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SHEET OF TECHNICAL PRESCRIPTIONS that must govern the contracting of the construction of the prototype of electrochemical water treatment system.

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- SECTION 1.- OBJECT

Construction of the prototype of electrochemical water treatment system

- SECTION 2.- TECHNICAL CHARACTERISTICS OF THE PROJECT

The prototype electrochemical system is skid-mounted and consists of 20 PVC cells, for 80x320 mm electrodes. The cells are equipped with stainless steel cathodes and empty anodic compartment (5 mm depth) to house metallic current feeders and graphene sponge electrodes, and a PVC spacer. The cells are designed to ensure a uniform distribution of the flow at the bottom of the reactor, and efficient evacuation of gas bubbles at the top, according to the drawings (Annex 1). The cells consist of a PVC anodic and cathodic base body, sandwiched using stainless steel screws and bolts, according to the drawings (Annex 1). The leakage from the cells is prevented using EPDM gaskets. The cell material, gaskets, tubing, and housing are all made from a material free from perfluorinated chemicals to avoid contamination, i.e., PVC and EPDM. The cells are grouped in four stacks of five cells to facilitate skid design and maintenance of the cells. The four stacks of cells can be operated in parallel, or in series (i.e., 2 x 2). If all the cells are operated in parallel, the maximum flowrate of the prototype is 2.88 m^3 per day. After the pump a T-piece is installed which gives the possibility to recirculate part of the influent to the IBC tank. On both the line going towards the candle filter as well as on the line back to the IBC tank, two ball valves are installed to regulate the recirculating flow. The media distribution system is designed in such a way to ensure equal distribution of the flow across the 20 cells.

The cells are operated in one pass, flow-through mode. The inlet tube connection is DN8. The influent media is drawn from IBC tanks (not included in the tender) using a flexible hose, provided with high- and low-level sensors (included in the tender) to protect the operation of the pump. The hose is equipped with a fine mesh to prevent the entrance of particulate matter into the system.

The skid has outer dimensions of approximately 900 x 1.000 x 1.300 mm. The cell stacks are installed on a compact frame, cells are easily accessible, and each cell can be pulled up individually for maintenance. The skid is made from stainless steel and equipped with wheels. The skid has a collecting tray (dimensions 1.200 x 1.650 mm) equipped with a leakage sensor. The skid is mounted with the four cell stacks (i.e., 20 cells in total) and a control cabinet for monitoring current, temperature, filling level, flow rate. The data can be downloaded via network. The data recording and visualization, and system control is achieved using a Siemens TIA V18 software. The software allows the application of direct current (in continuous mode or in an intermittent mode of application) or potential. The software allows frequency control of the main pump, and recording of the data of temperature sensors, flow meters, and leakage sensor. The software allows continuous updating without additional costs.

The cells are fed with current using a rectifier (e.g., DSC Electronic DP30-1HP, 30 V, 100 A) and

are connected in parallel allowing for a maximum of 5 A and 30 V per cell.

The media is fed to the prototype using a magnetic drive pump as the main pump. After the main pump, the tubing is equipped with a micro filtration candle filter that allows easy cleaning in case of obstruction. The first sampling point of the influent is placed after the candle filter. The flow through each of the four stacks is regulated by a flow meter (BAMO Bamomatic) placed before each stack. The flow is regulated using a ball valve installed after each flow meter. The prototype is equipped with four temperature sensors (PT100), i.e., one sensor after each cell stack. The temperature sensors and sampling points are installed after each cell stack before the manifolds that regulate the flow for the in parallel or in series operation of the stacks.

- SECTION 3.- DESCRIPTION OF THE TECHNICAL MATERIAL

Pilot plant with 20 graphene-based sponge cells, equipped with:

- Level sensor for IBC as feed and settling tank,
- Main pump (flow max. 120l/h; flow. min approx. 40l/h), with media distribution system with T-piece for recirculation, flow adjustable via ball valves on main line and recirculation line,
- Initial micro filtration with candle filter, sample point after filtration,
- 4 cells stacks: each equipped:
    - 5 Electrolysis cell, PVC, for electrodes 80 x 320 and a graphene-based sponge (height 5 mm) (ICRA-style) on anodic side with a PVC spacer; without anodes; Cathode: 80 x 320 mm, stainless steel; Anodic and cathodic base body, PVC, according to the drawings provided to ICRA via E-Mail (02.05.2023); Gasket set EPDM; Tube connection DN8, Sample point and Temperature sensor PT100 after each the cell stack.
- Media distribution to all cell stacks via a distribution system, one flow meter for each stack, flow adjustable via ball valve,
- Cells stacks installed on compact frame,
- Collecting tray with leakage sensor,
- Control cabinet for monitoring current, temperature, filling level, flow rate, software, and visualization,
- Rectifier

The prototype is designed for the operations of 4 stacks in parallel or for the operation of 2 x 2 stacks in series.

The date of delivery must be less than 8 months.

- SECTION 4.- SUPERVISION AND CONTROL

The prototype functioning and quality control will be verified by the bidder at the production site upon completion of the prototype in the presence of ICRA staff prior to the delivery to ICRA. This includes leakage tests, functioning of the electrical part (current application, functioning of sensors, pump, PLC and data storage). The delivery is under the responsibility of the bidder. Quality control of the final product will be done by the bidder in the presence of ICRA staff, and prior to the delivery.

- SECTION 5.- RESPONSABILITIES OF THE BIDDER

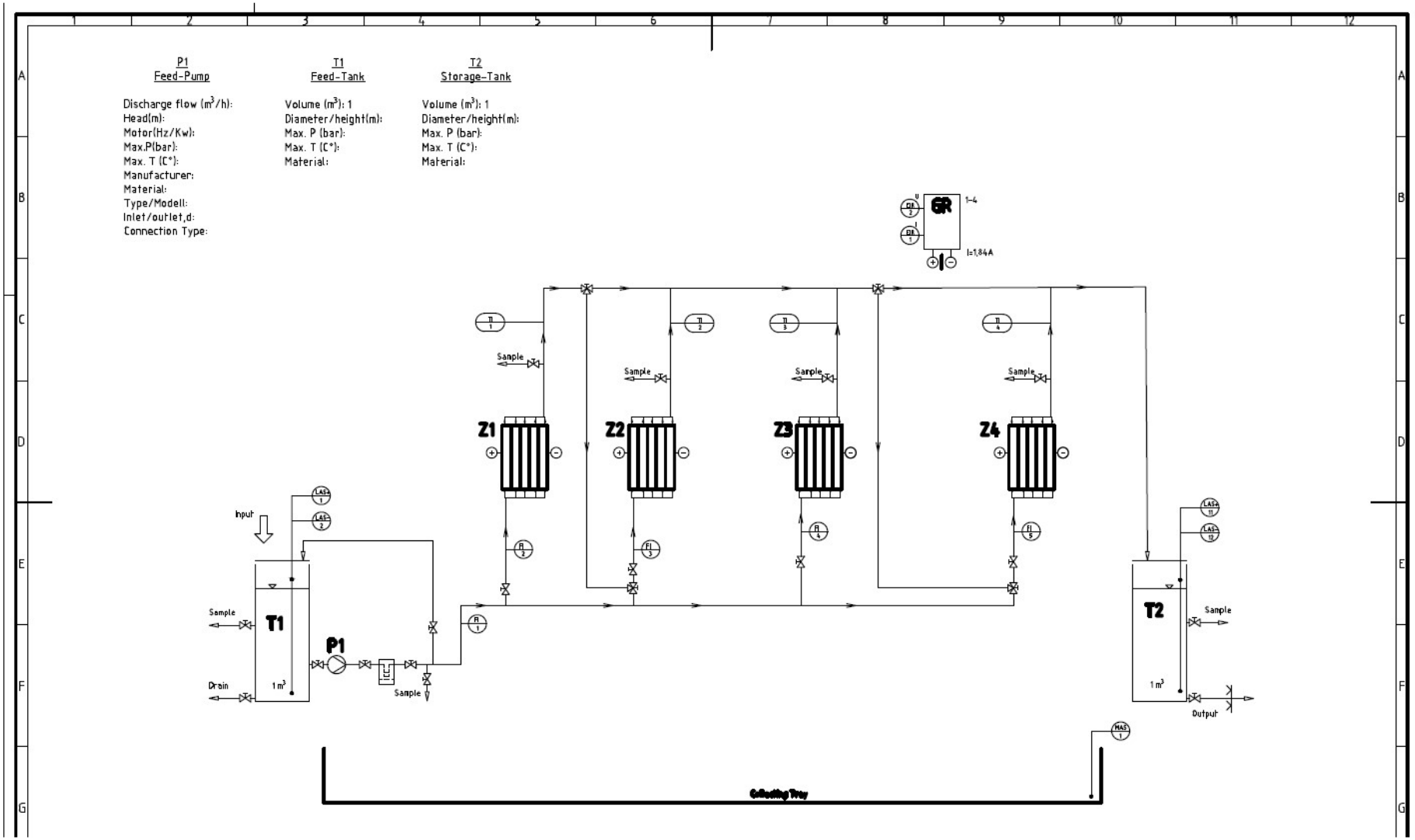
The bidder will assume the responsibility of the correct functioning of the prototype before its prepared to be delivered to ICRA. The supplier would have to pack correctly all the equipment to deliver it in perfect conditions. Any kind of material damage during the process of delivering will be assumed by the supplier.

The bidder will be responsible in case of any defect of production or functioning. Specifically, it will have to:

- Any products with manufacturing defects will be replaced by the bidder.
- Repair (if it is possible) the products that are damaged during the control phases.
- If any product is damaged during quality control and/or during transport cannot be repaired, the replacement pieces and the delivery costs will be assumed by the bidder.

APROBACIÓN DEL PLIEGO DE PRESCRIPCIONES TÉCNICAS
Órgano de contratación: Sr. Ivan Sanchez Tolosa

ANNEX 1 – Drawi



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