programa d'inspecció.

Es comprovarà la conformitat de totes les operacions de muntatge, especialment:

-L'ordre de cada operació.

-Eines utilitzades.

-Qualificació del personal.

-Traçabilitat del sistema.

UNIONS SOLDADES:

Els soldadors han d'estar en possessió de la qualificació adequada d'acord amb l'apartat 77.4.2 de l'EAE.

Cada soldador identificaré la feina amb marques personals no transferibles.

El soldat es realitzarà segons l'apartat 77.4.1 de l'EAE, el constructor realitzarà els assaigs i les proves necessàries per establir el mètode de soldadura més adequat.

Abans de fer la soldadura, s'inspeccionaran les peces a unir segons la UNE-EN 970.

Les inspeccions les farà un inspector de soldadura de nivell 2 o persona autoritzada per la DF.

UNIONS CARGOLADES:

Es comprovaran els parells de collament aplicats als cargols.

En el cas de cargols pretesats es comprovarà que l'esforç aplicat és superior al mínim establert.

CONTROL D'EXECUCIÓ. CRITERIS DE PRESA DE MOSTRES:

Els controls es faran segons les indicacions de la DF.

La mesura de les longituds es farà amb regla o cinta metàl·lica, d'exactitud no menor de 0,1 mm a cada metre, i no menor que 0,1 per mil en longituds majors.

La mesura de les fletxes de les barres es realitzarà per comparació entre la directriu del perfil i la línia recta definida entre les seccions extremes materialitzada amb un filferro tensat.

UNIONS SOLDADES:

La DF determinarà les soldadures que han de ser objecte d'anàlisi.

Els percentatges indicats poden ser variats, segons criteris de la DF, en funció dels resultats de la inspecció visual realitzada i de les anàlisis anteriors.

UNIONS CARGOLADES:

La DF determinarà les unions que han de ser objecte d'anàlisi.

CONTROL D'EXECUCIÓ. INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

El taller de fabricació disposarà de control dimensional adequat.

Quan se sobrepassi alguna de les toleràncies especificades en algun control, es corregirà la implantació a l'obra. A més, s'augmentarà el control, a l'apartat incomplet, fins a un 20% d'unitats. Si es troben irregularitats, es faran les oportunes correccions i/o deixalles i es farà el control sobre el 100% de les unitats amb les oportunes actuacions segons el resultat.

UNIONS SOLDADES:

La qualificació dels defectes observats a les inspeccions visuals i a les realitzades per mètodes no destructius, es farà d'acord amb les especificacions fixades al Plec de Condicions Particulars de l'obra.

CONTROL DE L'OBRA ACABADA. OPERACIONS DE CONTROL:

Inspecció visual de la unitat acabada.

A l'estructura acabada es realitzaran les comprovacions i proves de servei previstes en el projecte i/o ordenades per DF conjuntament amb les exigides per la normativa vigent.

UNIONS SOLDADES:

A l'estructura acabada es realitzaran les comprovacions i proves de servei previstes en el projecte i/o ordenades per DF conjuntament amb les exigides per la normativa vigent.

Es controlaran tots els cordons de soldadura.

Les soldadures que durant el procés de fabricació resultin inaccessibles seran inspeccionades amb anterioritat.

A l'autocontrol de les soldadures es comprovaran com a mínim:

-Inspecció visual de tots els cordons.

-Comprovacions mitjançant assaigs no destructius segons la taula 91.2.2.5 de l'EAE.

Es realitzaran els següents assaigs no destructius segons la norma EN12062

-Líquids penetrants (LP) segons UNE-EN 1289.

-Partícules magnètiques (PM) segons UNE-EN 1290.

-Ultrasons (US), segons UNE-EN 1714.

-Radiografies (RX), segons UNE-EN 12517.

A tots els punts on hi hagi creus de cordons de soldadura es realitzarà una radiografia addicional.

Es realitzarà una inspecció mitjançant partícules magnètiques o líquids penetrants del 15% del total de la longitud de les soldadures en angle.

Es realitzarà una inspecció radiogràfica i ultrasònica de les soldadures al màxim en planxes i unions en T quan aquestes siguin al màxim.

Els criteris d'acceptació de les soldadures es basaran a la UNE-EN ISO 5817.

UNIONS CARGOLADES:

La freqüència de comprovació serà del 100% per a elements principals com a bigues, i del 25% per a elements secundaris com a rigiditzadors.

CONTROL DE L'OBRA ACABADA. CRITERIS DE PRESA DE MOSTRES:

Els controls es faran segons les indicacions de la DF.

CONTROL DE L'OBRA ACABADA. INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

Correcció per part del contractista de les irregularitats observades.

UNIONS SOLDADES:

No s'acceptaran soldadures que no compleixin les especificacions.

No s'acceptaran unions soldades que no compleixin els assajos no destructius.

No s'acceptaran soldadures realitzades per soldadors no qualificats.

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# PART 4A.- REVESTIMENTS

## 4.1.- TRACTAMENTS SUPERFICIALS DE PREPARACIÓ I NETEJA

### 4.1.1.- NETEJA DE SUPERFÍCIE AMB MITJANS MECÀNICS O MANUALS

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Preparació i aplicació de diferents sistemes de neteja sobre superfícies de materials diversos. El sistema de neteja a utilitzar dependrà del tipus de material, del seu estat de conservació i de la naturalesa de les substàncies que es vulguin eliminar.

S'han considerat els tipus de neteja següents:

- Sistemes a base d'aigua:
- Aigua nebulitzada
- Aigua a baixa pressió: de 2,5 a 3 atmosferes, (no s'aplicaran a paraments murals d'interès historicoartístic)
- Vapor d'aigua, (no s'aplicarà a paraments murals d'interès historicoartístic)
- Apòsits aquosos amb materials absorbents
- Sistemes a base de detergents o productes químics:
- Agents quelants en suspensió en un gel
- Resines d'intercanvi iònic
- Apòsits amb dissolvents orgànics, surfactants o agents quelants.
- Sistemes abrasius

- Sistemes manuals

L'execució de la unitat d'obra inclou les operacions següents:

- Preparació de la superfície a netejar
- Protecció dels elements que no són objecte de la neteja
- Execució de la neteja

Determinació del grau de dificultat d'intervenció en conservació-restauració a les unitats d'obra on intervenen conservadors-restauradors:

- Valorar de 0 a 3 els aspectes següents:
- Degradació/fragilitat de l'element a tractar
- Dificultat/complexitat del tractament a realitzar
- Dificultat d'accés de l'element a tractar
- Sumar aquests factors i assignar el grau de dificultat amb el criteri següent:
- Suma 0 a 3: Grau de dificultat baix
- Suma 4 a 6: Grau de dificultat mitjà
- Suma 7 a 9: Grau de dificultat alt

CONDICIONS GENERALS:

Al parament net no hi ha d'haver zones esquerdades, trencades, escampades, tacades o amb decoloracions. No quedarà alterada la textura superficial del parament.

La neteja en pedra serà efectiva en l'eliminació de les substàncies nocives, restablirà el transport d'aigua en fase de vapor, facilitarà l'absorció dels productes de conservació a les successives etapes de tractament, no produirà un canvi de color, ni se'n percebrà cap canvi de rugositat de la superfície. No deixarà sals a la superfície, ni produirà cap substància nociva per a la futura conservació. Els mètodes seran fàcils de controlar pel tècnic restaurador.

El parament, un cop net, ha de complir les especificacions subjectives requerides per la DF.

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

CONDICIONS GENERALS:

Es treballarà a una temperatura superior als 5 ° C, amb vents de velocitat inferior a 50 km/hi sense pluja. Si una vegada realitzats els treballs es donen aquestes condicions, es revisarà allò executat 24 h abans i es refaran les parts afectades.

No s'utilitzaran sistemes de neteja amb mitjans humits quan hi hagi risc de gelada. Tampoc quan hi hagi perill de migració de sals a la superfície o formació de taques.

Cal fer anàlisis prèvies dels materials, escollint el sistema més convenient que deixi el material net sense deteriorar immediatament o posteriorment l'estructura interna del suport sobre el qual s'aplica.

Un cop escollit el sistema de neteja cal fer proves a les diferents zones de la façana per veure l'efecte de la neteja sobre el material.

En els sistemes de neteja abrasius i en els que utilitzen aigua s'han de protegir els elements més febles de la façana o els que no es netegen.

En els procediments amb raig de sorra, l'àrid utilitzat no ha de ser més fort que l'element a netejar

Es comprovarà els sistemes de neteja amb el suport que cal tractar.

El sistema d'aplicació del producte s'escollirà segons les instruccions del fabricant i l'autorització de la DF.

Durant el procés de neteja cal evitar els treballs que desprenguin pols a prop de l'àrea a netejar.

NETEJA EN SUPERFÍCIES DE FUSTA EN RESTAURACIÓ:

S'han d'aplicar els productes de neteja suaument, amb cotó o brotxes de pèl suau, evitant el contacte amb la pell per tractar-se de productes tòxics.

Quan s'utilitzi dissolvents, aquests s'apliquen de manera gradual, segons el poder de dissolució.

Es netejarà el parament en franges horitzontals completes i de dalt a baix, incloent voladissos, cornises i sortints.

3.- UNITAT I CRITERI D'AMIDAMENT

NETEJA AMB AGENTS QUÍMICS O MITJANS MECÀNICS, PREPARACIÓ DE LA SUPERFÍCIE, EXTRACCIÓ DE SALS SOLUBLES O RASPALLAT DE PARAMENT:

m2 de superfície real mesurada segons les especificacions de la DT.

Deducció de la superfície corresponent a obertures:

- Buits <= 1 m2: No es deduiran
- Buits > 1 m2: Es dedueix el 100%

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

No hi ha normativa de compliment obligat.

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**4.1.2. - NETEJA I PREPARACIÓ D'ESTRUCTURES D'ACER**

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Neteja i preparació de superfície d'elements d'acer, amb sistemes diferents, per aplicar posteriorment els recobriments d'acabat.

S'han considerat els tipus d'unitat d'obra següents:

- Graus de preparació de les superfícies d'acer
- Neteja amb medis mecànic
- Passivat de perfils laminats

L'execució de la unitat d'obra inclou les operacions següents:

Graus de preparació de les superfícies d'acer:

- Rascat manual acurat amb rasquetes de metall dur
- Raspall manual acurat amb raspall de filferro
- Eliminació de la pols resultant
- Neteja de la zona de treball i càrrega manual de runes

Neteja amb medis mecànics:

- Protecció dels elements que no són objecte de la neteja
- Raspallat mecànic
- Aplicació del producte de neteja en successives aplicacions
- Neteja de la zona de treball

Passivat:

- Neteja i preparació de la superfície a tractar
- Aplicació de la imprimació
- Aplicació del morter a dues capes

GRAUS DE PREPARACIÓ:

Grau St2: La superfície presenta una suau brillantor metàl·lica

Grau St3: La superfície presenta una clara brillantor metàl·lica

NETEJA I PREPARACIÓ:

La superfície ha de quedar neta, sense greixos, òxid i restes de materials adherits.

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

CONDICIONS GENERALS:

No es treballarà en cas de pluja, neu o si la velocitat del vent és superior a 50 km/h.

Es comprovarà els sistemes de neteja amb el suport que cal tractar.

Durant la neteja amb medis mecànic, cal disposar d'unes lones de protecció.

El sistema d'aplicació del producte s'escollirà segons les instruccions del fabricant i l'autorització de la DF.

GRAUS DE PREPARACIÓ:

El rascat i raspallat es realitzarà en una direcció, un cop acabat es repetirà en sentit perpendicular

3.- UNITAT I CRITERI D'AMIDAMENT

m2 de superfície realment executada, segons les especificacions de la DT.

Es considera el desenvolupament del perímetre.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

NETEJA I PREPARACIÓ I PASSIVAT:

No hi ha normativa de compliment obligat.

GRAUS DE PREPARACIÓ:

UNE-EN ISO 8501-1:2008 Preparació de substrats d´acer prèvia a l´aplicació de pintures i productes relacionats. Avaluació visual de la neteja de les superfícies. Part 1: Graus d'òxid i preparació de substrats d'acer no pintats després d'eliminar totalment els recobriments anteriors. (ISO 8501-1:2007).

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## 4.2.- TRACTAMENTS SUPERFICIALS DE PROTECCIÓ

### 4.2.1.- ANTICARBONATACIÓ

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Preparació i aplicació d'un recobriment protector sobre superfícies de materials diversos mitjançant diferents capes aplicades a l'obra.

S'han considerat els tractaments següents:

- Recobriment anticarbonatació aplicat sobre superfícies de formigó o morter.

L'execució de la unitat d'obra inclou les operacions següents:

Hidrofugació o anticarbonatació de paraments:

- Neteja i preparació de la superfície a tractar
- Aplicació successiva, amb intervals d'assecatge, de les capes necessàries

CONDICIONS GENERALS:

La superfície queda totalment coberta pel revestiment protector.

Tindrà la dotació prevista.

L'espessor total del recobriment, el nombre de capes i la forma de l'aplicació seran les definides per la DT o, si no, les especificades per la DF.

ANTICARBONATACIÓ:

Gruix de la pel·lícula seca del revestiment: >= 95 micres, < = 1,3 mm

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

CONDICIONS GENERALS:

No es treballarà en cas de pluja, neu o si la velocitat del vent és superior a 50 km/h.

Si una vegada realitzats els treballs es donen aquestes condicions, es revisarà allò executat 24 h abans i es refaran les parts afectades.

Les superfícies d'aplicació estaran netes, exemptes de pols, taques i greixos.

La superfície no tindrà fissures ni parts desfetes.

El sistema d'aplicació del producte s'escollirà segons les instruccions del fabricant i l'autorització de la DF.

S'evitaran els treballs que desprenguin pols o partícules a prop de l'àrea a tractar abans, durant i després de l'aplicació.

ANTICARBONATACIÓ:

S'aturaran els treballs si es donen les condicions següents:

- Temperatures inferiors a 8ºC
- Humitat relativa de l'aire > 80%

No s'aplica sobre superfícies humides.

El suport estarà prou sec i forjat per poder garantir una bona adherència. Tindrà una humitat inferior al 6% en pes.

Es neutralitzaran els àlcalis, les eflorescències, les floridures i les sals.

Quan s'apliqui sobre morters a base de ciment i resines sintètiques, aquests tenen una antiguitat de 5 dies com a mínim.

Quan s'apliqui sobre suports molt absorbents, es diluirà la primera capa amb un 5% d'aigua.

Les capes s'apliquen amb els intervals especificats pel fabricant, segons la temperatura ambient.

3.- UNITAT I CRITERI D'AMIDAMENT

m2 de superfície real mesurada segons les especificacions de la DT.

Deducció de la superfície corresponent a obertures:

- Buits <= 1 m2: No es dedueixen
- Buits > 1 m2 i <= 2 m2: Es dedueix el 50%
- Buits > 2 m2: Es dedueix el 100%

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

No hi ha normativa de compliment obligat.

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**4.2.2.- PINTAT D'ESTRUCTURES D'ACER AMB SISTEMES DE PROTECCIÓ**

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Aplicació d'un recobriment de pintura sobre una superfície d'acer amb un grau de preparació definida, mitjançant un conjunt de capes d'imprimació, intermèdies i d'acabat, amb gruixos nominals de pel·lícula seca definits, que condueix a una durabilitat determinada del sistema de pintura protector segons l'article 30.2 de l'EAE.

S'han considerat els elements següents:

- Estructures
- Paraments

L'execució de la unitat d'obra inclou les operacions següents:

- Aplicació de les capes d'imprimació necessàries i del tipus adequat, segons la composició de la pintura d'acabat
- Aplicació de capes de pintura intermèdies.
- Aplicació successiva, amb els intervals d'assecat de les capes d'acabat.

CONDICIONS GENERALS:

Els sistemes de pintura han de complir les prescripcions de la taula 30.3.a. de l'EAE

Es definirà el sistema de tractament, detallant com a mínim:

-Tipus i gruix de la capa d'imprimació anticorrosiva

-Tipus i gruix de les capes intermèdies

-Tipus i gruix de les capes d'acabat i retocs

Cal eliminar la superfície d'acer la brutícia, pellofa de laminació, restes d'escòries de soldadures, greixos, humitat superficial i revestiments existents

La superfície dels elements a pintar es netejarà i es prepararan d'acord amb el tractament de pintura a aplicar

Els mètodes de preparació de la superfície han d'obtenir el grau de rugositat definit

En cas de realitzar-se el pintat a l'obra dels elements, aquests s'imprimiran en taller amb un gruix mínim, per tal d'evitar una oxidació incipient durant l'apilament

Les pintures que componen el sistema de pintat han de ser compatibles entre si

És recomanable que les diferents capes de pintura siguin de diferents colors per poder-les diferenciar

Es respectaran de manera estricta els períodes d'assecatge i enduriment que aconselli el fabricant davant d'un possible contacte amb l'aigua.

Cal preveure la dificultat de pintar dels elements inaccessibles i pintar-los abans del muntatge

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

CONDICIONS GENERALS:

Es comprovarà prèviament que l'estat de la superfície és el previst a la fase anterior

S'aturaran els treballs si es donen les condicions següents:

- Temperatures inferiors a 5°C o superiors a 30 °C
- Humitat relativa de l'aire > 60%
- A exteriors: Velocitat del vent > 50 km/ h, Pluja

Si una vegada realitzats els treballs es donen aquestes condicions, es revisarà allò executat 24 h abans i es refaran les parts afectades.

Les superfícies d'aplicació estaran netes, exemptes de pols, taques i greixos.

No es pot pintar sobre suports molt freds ni reescalfats.

El sistema d'aplicació del producte s'escollirà segons les instruccions del fabricant i l'autorització de la DF.

Quan el revestiment estigui format per diverses capes, la primera capa estarà lleugerament diluïda, segons les instruccions del fabricant.

S'evitaran els treballs que desprenguin pols o partícules a prop de l'àrea a tractar abans, durant i després de l'aplicació.

No s'admet la utilització de procediments artificials d'assecatge.

Després de l'aplicació de la pintura, les superfícies s'han de protegir de l'acumulació d'aigua durant un cert temps

3.- UNITAT I CRITERI D'AMIDAMENT

m2 de superfície realment pintada segons les especificacions de la DT.

Es considera el desenvolupament del perímetre.

Deducció de la superfície corresponent a obertures:

- Obertures <=1 m2: No es dedueixen
- Obertures >1 m2 i <= 2 m2: Es dedueix el 50%
- Obertures >2 m2: Es dedueix el 100%

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

Reial Decret 751/2011, del 27 de maig, pel qual s'aprova la Instrucció d'Acer Estructural (EAE).

Reial decret 314/2006, de 17 de març, pel qual s'aprova el Codi tècnic de l'edificació part 2. Document bàsic d'acer DB-SE-A.

5.- CONDICIONS DE CONTROL D'EXECUCIÓ I DE L'OBRA ACABADA

CONTROL D'EXECUCIÓ. OPERACIONS DE CONTROL:

Els punts de control més destacables són els següents:

– Inspecció visual de la superfície a pintar.

- Acceptació del procediment d'aplicació de la pintura per part de la DF.
- Comprovació de l'assecatge d'una capa abans de fer una segona aplicació.

CONTROL D'EXECUCIÓ. CRITERIS DE PRESA DE MOSTRES:

Els controls es faran segons les instruccions de la DF.

CONTROL D'EXECUCIÓ. INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

Correcció per part del contractista de les irregularitats observades.

CONTROL DE L'OBRA ACABADA. OPERACIONS DE CONTROL:

Inspecció visual de la unitat acabada.

Al control se seguiran els criteris indicats a l'article 7.4 de la part I del CTE.

Determinació de l'espessor de pel·lícula del recobriment sobre un element metàl·lic (UNE EN ISO 2808)

CONTROL DE L'OBRA ACABADA. CRITERIS DE PRESA DE MOSTRES:

Els controls es faran segons les instruccions de la DF.

CONTROL DE L'OBRA ACABADA. INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

Correcció per part del contractista de les irregularitats observades.

No es permetrà la continuació dels treballs fins que no estiguin solucionats els errors d'execució.

# PART 5A. - EVACUACIÓ , CANALITZACIÓ I VENTILACIÓ ESTÀTICA

## 5.1.- DRENATGES

### 5.1.1.- DRENATGE AMB LÀMINES DE DRENATGE, COL·LOCAT

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Col·locació de làmina amb relleu, de manera que un cop fixada o recolzada a l'element formi canals per on conduir l'aigua.

S'han considerat els tipus de col·locació següents:

- Col·locada amb fixacions mecàniques
- Sense adherir

L'execució de la unitat d'obra inclou les operacions següents:

Làmina col·locada no adherida:

- Neteja i preparació del suport
- Col·locació de la làmina
- Resolució dels elements singulars (angles, juntes, entregues, etc.)

Col·locació amb fixacions mecàniques:

- Comprovació de la superfície de suport
- Col·locació de la làmina
- Col·locació de les fixacions
- Resolució dels elements singulars (angles, juntes, trobades, etc.)

CONDICIONS GENERALS:

El conjunt de la membrana cobrirà tota la superfície a impermeabilitzar.

Tindrà un aspecte superficial pla i regular, amb un mínim d'imperfeccions (embalums, arrugues, etc.).

Les làmines solaparan entre elles i protegiran el sentit del recorregut de l'aigua.

Les trobades de la membrana amb els paraments verticals seran aixamfranats o corbs.

L'extrem de la làmina queda encastat dins d'una rasa o fixat al parament amb un perfil de remat, seguint les especificacions de l'apartat 2.1.3.1 del DB HS1.

En tots dos casos aquesta unió quedarà segellada.

La cara amb nòduls ha de quedar en contacte amb la superfície que cal impermeabilitzar i l'altra cara ha de quedar en contacte amb l'origen de la humitat (terreny).

Serà imputrescible i compatible amb els materials amb què hagi d'estar en contacte.

Solapes: >= 20 cm

Toleràncies d'execució:

- Solapes: ± 5 mm
- Planeïtat: ± 50 mm/m

COL·LOCACIÓ AMB FIXACIONS MECÀNIQUES:

Les fixacions seran estanques i quedaran uniformement distribuïdes.

En cas d'impermeabilització de paraments, la làmina ha de quedar fixada per la part superior i en tota la superfície.

Nombre de fixacions: 2/m2

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

El suport estarà net, sense irregularitats que puguin perforar la làmina.

Les làmines col·locades es protegiran del pas de les persones, equips o materials.

Els ancoratges es faran a una temperatura ambient màxima de 20°C, procurant o transmetre tensions a la membrana.

3.- UNITAT I CRITERI D'AMIDAMENT

m2 de superfície mesurada segons les especificacions de la DT.

Aquests criteris inclouen les pèrdues de material corresponents a retallades i cavalcaments.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

Document Bàsic de Salubritat DB-HS, part II del CTE, aprovat pel Reial Decret 314/2006.

### 5.1.2. - DRENATGE AMB TUB DE PVC

1.- DEFINICIÓ I CONDICIONS DE LES PARTIDES D'OBRA EXECUTADES

Formació de drenatge amb tub ranurat de materials plàstics PVC.

S'han considerat els tipus de col·locació següents:

- Col·locació del tub sense incloure el farciment de material filtrant

- Col·locació del tub inclòs el farciment de material filtrant

L'execució de la unitat d'obra inclou les operacions següents:

Sense incloure el farciment de material filtrant:

- Comprovació de la superfície de suport
- Col·locació dels tubs
- Inclòs el farciment de material filtrant:

Sense incloure el farciment de material filtrant:

- Col·locació i unió dels tubs
- Farciment de la rasa amb material filtrant

CONDICIONS GENERALS:

Els tubs quedaran ben assentats sobre un llit de material filtrant de granulometria adequada a les característiques del terreny i del tub.

Hi haurà punts fixos de referència, exteriors a la zona de treball, als quals es referiran totes les lectures topogràfiques.

Els tubs col·locats tindran el pendent definit a la DT. per a cada tram i seguir les alineacions indicades a la DT.

Els tubs penetraran dins de les arquetes i dels pous de registre.

El drenatge acabat funcionarà correctament.

El pas d'aigua ha de ser el correcte en els pous de registre aigües avall.

Fletxa màxima dels tubs rectes: <= 1 cm/m

Pendent: >= 0,5%

Amplada de la rasa: Diàmetre nominal + 45 cm

Penetració de tubs en arquetes i pous: >= 1 cm

Toleràncies d'execució:

- Pendent <= 4%: ± 0,25%
- Pendent > 4%: ± 0,50%
- Rasants: ± 20 mm

INCLÒS EL FARCIT DE MATERIAL FILTRANT:

El drenatge estarà recobert per un farciment de 50 cm de material filtrant.

El grau de compactació del farciment de la rasa no serà inferior al del material circumdant.

Solapes de les làmines de polipropilè: >= 30 cm

Gruix màxim de les tongades de material filtrant: 30 cm

Toleràncies d'execució:

- Planeïtat de les capes de material filtrant: ± 20 mm/m
- Nivells de les capes de material filtrant: ± 30 mm

2.- CONDICIONS DEL PROCÉS D'EXECUCIÓ

CONDICIONS GENERALS:

El muntatge del tub l'ha de fer personal experimentat, que alhora vigilarà el posterior farciment de la rasa, en especial la compactació directament als tubs.

L'aportació de terres per a correcció de nivells ha de ser mínima, de les mateixes existents i de la mateixa compacitat. S'eliminaran els materials inestables, torba o argila tova de la base per al farciment.

Cal preveure un sistema de desguàs per evitar l'acumulació d'aigua dins de l'excavació.

No cal iniciar la manipulació ni la col·locació dels tubs sense l'autorització prèvia de la DF.

Abans de baixar els tubs a la rasa s'examinaran i s'apartaran els que estiguin deteriorats.

No transcorreran més de 8 dies entre l'execució de la rasa i la col·locació dels tubs.

La col·locació dels tubs es començarà pel punt més baix quan la rasa.

Els treballs es faran amb la rasa i els tubs lliures d'aigua i de terres soltes.

En cas d'interrompre's la col·locació dels tubs se n'evitarà l'obstrucció i se n'assegurarà el desguàs. Quan es reprenguin els treballs, es comprovarà que no s'hagi introduït cap cos estrany a l'interior dels tubs.

INCLÒS EL FARCIT DE MATERIAL FILTRANT:

No s'iniciarà el rebliment de la rasa sense l'autorització expressa de la DF.

Per sobre del tub, fins a l'alçada especificada a la DT, o indicada per la DF (mínim 25 cm), s'ha de col·locar un farciment de grava D 20-40, embolicat amb un feltre geotèxtil 100-150 g/m2.

No s'han de col·locar més de 100 m de tub sense procedir a la col·locació del geotèxtil i al rebliment amb material filtrant.

El geotèxtil ha de tenir un aspecte superficial pla i regular. Ha de ser imputrescible i compatible amb els materials amb què hagi d'estar en contacte. Les làmines del geotèxtil no han de solapar entre elles, i un cop col·locades s'han de protegir del pas de persones, equips o materials.

La composició granulomètrica de la grava ha de complir les condicions de filtratge fixades per la DF, en funció dels terrenys adjacents i del sistema previst d'evacuació d'aigua.

S'evitarà l'exposició perllongada del material filtrant a la intempèrie.

Les feines es faran de manera que s'eviti la contaminació de la grava amb materials estranys.

Un cop col·locats els tubs, el farciment de la rasa es compactarà per tongades successives amb un grau de compactació >= 75% del PN

La geometria del farciment ha de ser la indicada a la DT.

El material de cada tongada ha de tenir les mateixes característiques i el gruix ha de ser uniforme. Les tongades tindran una superfície convexa, amb pendent transversal comprès entre el 2% i el 5%. No se n'ha d'estendre cap fins que la inferior compleixi les condicions exigides. En cap cas el grau de compactació de cada tongada ha de ser inferior al més alt que tinguin els sòls adjacents, al mateix nivell.

Les tongades de cada costat del tub s'han d'estendre de manera simètrica.

Al final de la compactació, s'han de fer unes passades sense aplicar vibració.

Se suspenen els treballs quan la temperatura ambient sigui inferior a 0 °C.

El procediment utilitzat per terraplenar rases i consolidar farcits no produirà moviments dels tubs.

3.- UNITAT I CRITERI D'AMIDAMENT

m de longitud mesurada segons les especificacions de la DT.

INCLÒS EL FARCIT DE MATERIAL FILTRANT:

Aquest criteri no inclou la preparació de la superfície de seient ni l'execució del llit de material filtrant.

SENSE INCLOURE EL FARCIT DE MATERIAL FILTRANT:

Aquest criteri no inclou la preparació de la superfície de seient, ni l'emplenament de la rasa amb material filtrant.

4.- NORMATIVA DE COMPLIMENT OBLIGATORI

Ordre de 6 de febrer de 1976 per la qual s'aprova el Plec de Prescripcions Tècniques Generals per a Obres de Carreteres i Ponts (PG-3).

Ordre FOM/1382/2002 de 16 de maig, per la qual s'actualitzen determinats articles del plec de prescripcions tècniques generals per a obres de carreteres i ponts relatius a la construcció d'esplanacions, drenatges i fonaments (PG-3).

Orde FOM/298/2016, de 15 de febrer, per la qual s'aprova la norma 5.2-IC drenatge superficial de la Instrucció de Carreteres.

Ordre de 15 de setembre de 1986 per la qual s'aprova el Plec de Prescripcions Tècniques Generals de Canonades de Sanejament de Poblacions.

5.- CONDICIONS DE CONTROL D'EXECUCIÓ I DE L'OBRA ACABADA

CONTROL D'EXECUCIÓ. OPERACIONS DE CONTROL:

Els punts de control més destacables són els següents:

- Inspecció visual de la base sobre la qual s'assentaran els tubs i comprovació de les toleràncies d'execució, especialment en referència als pendents.
- Inspecció visual de les peces abans de col·locar-les, rebutjant les que presentin defectes.
- Control visual de les alineacions dels tubs col·locats i dels elements singulars, com ara unions amb pous i arquetes.
- Control d'execució del rebliment filtrant (veure àmbit de control 0537)

CONTROL D'EXECUCIÓ. CRITERIS DE PRESA DE MOSTRES:

Els controls es faran segons les instruccions de la DF.

CONTROL D'EXECUCIÓ. INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

Correcció de les irregularitats observades a càrrec del contractista.

CONTROL DE L'OBRA ACABADA. OPERACIONS DE CONTROL:

Els punts de control més destacables són els següents:

- Un cop finalitzada l'obra i abans de la recepció provisional, es comprovarà el bon funcionament de la xarxa abocant aigua als pous de registre de capçalera o, mitjançant les cambres de descàrrega si existissin, verificant el pas correcte d'aigua als pous de registre aigües avall.

CONTROL DE L'OBRA ACABADA. CRITERIS DE PRESA DE MOSTRES:

Se seguiran les instruccions de la DF en la realització dels controls previstos, i a més, el contractista subministrarà el personal i els materials necessaris per a aquesta prova.

CONTROL DE L'OBRA ACABADA. INTERPRETACIÓ DE RESULTATS I ACTUACIONS EN CAS D'INCOMPLIMENT:

Correcció de les irregularitats observades a càrrec del contractista.

## ARTICLE 1000.- UNITATS DEFECTUOSES O NO ORDENADES

Les unitats d'obra no incloses en Projecte i no ordenades per la Direcció d'obra al Llibre d'Ordres que es lliurarà al Contractista, i que poguessin haver-se executat, no seran objecte d'abonament, i les responsabilitats en què s'hi hagués pogut incórrer seran a càrrec del Contractista.

Les unitats incorrectament executades no s'han d'abonar, i el Contractista, si s'escau, ha de procedir a la demolició i la reconstrucció correcta.

## ARTICLE 1001.- UNITATS D'OBRA NO INCLOSES EN EL PRESSUPOST

Les unitats d'obra ordenades per la Direcció d'Obra i no incloses en Pressupost s'executaran d'acord amb el que especifica el present Plec i les normes que se citen o les que es remet, i si no, segons els criteris de bona pràctica constructiva i les indicacions del director d'obra.

S'abonaran al preu, assenyalat al Quadre de Preus Núm. 1 cas d'estar-hi incloses o d'existir algun preu d'unitat d'obra assimilable a l'efectuada, o bé per poder-se compondre amb diversos preus inclosos.

## ARTICLE 1002.- RETIRADA DE MATERIALS NO EMPLEATS

A mesura que es realitzin els treballs, el Contractista ha de procedir pel seu compte, a la retirada dels materials arreplegats que ja no hi tinguin ocupació.

## ARTICLE 1003.- PARALITZACIONS D'OBRA

Bé per ordre genèrica de l'Administració, bé per ordre directa de la Direcció d'Obra, i aquesta ha d'estar degudament raonada, podrà ordenar la paralització temporal de les obres per causa d'operacions de control de trànsit, inclemències climàtiques o altres causes, sense que això doni dret a cap reclamació ni a petició d'indemnització per part del Contractista.

Barcelona, febrer de 2024

Autor del Projecte

Fco. Javier Jordán García

PEDELTA SL

COL·LEGI D'ENGINYERS DE CAMINS, CANALS I PORTS CATALUNYA

| Expedient | Data |
|---|---|
| 2024/01262/01 | 10/04/2024 |

VISAT

# DOCUMENT NÚM. 4: PRESSUPOSTOS

**INDEX DOCUMENT NÚM. 4: PRESSUPOST**

AMIDAMENTS

ESTADÍSTICA DE PARTIDA

QUADRE DE PREUS NÚM.1

QUADRE DE PREUS NÚM. 2

PRESSUPOST PER COMPONENTS

PRESSUPOST GENERAL

RESUM DE PRESSUPOST

ÚLTIM FULL

# AMIDAMENTS

# AMIDAMENTS



Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 01 REPARACIÓ I CONSERVACIÓ D'ESTRUCTURA METÀL.LICA
Titol 3 01 TREBALLS PREVIS

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | P875-4SAH | m2 | Limp./prep.sup.perf.lam.acero,St 3,s/UNE-EN ISO 8501-1,medios manuales |

Limpieza y preparación de la superfície de perfiles laminados de acero hasta un grado de preparación St 3 según la norma UNE-EN ISO 8501-1, con medios manuales y carga manual de escombros sobre contenedor, inclòs part proporcional de mitjans auxiliars, nocturnitat i
aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Gelosia principal | T | m2/m | Longitud (m) | Ud | | |
| 2 | Cordó superior | | 1,720 | 17,900 | 2,000 | | 61,576 |
| 3 | Cordó inferior | | 1,720 | 17,900 | 2,000 | | 61,576 |
| 4 | Diagonals-6 | | 0,860 | 2,400 | 8,000 | | 16,512 |
| 5 | Diagonals-7 | | 0,740 | 2,400 | 20,000 | | 35,520 |
| 6 | Diagonals-8 | | 0,740 | 2,400 | 4,000 | | 7,104 |
| 7 | Diagonals-9 | | 0,740 | 2,400 | 4,000 | | 7,104 |
| 8 | Muntants-3 | | 3,720 | 2,000 | 2,000 | | 14,880 |
| 9 | Muntants-4 | | 1,580 | 2,000 | 16,000 | | 50,560 |
| 10 | Muntants-5 | | 1,800 | 2,000 | 2,000 | | 7,200 |
| 11 | Bigues tranversals | T | m2/m | Longitud (m) | Ud | | |
| 12 | | | 2,640 | 7,880 | 10,000 | | 208,032 |
| 13 | Travessers | T | m2/m | Longitud (m) | Ud | | |
| 14 | | | 1,266 | 17,200 | 4,000 | | 87,101 |
| 15 | Arriostraments | T | m2/m | Longitud (m) | Ud | | |
| 16 | Contravent | | 0,280 | 3,440 | 18,000 | | 17,338 |
| 17 | Contrafrenat | | 0,280 | 8,412 | 4,000 | | 9,421 |
| 18 | Arriostrament | | 0,540 | 10,452 | 6,000 | | 33,864 |
| 19 | Biga contracarril | T | m2/m | Longitud (m) | Ud | | |
| 20 | | | 0,400 | 17,900 | 4,000 | | 28,640 |
| 21 | Altres | T | m2/m | Longitud (m) | Ud | | |
| 22 | Canalització de serveis | | 1,520 | 17,900 | 4,000 | | 108,832 |
| 23 | Passadissos | | 0,340 | 17,900 | 8,000 | | 48,688 |
| 24 | (5% percentatge no mesurat) | P | 5,000 | | | | 40,197 |
| 25 | Subtotal "A origen" | O | | | | | 844,145 |

TOTAL AMIDAMENT 844,145

2 P214X-HCU3X m — Retirada de perfils angulars en bigues diafragma, amb càrreg. mecà.

Retirada de perfils angulars en bigues diafragma, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Longitud | | | |
| 2 | Perfils angulars | | 4,000 | 8,600 | | | 34,400 |

EUR

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# AMIDAMENTS



TOTAL AMIDAMENT 34,400

3 P214X-HCU3N m2 — Tall i ret. de xapes d'acer perfor. en bigues diafrag., amb eq. de tall oxiacetilènic, càrreg. mecà

Tall i retirada de xapes d'acer perforades en bigues diafragma, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Amplada | Longitud | | |
| 2 | Estrems de via | | 4,000 | 2,000 | 0,250 | | 2,000 |

TOTAL AMIDAMENT 2,000

4 P214X-HCU3A m — Tall i retirada d'arriostrament inferior, amb equip de tall oxiacetilènic, càrreg. mecà.

Tall i retirada d'arriostrament inferior, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Longitud | | | |
| 2 | Arriostrament inferior | | 6,000 | 10,500 | | | 63,000 |

TOTAL AMIDAMENT 63,000

5 P214X-HCU3B m2 — Retirada de xapes d'acer inferior amb càrreg. mecà.

Retirada de xapes d'acer inferior, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | elemento | T | Ud | Longitud | Anchura | | |
| 2 | Xapes inferiors | | 10,000 | 13,700 | 0,290 | | 39,730 |

TOTAL AMIDAMENT 39,730

6 P214X-HCU3C m — Retirada de la biga contracarril, amb càrreg. mecà.

Retirada de la biga contracarril, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Longitud | | | |
| 2 | Biga contracarril | | 4,000 | 17,900 | | | 71,600 |

TOTAL AMIDAMENT 71,600

7 P214X-HCU3D m2 — Retirada del tramex trepitjable, amb càrrega mecànica

Retirada del tramex trepitjable, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Longitud | Amplada | | |

EUR

# AMIDAMENTS



| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | Tramex | 1,000 | 17,900 | 9,800 | | 175,420 |

TOTAL AMIDAMENT 175,420

Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 01 REPARACIÓ I CONSERVACIÓ D'ESTRUCTURA METÀL.LICA
Titol 3 02 REPARACIÓ

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | P447-DMDM | kg | Acer S275J0,perf.lam.L,LD,T,rodó,quad.,rectang.,treb.taller+antiox.,p/ref.elem.encast.recolz.r |

Acer S275J0 segons UNE-EN 10025-2, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat a taller i amb una capa d'imprimació antioxidant, per a reforç d'elements d'encastament, recolzament i rigiditzadors, col·locat a l'obra amb soldadura, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Perfils Laminats S275 | T | Longitud | (m/kg) | Ud | | |
| 2 | Arriostrament | | 10,452 | 26,400 | 6,000 | | 1.655,597 |
| 3 | L120x15 | | 8,600 | 26,600 | 4,000 | | 915,040 |
| 4 | L100x10 | | 8,600 | 15,000 | 2,000 | | 258,000 |

TOTAL AMIDAMENT 2.828,637

| | | | | |
|---|---|---|---|---|
| 2 | P448-DMDQ | m | Reparació de cordó de soldadura segons classe d'execyció exc3 de norma en-1090:2-2011, i |

Reparació de cordó de soldadura segons classe d'execució exc3 de norma en-1090:2-2011, incloent retirada de cordó de soldadura existent fins a deixar exposat metall base, preparació de vores d'acord amb el mètode i procés de soldadura, alineat i fixació de xapes, preescalfament de xapes segons EN-ISO-13916 I 1011-2, execució de soldadures segons l'especificació que s'estableixi de WPS, soldadura de filet en angle amb gruix no inferior al valor mínim de coll per a cada unió soldada, inclòs classificació residus, càrrega , transport i cànon d'abocament i manteniment de l'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en feines en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Longitud (m) | | | | |
| 2 | Reparació de soldadures | | 1,000 | | | | 1,000 |
| 3 | Previstos després d'inspecció | T | | | | | |
| 4 | | | 29,000 | | | | 29,000 |

TOTAL AMIDAMENT 30,000

| | | | |
|---|---|---|---|
| 3 | P448-DMDUA | kg | Reposició de perfils en L a bigues diafragma |

Reposició de perfils en costat tauler de bigues diafragma, incloent perfils L120x120x15 i Lx100x100x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants en L120x120x15, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | L120x14 = 25kg/m \|\| L100x10=15kg/m | T | Ud | m | kg/m | | |
| 2 | Perfil acer segons amidaments | | 2,000 | 8,600 | 40,000 | | 688,000 |

TOTAL AMIDAMENT 688,000



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# AMIDAMENTS



| | | | |
|---|---|---|---|
| 4 | P448-DMDUB | kg | Refuerzo de conexión viga diafragma-viga longitudinal |

Reforçament de connexió entre bigues diafragma i bigues longitudinals incloent, nova xapa de 15 mm de gruix en acer S355J0 segons UNE-EN 10025-2, soldadura a xapes existents i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud, | kg/Ud | | | |
| 2 | Reforç | | 8,000 | 12,010 | | | 96,080 |

TOTAL AMIDAMENT 96,080

| | | | |
|---|---|---|---|
| 5 | P448-DMDUN | kg | Reposició de xapa a l'ànima en biga diafragma |

Reposició de xapa en l' ànima de bigues diafragma incloent tall de xapa existent, nova xapa de 10mm de gruix en acer S275J0 segons UNE-EN 10025-2, soldadura a xapa existent i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud, | Longitud | Amplada | kg/m2 | |
| 2 | Xapa en l'ànima | | 4,000 | 0,250 | 2,000 | 78,500 | 157,000 |

TOTAL AMIDAMENT 157,000

| | | | |
|---|---|---|---|
| 6 | P448-DMDU1C | kg | Arriostramient inferior |

Substitució de arriostrament inferior, incloent perfils Lx90x90x10, xapes de conexió de 10 mm i reposició de fins a quatre xapes de connexió de 10 mm en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant i la part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | kg/m | m | | | |
| 2 | Acer S275J0 | | 27,600 | 63,000 | | | 1.738,800 |

TOTAL AMIDAMENT 1.738,800

| | | | |
|---|---|---|---|
| 7 | P448-DMDUD | kg | Reforç perfil de diagonal |

Reforçament de perfil de l' ànima fissurat amb xapes cargolades planes de 90x15 en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant per a reforç en forma de sandvitx i unida mitjançant cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants a la xapa nova, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | m | kg/m | Ud | Long, Reforç | |
| 2 | Acer S355J0 | | 0,135 | 7.850,000 | 0,020 | 2,400 | 50,868 |

TOTAL AMIDAMENT 50,868

| | | | |
|---|---|---|---|
| 8 | P448-DMDUE | kg | Reposició de xapa a l'inferior de bigues interiors |

Substitució del reforçament de bigues metàl·liques amb xapes planes de 230x20 mm en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant, soldadura a la xapa existent, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|

# AMIDAMENTS



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Sup,(m2) | Longitud (m) | Pes específic | |
| 2 | Acer S275 J0 | | 8,000 | 0,046 | 8,600 | 785,000 | 2.484,368 |

TOTAL AMIDAMENT 2.484,368

9 P448-DMDUF kg

## Reposición de chapa en el inferior de vigas diafragma

Substitució del reforçament de bigues metàl·liques amb xapes cargolades planes de 290x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, per a reforç de bigues, cargols M22 en qualitat 10.9, pretensats, tendresa i arandela, incloent execució dels trepants en la xapa nova, part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | kg/Ud, | | | |
| 2 | Acer S275 J0 | | 2,000 | 311,900 | | | 623,800 |

TOTAL AMIDAMENT 623,800

10 P214X-HCU3V m2

## Reposició del tamex trepitjable

Reposició del tramex, amb càrrega mecànica amb grua sobre camió, transport, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Longitud | Amplada | | |
| 2 | Tramex | | 1,000 | 17,900 | 9,800 | | 175,420 |

TOTAL AMIDAMENT 175,420

11 P448-DMD1N m

## Subministrament i muntatge de rodapeu d'acer galvanitzat

Subministrament i muntatge de rodapeu d'acer galvanitzat per inmersió format per perfil inferior tubular 60x60x4mm i xapa vertical continua de 400mm d'alçada i 6 mm de gruix, col·locats soldats i/o amb connectors a la relliga inclosos mitjans auxiliars i d'elevació necessaris per a la completa execució dels treballs.

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | m | | | |
| 2 | Rodapeu | | 2,000 | 17,300 | | | 34,600 |

TOTAL AMIDAMENT 34,600

Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 01 REPARACIÓ I CONSERVACIÓ D'ESTRUCTURA METÀL.LICA
Titol 3 03 CONSERVACIÓ

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | P8B2-G2EZ | m2 | Pint.est.acer st.pro,g.d=H,cl.exp.=C5-I/M,3capes,g=250µm,manual o pistola |

Pintat d'estructures d'acer amb sistemes de protecció amb grau de durabilitat H, per a classe d'exposició C5-I/M, segons UNE-EN ISO 12944-5, format per 3 capes, capa d'imprimació de, capa intermèdia de, i capa de acabat, amb un gruix total de protecció de 250 µm, aplicat de forma manual o amb pistola, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Gelosia principal | T | m2/m | Longitud (m) | Ud | | |
| 2 | Cordó superior | | 1,720 | 17,900 | 2,000 | | 61,576 |
| 3 | Cordó inferior | | 1,720 | 17,900 | 2,000 | | 61,576 |

EUR

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# AMIDAMENTS



| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | Diagonals-6 | | 0,860 | 2,400 | 8,000 | 16,512 |
| 5 | Diagonals-7 | | 0,740 | 2,400 | 20,000 | 35,520 |
| 6 | Diagonals-8 | | 0,740 | 2,400 | 4,000 | 7,104 |
| 7 | Diagonals-9 | | 0,740 | 2,400 | 4,000 | 7,104 |
| 8 | Muntants-3 | | 3,720 | 2,000 | 2,000 | 14,880 |
| 9 | Muntants-4 | | 1,580 | 2,000 | 16,000 | 50,560 |
| 10 | Muntants-5 | | 1,800 | 2,000 | 2,000 | 7,200 |
| 11 | Bigues tranversals | T | m2/m | Longitud (m) | Ud | |
| 12 | | | 2,640 | 7,880 | 10,000 | 208,032 |
| 13 | Travessers | T | m2/m | Longitud (m) | Ud | |
| 14 | | | 1,266 | 17,200 | 4,000 | 87,101 |
| 15 | Arriostraments | T | m2/m | Longitud (m) | Ud | |
| 16 | Contravent | | 0,280 | 3,440 | 18,000 | 17,338 |
| 17 | Contrafrenat | | 0,280 | 8,412 | 4,000 | 9,421 |
| 18 | Arriostrament | | 0,540 | 10,452 | 6,000 | 33,864 |
| 19 | Biga contracarril | T | m2/m | Longitud (m) | Ud | |
| 20 | | | 0,400 | 17,900 | 4,000 | 28,640 |
| 21 | Altres | T | m2/m | Longitud (m) | Ud | |
| 22 | Canalització de serveis | | 1,520 | 17,900 | 4,000 | 108,832 |
| 23 | Passadissos | | 0,340 | 17,900 | 8,000 | 48,688 |
| 24 | (5% percentatge no mesurat) | P | 5,000 | | | 40,197 |
| 25 | Subtotal "A origen" | O | | | | 844,145 |

TOTAL AMIDAMENT 844,145

2 P2Z6U00N m

## Rectificat de biga contracarril i instal·lació

Rectificat de biga contracarril i instal·lació, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | m | | | |
| 2 | Biga contracarril | | 4,000 | 17,900 | | | 71,600 |

TOTAL AMIDAMENT 71,600

3 P2Z6U00M Ud

## Manteniment d'aparells de suport

Manteniment d'aparells de recolzament, neteja i aplicació de greix, inclòs part proporcional de mitjans auxiliars, nocturnitat i
aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud, | | | | |
| 2 | Aparells de suport | | 4,000 | | | | 4,000 |

TOTAL AMIDAMENT 4,000

4 PGD1-E3BCN Ud

## Muntatge de posada a terra simple

Muntatge de posada a terra simple. Inclou el transport dels materials a la ubicació del muntatge, desplaçaments, maquinària, eines i mitjans auxiliars necessaris per al muntatge. Totalment muntat. Treball: Nocturn . Banda de manteniment: No necessita interval (sense tall de tensió). Condicions d'execució: volum escàs.

EUR

# AMIDAMENTS



| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | | | | |
| 2 | Estructura metàl.lica | | 1,000 | | | | 1,000 |

TOTAL AMIDAMENT 1,000

Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 02 REPARACIÓ I CONSERVACIÓ D'OBRA DE FÀBRICA
Titol 3 01 TREBALLS PREVIS

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | P874-4UBV | m2 | Neteja de parament formigó,raig.agua pres. de 60 hasta 200bar |

Neteja de parament de formigó, amb raig d'aigua a pressió, de 60-200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC, inclòs classificació residus, càrrega, transport i cànon d'abocament i manteniment de l'abocador

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Longitud | Amplada | m2 | |
| 2 | Mur guardabalast | | 2,000 | 7,500 | 1,000 | | 15,000 |
| 3 | Arrebossat en voltes | | 1,000 | | | 149,300 | 149,300 |

TOTAL AMIDAMENT 164,300

| | | | |
|---|---|---|---|
| 2 | K878V118 | m2 | Neteja parament pedra,raig aig.pres. 60-200bar |

Neteja de parament de pedra amb raig d'aigua a pressió, de 60 fins a 200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i
aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Superficie | | | | |
| 2 | Paraments de carreu | | 273,000 | | | | 273,000 |

TOTAL AMIDAMENT 273,000

Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 02 REPARACIÓ I CONSERVACIÓ D'OBRA DE FÀBRICA
Titol 3 02 REPARACIÓ

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | K877VB1H | m | Rejuntat de junts param.vert. obra fàbrica, junts reenfonsats, morter mixt 1:0,5:4,prèvi buidat |

Rejuntat de junts de parament vertical d'obra de fàbrica, deixant els junts reenfonsats, amb morter mixt 1:0,5:4, amb prèvi buidat i neteja del material dels junts, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Longitud (m) | | | | |
| 2 | Rejuntats entre carreus | | 5,000 | | | | 5,000 |
| 3 | Previstos després d'inspecció | T | | | | | |
| 4 | | | 10,000 | | | | 10,000 |

EUR

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# AMIDAMENTS



TOTAL AMIDAMENT 15,000

| | | | |
|---|---|---|---|
| 2 | P45R8-4UAW | dm3 | Rest.vol.form.,morter poliméric reparac. tixotròpica+retrac.control.,capa<= 4cm |

Restitució de volum en estructures de formigó amb morter polimèric de reparació tixotròpica i de retracció controlada, aplicat en capes de gruix <= 4 cm, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Longitud | Amplda | Gruix | |
| 2 | Estructures de formigó amb morter | | 1,000 | 7,500 | 1,000 | 0,100 | 0,750 |

TOTAL AMIDAMENT 0,750

| | | | |
|---|---|---|---|
| 3 | K4GRV531 | m | Rep.fissur.obra fca. pilastra pedra,repic.+sanej.elem.sol., segellat morter 1:2:10,càrr.man s/c |

Reparació de fissures en obra de fàbrica en pilastra de paret feta amb pedra, previ repicat i sanejament dels elements soltos, segellat amb morter mixt 1:2:10, càrrega manual de runa sobre contenidor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Injecció de resines | T | Longitud | | | | |
| 2 | Carreus d'estreps | | 4,000 | | | | 4,000 |

TOTAL AMIDAMENT 4,000

| | | | |
|---|---|---|---|
| 4 | P811-3FFLN | m2 | Arrebossat bona vista,horit.ext.,h>3m,morter mixt 1:2:10,remolinat |

Arrebossat a bona vista sobre parament horitzontal exterior, a més de 3,00 m d'alçària, amb morter mixt 1:2:10, remolinat, Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Reposició arrebossat en voltes | T | m2 | % | | | |
| 2 | | | 149,300 | 0,600 | | | 89,580 |
| 3 | Reparació arrebossat murs laterals | T | m2 | | | | |
| 4 | | | 20,000 | 0,600 | | | 12,000 |

TOTAL AMIDAMENT 101,580

| | | | |
|---|---|---|---|
| 5 | P4GR-HASM | m2 | Reintegració volums deteriorats elem.singular pedra form.geomètr.,empelt pedra nat.,dif.baixa |

Reintegració de volums deteriorats d'element singular de pedra treballada amb formes geomètriques, amb empelts de pedra natural. Grau de dificultat baix, amb la intervenció del conservador-restaurador. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Carreus de pedra trencats | T | Longitud | Alçada | Ud | | |
| 2 | Vanol d'aprox., costat Manresa | | 0,600 | 0,250 | 3,000 | | 0,450 |

TOTAL AMIDAMENT 0,450

| | | | |
|---|---|---|---|
| 6 | GD5AV009 | Ud | Desaigüe amb tubs ranurat de PVC de 90 mm de diàmetre, amb una profunditat mín. de 80c |

Desaigüe amb tubs ranurat de PVC de 90 mm de diàmetre, amb una profunditat mínima de 80cm i un vol de 20cm embolicat amb geotèxtil, la part vista amb camisa de PVC llis, executat amb sonda a rotació, inclós

EUR

sellegat d'embocadures i cassoletes de morter, tant en paraments de pedra com en paraments de formigó, acabats i executat amb medis auxililiars d'acces com bastides, plataformes tissora o camió-cistella, inclou la part proporcional d'execució de peninsula de terres a riu que sigui necessari segons directrius de la direcció d'obra i sota el vist-i-plau de l'ACA. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Drenatge reblert arcs | T | Ud | | | | |
| 2 | Vanol d'aprox, costat BCN | | 3,000 | | | | 3,000 |
| 3 | Vanol d'aprox. costat Manresa | | 3,000 | | | | 3,000 |

TOTAL AMIDAMENT 6,000

Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 02 REPARACIÓ I CONSERVACIÓ D'OBRA DE FÀBRICA
Titol 3 03 CONSERVACIÓ

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | P870-4UBBN | m2 | Consolidació elem.singular pedra nat.,consolid.silic.etil,pinzell tres capes |

Consolidació d'element singular de pedra natural, amb aplicació de consolidant de silicat d'etil, aplicat amb polvoritzador en tres capes. inclòs part proporcional de mitjans auxiliars requerits

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Longitud | Amplada | m2 | |
| 2 | Frontal | | 2,000 | 10,500 | 4,600 | | 96,600 |
| 3 | Lateral | | 2,000 | 8,000 | 5,400 | | 86,400 |
| 4 | Darrere | | 2,000 | | | 45,000 | 90,000 |

TOTAL AMIDAMENT 273,000

2 P89H-4V77 m2 Pintat vert. ext. ciment,pintura silicat,llis,1fons+2acab.

Pintat de parament vertical exterior de ciment, amb pintura al silicat amb acabat llis, amb una capa de fons i dues d'acabat, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | Arrebosat en voltes | T | m2 | | | | |
| 2 | | | 149,300 | | | | 149,300 |
| 3 | Arrebosament Murs laterals | T | m2 | | | | |
| 4 | | | 20,000 | | | | 20,000 |

TOTAL AMIDAMENT 169,300

3 P45R8-4UAW dm3 Rest.vol.form.,morter polimèric reparac. tixotròpica+retrac.control.,capa<= 4cm

Restitució de volum en estructures de formigó amb morter polimèric de reparació tixotròpica i de retracció controlada, aplicat en capes de gruix <= 4 cm, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC

| Num. | Text | Tipus | [C] | [D] | [E] | [F] | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 | | T | Ud | Longitud | Amplda | Gruix | |





| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | Reposició pedra, vanol aprox. costat BC | 1,000 | 4,000 | 3,000 | 1,500 | 18,000 |

TOTAL AMIDAMENT 18,000

Obra 01 PROJECTE DE REPARACIÓ 23B117PMAN-FGC
Capítol 03 PARTIDES ALÇADES

| NUM. | CODI | UA | DESCRIPCIÓ |
|---|---|---|---|
| 1 | PPAUUSS1 | PA | Partida alçada del pressupost de l'Annex de Seguretat i Salut |

Partida alçada del pressupost de l'Annex de Seguretat i Salut

AMIDAMENT DIRECTE 1,000

2 PPCIGRU1 PA Partida alçada a justificar de gestió de residus de construcció i demolició

Partida alçada a justificar de gestió de residus de construcció i demolició

AMIDAMENT DIRECTE 1,000

3 PPCIVD01 PA Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i des

Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i desviaments provisionals durant l'execució de les obres, segons indicació de la Direcció de l'Obra

AMIDAMENT DIRECTE 1,000

4 PPCIVCQ5 PA Partida alçada a justificar per a la inspecció especial i assajos

Partida alçada a justificar per a la realització de campanya d'inspecció especial i realització d'assajos a tot el pont, incloent inspecció visual d'unions soldades segons UNE 14044 i UNE-EN 13018, assaig mitjançant ultrasons segons UNE-EN ISO 23279 i UNE-EN ISO 17640 i la seva acceptació segons UNE-EN ISO 11666, assaig mitjançant partícules magnètiques i/o líquids penetrants segons UNE-EN ISO 17638 i UNE-EN ISO 3452-1 i la seva acceptació segons UNE-EN ISO 23277 i UNE-EN ISO 23278, assajos de mesurament de gruixos d'ala, ànimes, etc, assaigs en provetes d'acer (tracció, químic, impacte, micro, laminació, gruix d'oxidació, etc.), s'hi inclouen materials, maquinària d'elevació de carretera o d'àmbit de FGC d'obra especialista (fins i tot perfils específics de FGC), tall de tensió, monitoratge, il·luminació, aportació d'electricitat, en horari diürn o nocturn, tot segons la indicació de la Direcció de l'Obra.

AMIDAMENT DIRECTE 1,000

5 PPAUSAF1 PA Partida alçada a justificar segons actuacions necessàries i imprevisibles en fase de projecte.

Partida alçada a justificar segons actuacions necessàries i imprevisibles en fase de projecte.

AMIDAMENT DIRECTE 1,000

# ESTADÍSTICA DE PARTIDA

## ESTADÍSTICA DE PARTIDES



**Màscara: * (Ordenació per import)**

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT | % | %ACUM |
|---|---|---|---|---|---|---|---|---|
| 1 | P8B2-G2EZ | m2 | Pintat d'estructures d'acer amb sistemes de protecció amb grau de durabilitat H, per a classe d'exposició C5-I/M, segons UNE-EN ISO 12944-5, format per 3 capes, capa d'imprimació de, capa intermèdia de, i capa de acabat, amb un gruix total de protecció de 250 µm, aplicat de forma manual o amb pistola, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 27,49 | 844,145 | 23.205,55 | 13,13 | 13,13 |
| 2 | P875-4SAH | m2 | Limpieza y preparación de la superficie de perfiles laminados de acero hasta un grado de preparación St 3 según la norma UNE-EN ISO 8501-1, con medios manuales y carga manual de escombros sobre contenedor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 20,70 | 844,145 | 17.473,80 | 9,89 | 23,02 |
| 3 | P447-DMDM | kg | Acer S275J0 segons UNE-EN 10025-2, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat a taller i amb una capa d'imprimació antioxidant, per a reforç d'elements d'encastament, recolzament i rigiditzadors, col·locat a l'obra amb soldadura, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 5,65 | 2.828,637 | 15.981,80 | 9,04 | 32,06 |
| 4 | P448-DMDUE | kg | Substitució del reforçament de bigues metàl·liques amb xapes planes de 230x20 mm en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant, soldadura a la xapa existent, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 6,41 | 2.484,368 | 15.924,80 | 9,01 | 41,07 |
| 5 | PPAUSAF1 | PA | Partida alçada a justificar segons actuacions necessàries i imprevisibles en fase de projecte. | 15.000,00 | 1,000 | 15.000,00 | 8,49 | 49,56 |
| 6 | PPCIVD01 | PA | Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i desviaments provisionals durant l'execució de les obres, segons indicació de la Direcció de l'Obra | 11.417,57 | 1,000 | 11.417,57 | 6,46 | 56,02 |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## ESTADÍSTICA DE PARTIDES



**Màscara: * (Ordenació per import)**

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT | % | %ACUM |
|---|---|---|---|---|---|---|---|---|
| 7 | P448-DMDU1C | kg | Substitució de arriostrament inferior, incloent perfils Lx90x90x10, xapes de conexió de 10 mm i reposició de fins a quatre xapes de connexió de 10 mm en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant i la part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 6,37 | 1.738,800 | 11.076,16 | 6,27 | 62,28 |
| 8 | PPCIVCQ5 | PA | Partida alçada a justificar per a la realització de campanya d'inspecció especial i realització d'assajos a tot el pont, incloent inspecció visual d'unions soldades segons UNE 14044 i UNE-EN 13018, assaig mitjançant ultrasons segons UNE-EN ISO 23279 i UNE-EN ISO 17640 i la seva acceptació segons UNE-EN ISO 11666, assaig mitjançant partícules magnètiques i/o líquids penetrants segons UNE-EN ISO 17638 i UNE-EN ISO 3452-1 i la seva acceptació segons UNE-EN ISO 23277 i UNE-EN ISO 23278, assajos de mesurament de gruixos d'ala, ànimes, etc, assaigs en provetes d'acer (tracció, químic, impacte, micro, laminació, gruix d'oxidació, etc.), s'hi inclouen materials, maquinària d'elevació de carretera o d'àmbit de FGC d'obra especialista (fins i tot perfils específics de FGC), tall de tensió, monitoratge, il·luminació, aportació d'electricitat, en horari diürn o nocturn, tot segons la indicació de la Direcció de l'Obra. | 6.000,00 | 1,000 | 6.000,00 | 3,39 | 65,68 |
| 9 | PPAUUSS1 | PA | Partida alçada del pressupost de l'Annex de Seguretat i Salut | 5.998,40 | 1,000 | 5.998,40 | 3,39 | 69,07 |
| 10 | P214X-HCU3V | m2 | Reposició del tramex, amb càrrega mecànica amb grua sobre camió, transport, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 32,02 | 175,420 | 5.616,95 | 3,18 | 72,25 |

## ESTADÍSTICA DE PARTIDES



**Màscara: * (Ordenació per import)**

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT | % | %ACUM |
|---|---|---|---|---|---|---|---|---|
| 11 | P448-DMD1N | m | Subministrament i muntatge de rodapeu d'acer galvanitzat per inmersió format per perfil inferior tubular 60x60x4mm i xapa vertical continua de 400mm d'alçada i 6 mm de gruix, col·locats soldats i/o amb connectors a la relliga inclosos mitjans auxiliars i d'elevació necessaris per a la completa execució dels treballs. | 160,36 | 34,600 | 5.548,46 | 3,14 | 75,39 |
| 12 | P448-DMDUF | kg | Substitució del reforçament de bigues metàl·liques amb xapes cargolades planes de 290x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, per a reforç de bigues, cargols M22 en qualitat 10.9, pretensats, tendresa i arandela, incloent execució dels trepants en la xapa nova, part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 8,89 | 623,800 | 5.545,58 | 3,14 | 78,53 |
| 13 | P448-DMDUA | kg | Reposició de perfils en costat tauler de bigues diafragma, incloent perfils L120x120x15 i Lx100x100x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants en L120x120x15, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 7,40 | 688,000 | 5.091,20 | 2,88 | 81,41 |
| 14 | P870-4UBBN | m2 | Consolidació d'element singular de pedra natural, amb aplicació de consolidant de silicat d'etil, aplicat amb polvoritzador en tres capes. inclòs part proporcional de mitjans auxiliars requerits | 17,40 | 273,000 | 4.750,20 | 2,69 | 84,10 |
| 15 | P214X-HCU3D | m2 | Retirada del tramex trepitjable, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 21,69 | 175,420 | 3.804,86 | 2,15 | 86,25 |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## ESTADÍSTICA DE PARTIDES



**Màscara: * (Ordenació per import)**

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT | % | %ACUM |
|---|---|---|---|---|---|---|---|---|
| 16 | P811-3FFLN | m2 | Arrebossat a bona vista sobre parament horitzontal exterior, a més de 3,00 m d'alçària, amb morter mixt 1:2:10, remolinat, Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 36,99 | 101,580 | 3.757,44 | 2,13 | 88,38 |
| 17 | PPCIGRU1 | PA | Partida alçada a justificar de gestió de residus de construcció i demolició | 2.500,00 | 1,000 | 2.500,00 | 1,41 | 89,79 |
| 18 | P2Z6U00N | m | Rectificat de biga contracarril i instal·lació, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 33,81 | 71,600 | 2.420,80 | 1,37 | 91,16 |
| 19 | K878V118 | m2 | Neteja de parament de pedra amb raig d'aigua a pressió, de 60 fins a 200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 7,19 | 273,000 | 1.962,87 | 1,11 | 92,27 |
| 20 | P89H-4V77 | m2 | Pintat de parament vertical exterior de ciment, amb pintura al silicat amb acabat llis, amb una capa de fons i dues d'acabat, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 10,86 | 169,300 | 1.838,60 | 1,04 | 93,31 |
| 21 | P214X-HCU3C | m | Retirada de la biga contracarril, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 19,84 | 71,600 | 1.420,54 | 0,80 | 94,11 |
| 22 | P2Z6U00M | Ud | Manteniment d'aparells de recolzament, neteja i aplicació de greix, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 354,35 | 4,000 | 1.417,40 | 0,80 | 94,92 |
| 23 | P214X-HCU3A | m | Tall i retirada d'arriostrament inferior, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 20,89 | 63,000 | 1.316,07 | 0,74 | 95,66 |

## ESTADÍSTICA DE PARTIDES



**Màscara: * (Ordenació per import)**

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT | % | %ACUM |
|---|---|---|---|---|---|---|---|---|
| 24 | P874-4UBV | m2 | Neteja de parament de formigó, amb raig d'aigua a pressió, de 60-200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC, inclòs classificació residus, càrrega, transport i cànon d'abocament i manteniment de l'abocador | 6,79 | 164,300 | 1.115,60 | 0,63 | 96,29 |
| 25 | P448-DMDUN | kg | Reposició de xapa en l' ànima de bigues diafragma incloent tall de xapa existent, nova xapa de 10mm de gruix en acer S275J0 segons UNE-EN 10025-2, soldadura a xapa existent i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 6,40 | 157,000 | 1.004,80 | 0,57 | 96,86 |
| 26 | PGD1-E3BCN | Ud | Muntatge de posada a terra simple. Inclou el transport dels materials a la ubicació del muntatge, desplaçaments, maquinària, eines i mitjans auxiliars necessaris per al muntatge. Totalment muntat.<br><br>Treball: Nocturn .<br>Banda de manteniment: No necessita interval (sense tall de tensió).<br>Condicions d'execució: volum escàs. | 861,28 | 1,000 | 861,28 | 0,49 | 97,35 |
| 27 | P448-DMDQ | m | Reparació de cordó de soldadura segons classe d'execució exc3 de norma en-1090:2-2011, incloent retirada de cordó de soldadura existent fins a deixar exposat metall base, preparació de vores d'acord amb el mètode i procés de soldadura, alineat i fixació de xapes, preescalfament de xapes segons EN-ISO-13916 I 1011-2, execució de soldadures segons l'especificació que s'estableixi de WPS, soldadura de filet en angle amb gruix no inferior al valor mínim de coll per a cada unió soldada, inclòs classificació residus, càrrega , transport i cànon d'abocament i manteniment de l'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en feines en àmbit FGC | 28,69 | 30,000 | 860,70 | 0,49 | 97,83 |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## ESTADÍSTICA DE PARTIDES



**Màscara: * (Ordenació per import)**

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT | % | %ACUM |
|---|---|---|---|---|---|---|---|---|
| 28 | P214X-HCU3B | m2 | Retirada de xapes d'acer inferior, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 20,23 | 39,730 | 803,74 | 0,45 | 98,29 |
| 29 | GD5AV009 | Ud | Desaigüe amb tubs ranurat de PVC de 90 mm de diàmetre, amb una profunditat mínima de 80cm i un vol de 20cm embolicat amb geotèxtil, la part vista amb camisa de PVC llis, executat amb sonda a rotació, inclòs sellegat d'embocadures i cassoletes de morter, tant en paraments de pedra com en paraments de formigó, acabats i executat amb medis auxililiars d'acces com bastides, plataformes tissora o camió-cistella, inclou la part proporcional d'execució de peninsula de terres a riu que sigui necessari segons directrius de la direcció d'obra i sota el vist-i-plau de l'ACA. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 116,11 | 6,000 | 696,66 | 0,39 | 98,68 |
| 30 | P448-DMDUB | kg | Reforçament de connexió entre bigues diafragma i bigues longitudinals incloent, nova xapa de 15 mm de gruix en acer S355J0 segons UNE-EN 10025-2, soldadura a xapes existents i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 5,53 | 96,080 | 531,32 | 0,30 | 98,98 |
| 31 | P214X-HCU3X | m | Retirada de perfils angulars en bigues diafragma, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 13,37 | 34,400 | 459,93 | 0,26 | 99,24 |

## ESTADÍSTICA DE PARTIDES



**Màscara: * (Ordenació per import)**

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT | % | %ACUM |
|---|---|---|---|---|---|---|---|---|
| 32 | P448-DMDUD | kg | Reforçament de perfil de l' ànima fissurat amb xapes cargolades planes de 90x15 en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant per a reforç en forma de sandvitx i unida mitjançant cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants a la xapa nova, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 7,40 | 50,868 | 376,42 | 0,21 | 99,46 |
| 33 | P45R8-4UAW | dm3 | Restitució de volum en estructures de formigó amb morter polimèric de reparació tixotròpica i de retracció controlada, aplicat en capes de gruix <= 4 cm, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 18,68 | 18,750 | 350,25 | 0,20 | 99,66 |
| 34 | P4GR-HASM | m2 | Reintegració de volums deteriorats d'element singular de pedra treballada amb formes geomètriques, amb empelts de pedra natural. Grau de dificultat baix, amb la intervenció del conservador-restaurador. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 580,92 | 0,450 | 261,41 | 0,15 | 99,80 |
| 35 | K877VB1H | m | Rejuntat de juncts de parament vertical d'obra de fàbrica, deixant els junts reenfonsats, amb morter mixt 1:0,5:4, amb prèvi buidat i neteja del material dels junts, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 15,26 | 15,000 | 228,90 | 0,13 | 99,93 |
| 36 | K4GRV531 | m | Reparació de fissures en obra de fàbrica en pilastra de paret feta amb pedra, previ repicat i sanejament dels elements soltos, segellat amb morter mixt 1:2:10, càrrega manual de runa sobre contenidor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 18,65 | 4,000 | 74,60 | 0,04 | 99,98 |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

## ESTADÍSTICA DE PARTIDES



**Màscara: * (Ordenació per import)**

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT | % | %ACUM |
|---|---|---|---|---|---|---|---|---|
| 37 | P214X-HCU3N | m2 | Tall i retirada de xapes d'acer perforades en bigues diafragma, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 21,64 | 2,000 | 43,28 | 0,02 | 100,00 |
| | | | **TOTAL:** | | | **176.737,93** | **100,00** | |

# QUADRE DE PREUS NÚM. 1

# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|
| P-1 | GD5AV009 | Ud | Desaigüe amb tubs ranurat de PVC de 90 mm de diàmetre, amb una profunditat mín. de 80c<br>Desaigüe amb tubs ranurat de PVC de 90 mm de diàmetre, amb una profunditat mínima de 80cm i un vol de 20cm embolicat amb geotèxtil, la part vista amb camisa de PVC llis, executat amb sonda a rotació, inclós sellegat d'embocadures i cassoletes de morter, tant en paraments de pedra com en paraments de formigó, acabats i executat amb medis auxilliars d'acces com bastides, plataformes tissora o camió-cistella, inclou la part proporcional d'execució de peninsula de terres a riu que sigui necessari segons directrius de la direcció d'obra i sota el vist-i-plau de l'ACA. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(CENT SETZE EUROS AMB ONZE CÈNTIMS) | 116,11 € |
| P-2 | K4GRV531 | m | Rep.fissur.obra fca. pilastra pedra,repic.+sanej.elem.sol., segellat morter 1:2:10,càrr.man s/c<br>Reparació de fissures en obra de fàbrica en pilastra de paret feta amb pedra, previ repicat i sanejament dels elements soltos, segellat amb morter mixt 1:2:10, càrrega manual de runa sobre contenidor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(DIVUIT EUROS AMB SEIXANTA-CINC CÈNTIMS) | 18,65 € |
| P-3 | K877VB1H | m | Rejuntat de junts param.vert. obra fàbrica, junts reenfonsats, morter mixt 1:0,5:4,prèvi buidat<br>Rejuntat de junts de parament vertical d'obra de fàbrica, deixant els junts reenfonsats, amb morter mixt 1:0,5:4, amb prèvi buidat i neteja del material dels junts, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(QUINZE EUROS AMB VINT-I-SIS CÈNTIMS) | 15,26 € |
| P-4 | K878V118 | m2 | Neteja parament pedra,raig aig.pres. 60-200bar<br>Neteja de parament de pedra amb raig d'aigua a pressió, de 60 fins a 200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i<br>aportació de personal requerit en treballs en àmbit FGC<br>(SET EUROS AMB DINOU CÈNTIMS) | 7,19 € |
| P-5 | P214X-HCU3A | m | Tall i retirada d'arriostrament inferior, amb equip de tall oxiacetilènic, càrreg. mecà.<br>Tall i retirada d'arriostrament inferior, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.<br>(VINT EUROS AMB VUITANTA-NOU CÈNTIMS) | 20,89 € |
| P-6 | P214X-HCU3B | m2 | Retirada de xapes d'acer inferior amb càrreg. mecà.<br>Retirada de xapes d'acer inferior, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(VINT EUROS AMB VINT-I-TRES CÈNTIMS) | 20,23 € |
| P-7 | P214X-HCU3C | m | Retirada de la biga contracarril, amb càrreg. mecà.<br>Retirada de la biga contracarril, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.<br>(DINOU EUROS AMB VUITANTA-QUATRE CÈNTIMS) | 19,84 € |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|
| P-8 | P214X-HCU3D | m2 | Retirada del tramex trepitjable, amb càrrega mecànica<br>Retirada del tramex trepitjable, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC.<br>(VINT-I-UN EUROS AMB SEIXANTA-NOU CÈNTIMS) | 21,69 € |
| P-9 | P214X-HCU3N | m2 | Tall i ret. de xapes d'acer perfor. en bigues diafrag., amb eq. de tall oxiacetilènic, càrreg. me<br>Tall i retirada de xapes d'acer perforades en bigues diafragma, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(VINT-I-UN EUROS AMB SEIXANTA-QUATRE CÈNTIMS) | 21,64 € |
| P-10 | P214X-HCU3V | m2 | Reposició del tamex trepitjable<br>Reposició del tramex, amb càrrega mecànica amb grua sobre camió, transport, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(TRENTA-DOS EUROS AMB DOS CÈNTIMS) | 32,02 € |
| P-11 | P214X-HCU3X | m | Retirada de perfils angulars en bigues diafragma, amb càrreg. mecà.<br>Retirada de perfils angulars en bigues diafragma, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(TRETZE EUROS AMB TRENTA-SET CÈNTIMS) | 13,37 € |
| P-12 | P2Z6U00M | Ud | Manteniment d'aparells de suport<br>Manteniment d'aparells de recolzament, neteja i aplicació de greix, inclòs part proporcional de mitjans auxiliars, nocturnitat i<br>aportació de personal requerit en treballs en àmbit FGC<br>(TRES-CENTS CINQUANTA-QUATRE EUROS AMB TRENTA-CINC CÈNTIMS) | 354,35 € |
| P-13 | P2Z6U00N | m | Rectificat de biga contracarril i instal·lació<br>Rectificat de biga contracarril i instal·lació, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(TRENTA-TRES EUROS AMB VUITANTA-UN CÈNTIMS) | 33,81 € |
| P-14 | P447-DMDM | kg | Acer S275J0,perf.lam.L,LD,T,rodó,quad.,rectang.,treb.taller+antiox.,p/ref.elem.encast.recolz.<br>Acer S275J0 segons UNE-EN 10025-2, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat a taller i amb una capa d'imprimació antioxidant, per a reforç d'elements d'encastament, recolzament i rigiditzadors, col·locat a l'obra amb soldadura, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(CINC EUROS AMB SEIXANTA-CINC CÈNTIMS) | 5,65 € |
| P-15 | P448-DMDQ | m | Reparació de cordó de soldadura segons classe d'execyció exc3 de norma en-1090:2-2011,<br>Reparació de cordó de soldadura segons classe d'execució exc3 de norma en-1090:2-2011, incloent retirada de cordó de soldadura existent fins a deixar exposat metall base, preparació de vores d'acord amb el mètode i procés de soldadura, alineat i fixació de xapes, preescalfament de xapes segons EN-ISO-13916 I 1011-2, execució de soldadures segons l'especificació que s'estableixi de WPS, soldadura de filet en angle amb gruix no inferior al valor mínim de coll per a cada unió soldada, inclòs classificació residus, càrrega , transport i cànon d'abocament i manteniment de l'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en feines en àmbit FGC<br>(VINT-I-VUIT EUROS AMB SEIXANTA-NOU CÈNTIMS) | 28,69 € |

# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| P-16 | P448-DMD1N | m | Subministrament i muntatge de rodapeu d'acer galvanitzat | 160,36 | € |
| | | | Subministrament i muntatge de rodapeu d'acer galvanitzat per inmersió format per perfil inferior tubular 60x60x4mm i xapa vertical continua de 400mm d'alçada i 6 mm de gruix, col·locats soldats i/o amb connectors a la relliga inclosos mitjans auxiliars i d'elevació necessaris per a la completa execució dels treballs. | | |
| | | | (CENT SEIXANTA EUROS AMB TRENTA-SIS CÈNTIMS) | | |
| P-17 | P448-DMDUA | kg | Reposició de perfils en L a bigues diafragma | 7,40 | € |
| | | | Reposició de perfils en costat tauler de bigues diafragma, incloent perfils L120x120x15 i Lx100x100x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants en L120x120x15, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | | |
| | | | (SET EUROS AMB QUARANTA CÈNTIMS) | | |
| P-18 | P448-DMDUB | kg | Refuerzo de conexión viga diafragma-viga longitudinal | 5,53 | € |
| | | | Reforçament de connexió entre bigues diafragma i bigues longitudinals incloent, nova xapa de 15 mm de gruix en acer S355J0 segons UNE-EN 10025-2, soldadura a xapes existents i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | | |
| | | | (CINC EUROS AMB CINQUANTA-TRES CÈNTIMS) | | |
| P-19 | P448-DMDUD | kg | Reforç perfil de diagonal | 7,40 | € |
| | | | Reforçament de perfil de l' ànima fissurat amb xapes cargolades planes de 90x15 en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant per a reforç en forma de sandvitx i unida mitjançant cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants a la xapa nova, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | | |
| | | | (SET EUROS AMB QUARANTA CÈNTIMS) | | |
| P-20 | P448-DMDUE | kg | Reposició de xapa a l'inferior de bigues interiors | 6,41 | € |
| | | | Substitució del reforçament de bigues metàl·liques amb xapes planes de 230x20 mm en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant, soldadura a la xapa existent, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | | |
| | | | (SIS EUROS AMB QUARANTA-UN CÈNTIMS) | | |
| P-21 | P448-DMDUF | kg | Reposición de chapa en el inferior de vigas diafragma | 8,89 | € |
| | | | Substitució del reforçament de bigues metàl·liques amb xapes cargolades planes de 290x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, per a reforç de bigues, cargols M22 en qualitat 10.9, pretensats, tendresa i arandela, incloent execució dels trepants en la xapa nova, part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | | |
| | | | (VUIT EUROS AMB VUITANTA-NOU CÈNTIMS) | | |
| P-22 | P448-DMDUN | kg | Reposició de xapa a l'ànima en biga diafragma | 6,40 | € |
| | | | Reposició de xapa en l' ànima de bigues diafragma incloent tall de xapa existent, nova xapa de 10mm de gruix en acer S275J0 segons UNE-EN 10025-2, soldadura a xapa existent i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | | |
| | | | (SIS EUROS AMB QUARANTA CÈNTIMS) | | |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| P-23 | P448-DMDU1C | kg | Arriostramient inferior | 6,37 | € |
| | | | Substitució de arriostrament inferior, incloent perfils Lx90x90x10, xapes de conexió de 10 mm i reposició de fins a quatre xapes de connexió de 10 mm en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant i la part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | | |
| | | | (SIS EUROS AMB TRENTA-SET CÈNTIMS) | | |
| P-24 | P45R8-4UAW | dm3 | Rest.vol.form.,morter polimèric reparac. tixotròpica+retrac.control.,capa<= 4cm | 18,68 | € |
| | | | Restitució de volum en estructures de formigó amb morter polimèric de reparació tixotròpica i de retracció controlada, aplicat en capes de gruix <= 4 cm, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | | |
| | | | (DIVUIT EUROS AMB SEIXANTA-VUIT CÈNTIMS) | | |
| P-25 | P4GR-HASM | m2 | Reintegració volums deteriorats elem.singular pedra form.geomètr.,empelt pedra nat.,dif.baix | 580,92 | € |
| | | | Reintegració de volums deteriorats d'element singular de pedra treballada amb formes geomètriques, amb empelts de pedra natural. Grau de dificultat baix, amb la intervenció del conservador-restaurador. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | | |
| | | | (CINC-CENTS VUITANTA EUROS AMB NORANTA-DOS CÈNTIMS) | | |
| P-26 | P811-3FFLN | m2 | Arrebossat bona vista,horit.ext.,h>3m,morter mixt 1:2:10,remolinat | 36,99 | € |
| | | | Arrebossat a bona vista sobre parament horitzontal exterior, a més de 3,00 m d'alçària, amb morter mixt 1:2:10, remolinat, Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | | |
| | | | (TRENTA-SIS EUROS AMB NORANTA-NOU CÈNTIMS) | | |
| P-27 | P870-4UBBN | m2 | Consolidació elem.singular pedra nat.,consolid.silic.etil,pinzell tres capes | 17,40 | € |
| | | | Consolidació d'element singular de pedra natural, amb aplicació de consolidant de silicat d'etil, aplicat amb polvoritzador en tres capes. inclòs part proporcional de mitjans auxiliars requerits | | |
| | | | (DISSET EUROS AMB QUARANTA CÈNTIMS) | | |
| P-28 | P874-4UBV | m2 | Neteja de parament formigó,raig.agua pres. de 60 hasta 200bar | 6,79 | € |
| | | | Neteja de parament de formigó, amb raig d'aigua a pressió, de 60-200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC, inclòs classificació residus, càrrega, transport i cànon d'abocament i manteniment de l'abocador | | |
| | | | (SIS EUROS AMB SETANTA-NOU CÈNTIMS) | | |
| P-29 | P875-4SAH | m2 | Limp./prep.sup.perf.lam.acero,St 3,s/UNE-EN ISO 8501-1,medios manuales | 20,70 | € |
| | | | Limpieza y preparación de la superfície de perfiles laminados de acero hasta un grado de preparación St 3 según la norma UNE-EN ISO 8501-1, con medios manuales y carga manual de escombros sobre contenedor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | | |
| | | | (VINT EUROS AMB SETANTA CÈNTIMS) | | |
| P-30 | P89H-4V77 | m2 | Pintat vert. ext. ciment,pintura silicat,llis,1fons+2acab. | 10,86 | € |
| | | | Pintat de parament vertical exterior de ciment, amb pintura al silicat amb acabat llis, amb una capa de fons i dues d'acabat, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | | |
| | | | (DEU EUROS AMB VUITANTA-SIS CÈNTIMS) | | |

# QUADRE DE PREUS NÚMERO 1



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU |
|---|---|---|---|---|
| P-31 | P8B2-G2EZ | m2 | Pint.est.acer st.pro,g.d=H,cl.exp.=C5-I/M,3capes,g=250µm,manual o pistola | 27,49 € |
| | | | Pintat d'estructures d'acer amb sistemes de protecció amb grau de durabilitat H, per a classe d'exposició C5-I/M, segons UNE-EN ISO 12944-5, format per 3 capes, capa d'imprimació de, capa intermèdia de, i capa de acabat, amb un gruix total de protecció de 250 µm, aplicat de forma manual o amb pistola, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | |
| | | | (VINT-I-SET EUROS AMB QUARANTA-NOU CÈNTIMS) | |
| P-32 | PGD1-E3BCN | Ud | Muntatge de posada a terra simple | 861,28 € |
| | | | Muntatge de posada a terra simple. Inclou el transport dels materials a la ubicació del muntatge, desplaçaments, maquinària, eines i mitjans auxiliars necessaris per al muntatge. Totalment muntat. Treball: Nocturn . Banda de manteniment: No necessita interval (sense tall de tensió). Condicions d'execució: volum escàs. | |
| | | | (VUIT-CENTS SEIXANTA-UN EUROS AMB VINT-I-VUIT CÈNTIMS) | |
| P-33 | PPCIVD01 | PA | Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i de | 11.417,57 € |
| | | | Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i desviaments provisionals durant l'execució de les obres, segons indicació de la Direcció de l'Obra | |
| | | | (ONZE MIL QUATRE-CENTS DISSET EUROS AMB CINQUANTA-SET CÈNTIMS) | |

Barcelona, Març de 2024
L'enginyer autor del projecte

Fco. Javier Jordán Garcia
PEDELTA SL

# QUADRE DE PREUS NÚM. 2

# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| P-1 | GD5AV009 | Ud | Desaigüe amb tubs ranurat de PVC de 90 mm de diàmetre, amb una profunditat mínima de 80cm i un vol de 20cm embolicat amb geotèxtil, la part vista amb camisa de PVC llis, executat amb sonda a rotació, inclós sellegat d'embocadures i cassoletes de morter, tant en paraments de pedra com en paraments de formigó, acabats i executat amb medis auxiliars d'acces com bastides, plataformes tissora o camió-cistella, inclou la part proporcional d'execució de peninsula de terres a riu que sigui necessari segons directrius de la direcció d'obra i sota el vist-i-plau de l'ACA. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 116,11 | € |
| | B7JZ1010 | dm3 | Imprimació prèvia per a segellats de massilla de silicona neutra | 12,47000 | € |
| | B7J50060 | dm3 | Massilla per a segellats, d'aplicació amb pistola, de base polisulfurs bicomponent | 7,12500 | € |
| | B0111000 | m3 | Aigua | 1,56000 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 3,80160 | € |
| | B0714000 | kg | Morter sintètic epoxi de resines epoxi | 13,00000 | € |
| | | | Altres conceptes | 78,15340 | € |
| P-2 | K4GRV531 | m | Reparació de fissures en obra de fàbrica en pilastra de paret feta amb pedra, previ repicat i sanejament dels elements soltos, segellat amb morter mixt 1:2:10, càrrega manual de runa sobre contenidor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 18,65 | € |
| | | | Altres conceptes | 18,65000 | € |
| P-3 | K877VB1H | m | Rejuntat de junts de parament vertical d'obra de fàbrica, deixant els junts reenfonsats, amb morter mixt 1:0,5:4, amb prèvi buidat i neteja del material dels junts, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 15,26 | € |
| | | | Altres conceptes | 15,26000 | € |
| P-4 | K878V118 | m2 | Neteja de parament de pedra amb raig d'aigua a pressió, de 60 fins a 200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 7,19 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,23253 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,25238 | € |
| | B0111000 | m3 | Aigua | 0,93600 | € |
| | | | Altres conceptes | 5,76909 | € |
| P-5 | P214X-HCU | m | Tall i retirada d'arriostrament inferior, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 20,89 | € |
| | | | Altres conceptes | 20,89000 | € |
| P-6 | P214X-HCU | m2 | Retirada de xapes d'acer inferior, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 20,23 | € |
| | | | Altres conceptes | 20,23000 | € |
| P-7 | P214X-HCU | m | Retirada de la biga contracarril, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 19,84 | € |
| | | | Altres conceptes | 19,84000 | € |
| P-8 | P214X-HCU | m2 | Retirada del tramex trepitjable, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 21,69 | € |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| | | | Altres conceptes | 21,69000 | € |
| P-9 | P214X-HCU | m2 | Tall i retirada de xapes d'acer perforades en bigues diafragma, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 21,64 | € |
| | | | Altres conceptes | 21,64000 | € |
| P-10 | P214X-HCU | m2 | Reposició del tramex, amb càrrega mecànica amb grua sobre camió, transport, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 32,02 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,72108 | € |
| | B0111000 | m3 | Aigua | 0,12480 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,60192 | € |
| | | | Altres conceptes | 30,57220 | € |
| P-11 | P214X-HCU | m | Retirada de perfils angulars en bigues diafragma, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 13,37 | € |
| | | | Altres conceptes | 13,37000 | € |
| P-12 | P2Z6U00M | Ud | Manteniment d'aparells de recolzament, neteja i aplicació de greix, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 354,35 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 9,13334 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 9,62636 | € |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 2,91000 | € |
| | | | Altres conceptes | 332,68030 | € |
| P-13 | P2Z6U00N | m | Rectificat de biga contracarril i instal·lació, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 33,81 | € |
| | | | Altres conceptes | 33,81000 | € |
| P-14 | P447-DMD | kg | Acer S275J0 segons UNE-EN 10025-2, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat a taller i amb una capa d'imprimació antioxidant, per a reforç d'elements d'encastament, recolzament i rigiditzadors, col·locat a l'obra amb soldadura, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 5,65 | € |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 1,94000 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,15206 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,14422 | € |
| | | | Altres conceptes | 3,41372 | € |
| P-15 | P448-DMDQ | m | Reparació de cordó de soldadura segons classe d'execució exc3 de norma en-1090:2-2011, incloent retirada de cordó de soldadura existent fins a deixar exposat metall base, preparació de vores d'acord amb el mètode i procés de soldadura, alineat i fixació de xapes, preescalfament de xapes segons EN-ISO-13916 I 1011-2, execució de soldadures segons l'especificació que s'estableixi de WPS, soldadura de filet en angle amb gruix no inferior al valor mínim de coll per a cada unió soldada, inclòs classificació residus, càrrega , transport i | 28,69 | € |

# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| | | | cànon d'abocament i manteniment de l'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en feines en àmbit FGC | | |
| | | | Altres conceptes | 28,69000 | € |
| P-16 | P448-DMD1 | m | Subministrament i muntatge de rodapeu d'acer galvanitzat per inmersió format per perfil inferior tubular 60x60x4mm i xapa vertical continua de 400mm d'alçada i 6 mm de gruix, col·locats soldats i/o amb connectors a la relliga inclosos mitjans auxiliars i d'elevació necessaris per a la completa execució dels treballs. | 160,36 | € |
| | B44Z-0M0Y | kg | Acer S275JR segons UNE-EN 10025-2, format per peça simple, en perfils laminats en calent sèrie IPN, IPE, HEB, HEA, HEM i UPN, treballat al taller per a col·locar amb cargols i galvanitzat | 76,72000 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 4,36804 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 4,61489 | € |
| | | | Altres conceptes | 74,65707 | € |
| P-17 | P448-DMDU | kg | Reposició de perfils en costat tauler de bigues diafragma, incloent perfils L120x120x15 i Lx100x100x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants en L120x120x15, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 7,40 | € |
| | B0AP-07IU | u | Tornillos en calidad 10.9, pretensados, arandela y tuerca de acero, 130 mm de longitud | 0,64875 | € |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 2,03700 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,20275 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,18027 | € |
| | | | Altres conceptes | 4,33123 | € |
| P-18 | P448-DMDU | kg | Reforçament de connexió entre bigues diafragma i bigues longitudinals incloent, nova xapa de 15 mm de gruix en acer S355J0 segons UNE-EN 10025-2, soldadura a xapes existents i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 5,53 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,14422 | € |
| | B44Z-0M1P | kg | Acero S355J0 según UNE-EN 10025-2, formado por pieza simple, para refuerzo de elementos de empotramiento, apoyo y rigidizado, en perfiles laminados en caliente serie L, LD, T, redondo, cuadrado, rectangular y plancha, trabajado en el taller para colocar con soldadura y con una capa de imprimación antioxidante | 1,43850 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,15206 | € |
| | | | Altres conceptes | 3,79522 | € |
| P-19 | P448-DMDU | kg | Reforçament de perfil de l' ànima fissurat amb xapes cargolades planes de 90x15 en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant per a reforç en forma de sandvitx i unida mitjançant cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants a la xapa nova, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 7,40 | € |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 2,03700 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,20148 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,21632 | € |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
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# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| | B0AP-07IU | u | Tornillos en calidad 10.9, pretensados, arandela y tuerca de acero, 130 mm de longitud | 0,61207 | € |
| | | | Altres conceptes | 4,33313 | € |
| P-20 | P448-DMDU | kg | Substitució del reforçament de bigues metàl·liques amb xapes planes de 230x20 mm en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant, soldadura a la xapa existent, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 6,41 | € |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 2,03700 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,17424 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,18027 | € |
| | | | Altres conceptes | 4,01849 | € |
| P-21 | P448-DMDU | kg | Substitució del reforçament de bigues metàl·liques amb xapes cargolades planes de 290x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, per a reforç de bigues, cargols M22 en qualitat 10.9, pretensats, tendresa i arandela, incloent execució dels trepants en la xapa nova, part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 8,89 | € |
| | B0AP-07IU | u | Tornillos en calidad 10.9, pretensados, arandela y tuerca de acero, 130 mm de longitud | 1,66391 | € |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 2,03700 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,24204 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,25238 | € |
| | | | Altres conceptes | 4,69467 | € |
| P-22 | P448-DMDU | kg | Reposició de xapa en l' ànima de bigues diafragma incloent tall de xapa existent, nova xapa de 10mm de gruix en acer S275J0 segons UNE-EN 10025-2, soldadura a xapa existent i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 6,40 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,18027 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,17424 | € |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 2,03700 | € |
| | | | Altres conceptes | 4,00849 | € |
| P-23 | P448-DMDU | kg | Substitució de arriostrament inferior, incloent perfils Lx90x90x10, xapes de conexió de 10 mm i reposició de fins a quatre xapes de connexió de 10 mm en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant i la part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. | 6,37 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,17424 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,18027 | € |
| | B44Z-0LYG | kg | Acer S275J0 segons UNE-EN 10025-2, format per peça simple, per a reforç d'elements d'encastament, recolzament i rigiditzadors, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat al taller per a col·locar amb soldadura i amb una capa d'imprimació antioxidant | 2,03700 | € |
| | | | Altres conceptes | 3,97849 | € |

# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| P-24 | P45R8-4UA | dm3 | Restitució de volum en estructures de formigó amb morter polimèric de reparació tixotròpica i de retracció controlada, aplicat en capes de gruix <= 4 cm, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 18,68 | € |
| | B079-06TD | kg | Mortero polimérico de cemento con resinas epoxi para imprimación anticorrosiva y puente de unión | 12,65000 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,63360 | € |
| | | | Altres conceptes | 5,39640 | € |
| P-25 | P4GR-HAS | m2 | Reintegració de volums deteriorats d'element singular de pedra treballada amb formes geomètriques, amb empelts de pedra natural. Grau de dificultat baix, amb la intervenció del conservador-restaurador. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 580,92 | € |
| | B011-05MF | l | Aigua desionitzada no polaritzada | 6,51000 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 19,00800 | € |
| | B0G3-1GB4 | m3 | Pedra calcària/arenítica Vinaixa en blocs escollits, deixat de serra, per a dovelles, traceries, capitells i treballs escultòrics | 34,75200 | € |
| | | | Altres conceptes | 520,65000 | € |
| P-26 | P811-3FFL | m2 | Arrebossat a bona vista sobre parament horitzontal exterior, a més de 3,00 m d'alçària, amb morter mixt 1:2:10, remolinat, Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 36,99 | € |
| | | | Altres conceptes | 36,99000 | € |
| P-27 | P870-4UBB | m2 | Consolidació d'element singular de pedra natural, amb aplicació de consolidant de silicat d'etil, aplicat amb polvoritzador en tres capes. inclòs part proporcional de mitjans auxiliars requerits | 17,40 | € |
| | B8Z2-12Y5 | kg | Consolidant de silicat d'etil per a pedra natural | 7,55577 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,63360 | € |
| | | | Altres conceptes | 9,21063 | € |
| P-28 | P874-4UBV | m2 | Neteja de parament de formigó, amb raig d'aigua a pressió, de 60-200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC, inclòs classificació residus, càrrega, transport i cànon d'abocament i manteniment de l'abocador | 6,79 | € |
| | B0111000 | m3 | Aigua | 0,93600 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,22176 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,21632 | € |
| | | | Altres conceptes | 5,41592 | € |
| P-29 | P875-4SAH | m2 | Limpieza y preparación de la superfície de perfiles laminados de acero hasta un grado de preparación St 3 según la norma UNE-EN ISO 8501-1, con medios manuales y carga manual de escombros sobre contenedor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 20,70 | € |
| | | | Altres conceptes | 20,70000 | € |
| P-30 | P89H-4V77 | m2 | Pintat de parament vertical exterior de ciment, amb pintura al silicat amb acabat llis, amb una capa de fons i dues d'acabat, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 10,86 | € |
| | B015-16HS | l | Diluent de pintura mineral al silicat, per a interiors i exteriors | 0,94800 | € |

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# QUADRE DE PREUS NÚMERO 2



| NÚMERO | CODI | UA | DESCRIPCIÓ | PREU | |
|---|---|---|---|---|---|
| | B896-HYC4 | kg | Pintura al silicat, per a exteriors | 4,45893 | € |
| | B8ZH-358R | kg | Pintura de fons al silicat, per a exteriors | 1,93400 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,36749 | € |
| | | | Altres conceptes | 3,15158 | € |
| P-31 | P8B2-G2EZ | m2 | Pintat d'estructures d'acer amb sistemes de protecció amb grau de durabilitat H, per a classe d'exposició C5-I/M, segons UNE-EN ISO 12944-5, format per 3 capes, capa d'imprimació de, capa intermèdia de, i capa de acabat, amb un gruix total de protecció de 250 µm, aplicat de forma manual o amb pistola, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC | 27,49 | € |
| | B898-2MHY | l | Pintura de poliuretano bicomponente, para sistemas de protección de del acero | 1,29000 | € |
| | B898-2MHX | l | Pintura epoxi bicomponente, para sistemas de protección de del acero | 2,23500 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 0,76032 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 0,79318 | € |
| | | | Altres conceptes | 22,41150 | € |
| P-32 | PGD1-E3BC | Ud | Muntatge de posada a terra simple. Inclou el transport dels materials a la ubicació del muntatge, desplaçaments, maquinària, eines i mitjans auxiliars necessaris per al muntatge. Totalment muntat. Treball: Nocturn . Banda de manteniment: No necessita interval (sense tall de tensió). Condicions d'execució: volum escàs. | 861,28 | € |
| | BGYD-0B2W | u | Part proporcional d'elements especials per a piquetes de connexió a terra | 50,70000 | € |
| | BGD5-06SS | u | Piqueta de connexió a terra d'acer i recobriment de coure, de 2500 mm de llargària, de 18,3 mm de diàmetre, de 300 µm | 28,92000 | € |
| | P1MAO-MAN | h | Muntatge i desmuntatge de fases (ocupació carrils, tall transit) (3 fases) | 23,44320 | € |
| | P1MAO-MAN | u | Muntatge i desmuntatge de lones i mitjans (protecció i elevació) (3 fases) | 25,23766 | € |
| | | | Altres conceptes | 732,97914 | € |
| P-33 | PPCIVD01 | PA | Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i desviaments provisionals durant l'execució de les obres, segons indicació de la Direcció de l'Obra | 11.417,57 | € |
| | | | Sense descomposició | 11.417,57000 | € |

Barcelona, Març de 2024
L'enginyer autor del projecte

Fco. Javier Jordán Garcia
PEDELTA SL

# PRESSUPOST GENERAL

# PRESSUPOST



| | | |
|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC |
| Capítol | 01 | REPARACIÓ I CONSERVACIÓ D'ESTRUCTURA METÀL.LICA |
| Títol 3 | 01 | TREBALLS PREVIS |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | P875-4SAH | m2 | **Limp./prep.sup.perf.lam.acero,St 3,s/UNE-EN ISO 8501-1,medios manuales**<br>Limpieza y preparación de la superfície de perfiles laminados de acero hasta un grado de preparación St 3 según la norma UNE-EN ISO 8501-1, con medios manuales y carga manual de escombros sobre contenedor, inclòs part proporcional de mitjans auxiliars, nocturnitat i<br>aportació de personal requerit en treballs en àmbit FGC<br>(P - 29) | 20,70 | 844,145 | 17.473,80 |
| 2 | P214X-HCU3X | m | **Retirada de perfils angulars en bigues diafragma, amb càrreg. mecà.**<br>Retirada de perfils angulars en bigues diafragma, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 11) | 13,37 | 34,400 | 459,93 |
| 3 | P214X-HCU3N | m2 | **Tall i ret. de xapes d'acer perfor. en bigues diafrag., amb eq. de tall oxiacetilènic, càrreg. mecà.**<br>Tall i retirada de xapes d'acer perforades en bigues diafragma, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 9) | 21,64 | 2,000 | 43,28 |
| 4 | P214X-HCU3A | m | **Tall i retirada d'arriostrament inferior, amb equip de tall oxiacetilènic, càrreg. mecà.**<br>Tall i retirada d'arriostrament inferior, amb equip de tall oxiacetilènic, càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 5) | 20,89 | 63,000 | 1.316,07 |
| 5 | P214X-HCU3B | m2 | **Retirada de xapes d'acer inferior amb càrreg. mecà.**<br>Retirada de xapes d'acer inferior, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 6) | 20,23 | 39,730 | 803,74 |
| 6 | P214X-HCU3C | m | **Retirada de la biga contracarril, amb càrreg. mecà.**<br>Retirada de la biga contracarril, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 7) | 19,84 | 71,600 | 1.420,54 |
| 7 | P214X-HCU3D | m2 | **Retirada del tramex trepitjable, amb càrrega mecànica**<br>Retirada del tramex trepitjable, amb càrrega mecànica amb grua sobre camió o contenidor, transport i cànon d'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 8) | 21,69 | 175,420 | 3.804,86 |

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|---|---|---|---|
| **TOTAL** | **Títol 3** | **01.01.01** | **25.322,22** |

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|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC |
| Capítol | 01 | REPARACIÓ I CONSERVACIÓ D'ESTRUCTURA METÀL.LICA |
| Títol 3 | 02 | REPARACIÓ |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.



| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | P447-DMDM | kg | **Acer S275J0,perf.lam.L,LD,T,rodó,quad.,rectang.,treb.taller+antiox.,p/ref.elem.encast.recolz.rig.,co**<br>Acer S275J0 segons UNE-EN 10025-2, en perfils laminats en calent sèrie L, LD, T, rodó, quadrat, rectangular i planxa, treballat a taller i amb una capa d'imprimació antioxidant, per a reforç d'elements d'encastament, recolzament i rigiditzadors, col·locat a l'obra amb soldadura, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(P - 14) | 5,65 | 2.828,637 | 15.981,80 |
| 2 | P448-DMDQ | m | **Reparació de cordó de soldadura segons classe d'execució exc3 de norma en-1090:2-2011, inclo. retir.**<br>Reparació de cordó de soldadura segons classe d'execució exc3 de norma en-1090:2-2011, incloent retirada de cordó de soldadura existent fins a deixar exposat metall base, preparació de vores d'acord amb el mètode i procés de soldadura, alineat i fixació de xapes, preescalfament de xapes segons EN-ISO-13916 I 1011-2, execució de soldadures segons l'especificació que s'estableixi de WPS, soldadura de filet en angle amb gruix no inferior al valor mínim de coll per a cada unió soldada, inclòs classificació residus, càrrega , transport i cànon d'abocament i manteniment de l'abocador, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en feines en àmbit FGC (P - 15) | 28,69 | 30,000 | 860,70 |
| 3 | P448-DMDUA | kg | **Reposició de perfils en L a bigues diafragma**<br>Reposició de perfils en costat tauler de bigues diafragma, incloent perfils L120x120x15 i Lx100x100x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants en L120x120x15, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 17) | 7,40 | 688,000 | 5.091,20 |
| 4 | P448-DMDUB | kg | **Refuerzo de conexión viga diafragma-viga longitudinal**<br>Reforçament de connexió entre bigues diafragma i bigues longitudinals incloent, nova xapa de 15 mm de gruix en acer S355J0 segons UNE-EN 10025-2, soldadura a xapes existents i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 18) | 5,53 | 96,080 | 531,32 |
| 5 | P448-DMDUN | kg | **Reposició de xapa a l'ànima en biga diafragma**<br>Reposició de xapa en l' ànima de bigues diafragma incloent tall de xapa existent, nova xapa de 10mm de gruix en acer S275J0 segons UNE-EN 10025-2, soldadura a xapa existent i part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 22) | 6,40 | 157,000 | 1.004,80 |
| 6 | P448-DMDU1C | kg | **Arriostramient inferior**<br>Substitució de arriostrament inferior, incloent perfils Lx90x90x10, xapes de conexió de 10 mm i reposició de fins a quatre xapes de connexió de 10 mm en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant i la part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 23) | 6,37 | 1.738,800 | 11.076,16 |
| 7 | P448-DMDUD | kg | **Reforç perfil de diagonal**<br>Reforçament de perfil de l' ànima fissurat amb xapes cargolades planes de 90x15 en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant per a reforç en forma de sandvitx i unida mitjançant cargols M22 en qualitat 10.9, pretensats, tendra i arandela, incloent execució dels trepants a la xapa nova, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 19) | 7,40 | 50,868 | 376,42 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | P448-DMDUE | kg | **Reposició de xapa a l'inferior de bigues interiors**<br>Substitució del reforçament de bigues metàl·liques amb xapes planes de 230x20 mm en acer S355J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d' imprimació antioxidant, soldadura a la xapa existent, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC. (P - 20) | 6,41 | 2.484,368 | 15.924,80 |
| 9 | P448-DMDUF | kg | **Reposición de chapa en el inferior de vigas diafragma**<br>Substitució del reforçament de bigues metàl·liques amb xapes cargolades planes de 290x10 en acer S275J0 segons UNE-EN 10025-2 treballat en taller i amb una capa d'imprimació antioxidant, per a reforç de bigues, cargols M22 en qualitat 10.9, pretensats, tendresa i arandela, incloent execució dels trepants en la xapa nova, part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 21) | 8,89 | 623,800 | 5.545,58 |
| 10 | P214X-HCU3V | m2 | **Reposició del tamex trepitjable**<br>Reposició del tramex, amb càrrega mecànica amb grua sobre camió, transport, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 10) | 32,02 | 175,420 | 5.616,95 |
| 11 | P448-DMD1N | m | **Subministrament i muntatge de rodapeu d'acer galvanitzat**<br>Subministrament i muntatge de rodapeu d'acer galvanitzat per inmersió format per perfil inferior tubular 60x60x4mm i xapa vertical continua de 400mm d'alçada i 6 mm de gruix, col·locats soldats i/o amb connectors a la relliga inclosos mitjans auxiliars i d'elevació necessaris per a la completa execució dels treballs. (P - 16) | 160,36 | 34,600 | 5.548,46 |

**TOTAL Titol 3 01.01.02 67.558,19**

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|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC |
| Capítol | 01 | REPARACIÓ I CONSERVACIÓ D'ESTRUCTURA METÀL.LICA |
| Titol 3 | 03 | CONSERVACIÓ |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | P8B2-G2EZ | m2 | **Pint.est.acer st.pro,g.d=H,cl.exp.=C5-I/M,3capes,g=250µm,manual o pistola**<br>Pintat d'estructures d'acer amb sistemes de protecció amb grau de durabilitat H, per a classe d'exposició C5-I/M, segons UNE-EN ISO 12944-5, format per 3 capes, capa d'imprimació de, capa intermèdia de, i capa de acabat, amb un gruix total de protecció de 250 µm, aplicat de forma manual o amb pistola, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 31) | 27,49 | 844,145 | 23.205,55 |
| 2 | P2Z6U00N | m | **Rectificat de biga contracarril i instal·lació**<br>Rectificat de biga contracarril i instal·lació, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(P - 13) | 33,81 | 71,600 | 2.420,80 |
| 3 | P2Z6U00M | Ud | **Manteniment d'aparells de suport**<br>Manteniment d'aparells de recolzament, neteja i aplicació de greix, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(P - 12) | 354,35 | 4,000 | 1.417,40 |
| 4 | PGD1-E3BCN | Ud | **Muntatge de posada a terra simple**<br>Muntatge de posada a terra simple. Inclou el transport dels materials a la ubicació del muntatge, desplaçaments, maquinària, eines i mitjans auxiliars necessaris per al muntatge. Totalment muntat. Treball: Nocturn . Banda de manteniment: No necessita interval (sense tall de tensió). Condicions d'execució: volum escàs. (P - 32) | 861,28 | 1,000 | 861,28 |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.



**TOTAL Titol 3 01.01.03 27.905,03**

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|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC |
| Capítol | 02 | REPARACIÓ I CONSERVACIÓ D'OBRA DE FÀBRICA |
| Titol 3 | 01 | TREBALLS PREVIS |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | P874-4UBV | m2 | **Neteja de parament formigó,raig.agua pres. de 60 hasta 200bar**<br>Neteja de parament de formigó, amb raig d'aigua a pressió, de 60-200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC, inclòs classificació residus, càrrega, transport i cànon d'abocament i manteniment de l'abocador (P - 28) | 6,79 | 164,300 | 1.115,60 |
| 2 | K878V118 | m2 | **Neteja parament pedra,raig aig.pres. 60-200bar**<br>Neteja de parament de pedra amb raig d'aigua a pressió, de 60 fins a 200 bar, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(P - 4) | 7,19 | 273,000 | 1.962,87 |

**TOTAL Titol 3 01.02.01 3.078,47**

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|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC |
| Capítol | 02 | REPARACIÓ I CONSERVACIÓ D'OBRA DE FÀBRICA |
| Titol 3 | 02 | REPARACIÓ |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | K877VB1H | m | **Rejuntat de junts param.vert. obra fàbrica, junts reenfonsats, morter mixt 1:0,5:4,prèvi buidat m**<br>Rejuntat de junts de parament vertical d'obra de fàbrica, deixant els junts reenfonsats, amb morter mixt 1:0,5:4, amb prèvi buidat i neteja del material dels junts, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(P - 3) | 15,26 | 15,000 | 228,90 |
| 2 | P45R8-4UAW | dm3 | **Rest.vol.form.,morter polimèric reparac. tixotròpica+retrac.control.,capa<= 4cm**<br>Restitució de volum en estructures de formigó amb morter polimèric de reparació tixotròpica i de retracció controlada, aplicat en capes de gruix <= 4 cm, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 24) | 18,68 | 0,750 | 14,01 |
| 3 | K4GRV531 | m | **Rep.fissur.obra fca. pilastra pedra,repic.+sanej.elem.sol., segellat morter 1:2:10,càrr.man s/cont.**<br>Reparació de fissures en obra de fàbrica en pilastra de paret feta amb pedra, previ repicat i sanejament dels elements soltos, segellat amb morter mixt 1:2:10, càrrega manual de runa sobre contenidor, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(P - 2) | 18,65 | 4,000 | 74,60 |
| 4 | P811-3FFLN | m2 | **Arrebossat bona vista,horit.ext.,h>3m,morter mixt 1:2:10,remolinat**<br>Arrebossat a bona vista sobre parament horitzontal exterior, a més de 3,00 m d'alçària, amb morter mixt 1:2:10, remolinat, Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC<br>(P - 26) | 36,99 | 101,580 | 3.757,44 |

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|---|---|---|---|---|---|---|
| 5 | P4GR-HASM | m2 | **Reintegració volums deteriorats elem.singular pedra form.geomètr.,empelt pedra nat.,dif.baixa+conser**<br>Reintegració de volums deteriorats d'element singular de pedra treballada amb formes geomètriques, amb empelts de pedra natural. Grau de dificultat baix, amb la intervenció del conservador-restaurador. Inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 25) | 580,92 | 0,450 | 261,41 |
| 6 | GD5AV009 | Ud | **Desaigüe amb tubs ranurat de PVC de 90 mm de diàmetre, amb una profunditat mín. de 80cm i vol 20cm**<br>Desaigüe amb tubs ranurat de PVC de 90 mm de diàmetre, amb una profunditat mínima de 80cm i un vol de 20cm embolicat amb geotèxtil, la part vista amb camisa de PVC llis, executat amb sonda a rotació, inclós sellegat d'embocadures i cassoletes de morter, tant en paraments de pedra com en paraments de formigó, acabats i executat amb medis auxililiars d'acces com bastides, plataformes tissora o camió-cistella, inclou la part proporcional d'execució de peninsula de terres a riu que sigui necessari segons directrius de la direcció d'obra i sota el vist-i-plau de l'ACA. Inclòs part proporcional de mitjans auxiliars, nocturnitat i<br>aportació de personal requerit en treballs en àmbit FGC (P - 1) | 116,11 | 6,000 | 696,66 |

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| **TOTAL** | **Titol 3** | **01.02.02** | **5.033,02** |

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| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC |
| Capítol | 02 | REPARACIÓ I CONSERVACIÓ D'OBRA DE FÀBRICA |
| Titol 3 | 03 | CONSERVACIÓ |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | P870-4UBBN | m2 | **Consolidació elem.singular pedra nat.,consolid.silic.etil,pinzell tres capes**<br>Consolidació d'element singular de pedra natural, amb aplicació de consolidant de silicat d'etil, aplicat amb polvoritzador en tres capes. inclòs part proporcional de mitjans auxiliars requerits (P - 27) | 17,40 | 273,000 | 4.750,20 |
| 2 | P89H-4V77 | m2 | **Pintat vert. ext. ciment,pintura silicat,llis,1fons+2acab.**<br>Pintat de parament vertical exterior de ciment, amb pintura al silicat amb acabat llis, amb una capa de fons i dues d'acabat, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 30) | 10,86 | 169,300 | 1.838,60 |
| 3 | P45R8-4UAW | dm3 | **Rest.vol.form.,morter polimèric reparac. tixotròpica+retrac.control.,capa<= 4cm**<br>Restitució de volum en estructures de formigó amb morter polimèric de reparació tixotròpica i de retracció controlada, aplicat en capes de gruix <= 4 cm, inclòs part proporcional de mitjans auxiliars, nocturnitat i aportació de personal requerit en treballs en àmbit FGC (P - 24) | 18,68 | 18,000 | 336,24 |

| | | | |
|---|---|---|---|
| **TOTAL** | **Titol 3** | **01.02.03** | **6.925,04** |

| | | |
|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC |
| Capítol | 03 | PARTIDES ALÇADES |

| NUM. | CODI | UA | DESCRIPCIÓ | PREU | AMIDAMENT | IMPORT |
|---|---|---|---|---|---|---|
| 1 | PPAUUSS1 | PA | **Partida alçada del pressupost de l'Annex de Seguretat i Salut**<br>Partida alçada del pressupost de l'Annex de Seguretat i Salut (P - 0) | 5.998,40 | 1,000 | 5.998,40 |



Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.



| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | PPCIGRU1 | PA | **Partida alçada a justificar de gestió de residus de construcció i demolició**<br>Partida alçada a justificar de gestió de residus de construcció i demolició (P - 0) | 2.500,00 | 1,000 | 2.500,00 |
| 3 | PPCIVD01 | PA | **Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i desviame**<br>Partida alçada de cobrament integre per a la seguretat viària, senyalització, abalisament i desviaments provisionals durant l'execució de les obres, segons indicació de la Direcció de l'Obra (P - 33) | 11.417,57 | 1,000 | 11.417,57 |
| 4 | PPCIVCQ5 | PA | **Partida alçada a justificar per a la inspecció especial i assajos**<br>Partida alçada a justificar per a la realització de campanya d'inspecció especial i realització d'assajos a tot el pont, incloent inspecció visual d'unions soldades segons UNE 14044 i UNE-EN 13018, assaig mitjançant ultrasons segons UNE-EN ISO 23279 i UNE-EN ISO 17640 i la seva acceptació segons UNE-EN ISO 11666, assaig mitjançant partícules magnètiques i/o líquids penetrants segons UNE-EN ISO 17638 i UNE-EN ISO 3452-1 i la seva acceptació segons UNE-EN ISO 23277 i UNE-EN ISO 23278, assajos de mesurament de gruixos d'ala, ànimes, etc, assaigs en provetes d'acer (tracció, químic, impacte, micro, laminació, gruix d'oxidació, etc.), s'hi inclouen materials, maquinària d'elevació de carretera o d'àmbit de FGC d'obra especialista (fins i tot perfils específics de FGC), tall de tensió, monitoratge, il·luminació, aportació d'electricitat, en horari diürn o nocturn, tot segons la indicació de la Direcció de l'Obra. (P - 0) | 6.000,00 | 1,000 | 6.000,00 |
| 5 | PPAUSAF1 | PA | **Partida alçada a justificar segons actuacions necessàries i imprevisibles en fase de projecte.**<br>Partida alçada a justificar segons actuacions necessàries i imprevisibles en fase de projecte. (P - 0) | 15.000,00 | 1,000 | 15.000,00 |

| | | | |
|---|---|---|---|
| **TOTAL** | **Capítol** | **01.03** | **40.915,97** |

# RESUM DE PRESSUPOST

Redacció del projecte de reparació del pont metàl·lic sobre la carretera de Vic (Manresa)
Línia de Llobregat-Anoia de FGC.

# RESUM DE PRESSUPOST



| NIVELL 2 : Capítol | | | Import |
|---|---|---|---|
| Capítol | 01.01 | REPARACIÓ I CONSERVACIÓ D'ESTRUCTURA METÀL.LICA | 120.785,44 |
| Capítol | 01.02 | REPARACIÓ I CONSERVACIÓ D'OBRA DE FÀBRICA | 15.036,53 |
| Capítol | 01.03 | PARTIDES ALÇADES | 40.915,97 |
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC | 176.737,94 |
| | | | 176.737,94 |

| NIVELL 1 : Obra | | | Import |
|---|---|---|---|
| Obra | 01 | PROJECTE DE REPARACIÓ 23B117PMAN-FGC | 176.737,94 |
| | | | 176.737,94 |

**ÚLTIM FULL**

## PRESSUPOST D'EXECUCIÓ PER CONTRACTE



| | | |
|---|---|---|
| PRESSUPOST D'EXECUCIÓ MATERIAL..... | | 176.737,94 |
| 13 % DESPESES GENERALS SOBRE 176.737,94..... | | 22.975,93 |
| 6 % BENEFICI INDUSTRIAL SOBRE 176.737,94..... | | 10.604,28 |
| | **Subtotal** | 210.318,15 |
| 21 % IVA SOBRE 210.318,15..... | | 44.166,81 |
| **TOTAL PRESSUPOST PER CONTRACTE** | € | 254.484,96 |

Aquest pressupost d'execució per contracte puja a

( DOS-CENTS CINQUANTA-QUATRE MIL QUATRE-CENTS VUITANTA-QUATRE EUROS AMB NORANTA-SIS CÈNTIMS )

Barcelona, Març de 2024
L'enginyer autor del projecte

Fco. Javier Jordán Garcia
PEDELTA SL

COL·LEGI D'ENGINYERS DE CAMINS, CANALS I PORTS CATALUNYA

| Expedient | Data |
|---|---|
| 2024/01262/01 | 10/04/2024 |

V I S A T