(1523)

Specification	Schedule of Technical Requirements for Discharge Free Bio-Toilet System for LHB/Conventional Coaches	MDTS 16298 REV-Nil PAGE 1 OF 9 Date: 07.11.16

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1. **PREAMBLE:**

1.1. IR-DRDO retention tank system containing anaerobic bacteria converts human fecal solid matter into inoffensive liquid & gases. The discharge liquid is to be circulated and used for flushing. This will make the bio-toilet system discharge free. The provisions shall be made for deodorization/fragrance in the re-circulate flushing water.

2. **ELIGIBILITY CRITERIA:**

2.1. Approved vendors of retention tank, mentioned in RCF vendor Directory, shall be eligible.
2.2. The tenderer must submit detailed clause-wise comments on the specification and specially mention about availability of in-house CNC laser cutting machine in working order or a valid tie-up in the form of MoU with the agency having CNC laser cutting machine in-house in working order. The availability of infrastructure has been mentioned in annexure-A. In absence of above, offers shall be deemed as incomplete and may not be considered.

3. **SCOPE OF SUPPLY:**

3.1. Retention tank with accessories as per drawing indicated in the tender description.
3.2. Lavatory pan with provision of nozzles/ring through which pressurized flushing water will be spread on the surface of the pan (Oriental or Western style depending upon the type of lavatory).
3.3. Equipment for circulating the water from the discharge point to the pan along with its accessories (such as pump, piping, cables, switch etc.). This arrangement can be assisted pneumatically or electrically or by both. 110V DC and 6 bar pneumatic pressure will be available in case of conventional coaches. 110V AC and 6 bar pneumatic pressure will be available in case of LHB coaches. Any other voltage rating required for operation shall be derived by the firm from these and will be in firm's scope.
3.4. Supply, Installation and commissioning will be in the scope of tenderer.

4. **TECHNICAL REQUIREMENTS**

4.1. For selection of material & electrode and manufacturing process firm should follow the guidelines mentioned in annexure-B along with flow chart.
4.2. All components and sub-assemblies will be manufactured to a standard for high level of ruggedness, corrosion resistance, and reliability and long-life. There should be no maintenance requirement like painting, lubrication, oiling, periodic tightening of fasteners etc. All fasteners should be of locking type and should not get loose due to coach vibration. If due to any technical/commercial reason, a component/part or sub-assembly does not meet these requirements, it should be clearly spelt out in the offer and the maintenance requirements shall be furnished. However if any choking or mal function occurs due to any unforeseen reason, tenderer will rectify it under warranty with proper tools and equipments to ensure cleanliness and hygiene in the depot.
4.3. The tenderer must have adequate plant and manufacturing capacity to manufacture and supply the tank system being offered to IR within the delivery schedule. Tenderer should have supplied these types of tanks or similar fabrication items.

4.4. The tenderer should have established quality control system and organization to ensure quality of the product and should be an ISO 9000 certified company or should have an internationally certified quality control system.

4.5. The tenderer should have adequate financial stability and status to meet the obligations under the contract and should submit a report from a recognized bank or a financial institution. The tenderer should also submit a copy of his company's annual report of last three years.

5. OPERATING CONDITIONS

5.1. Ambient Conditions:

-4^0C to 55^0C with 100% humidity and dust. Retention tank system should not get damaged in these conditions. Quality of manufacturer should be excellent. Temperature variations can be quite high in the same journey or short period of time. Most coaches are based in coastal cities, with continued exposure to salt laden air.

5.2. Car-body dynamics and forces on retention tank system:

±100 mm vertically
±55 mm laterally
±10 mm longitudinally
$\pm 4^0$ bogie rotation about centre pivot
Maximum Speed of train - 130 KMPH.
Fitment installation and commissioning with two security ropes of SS should be done to ensure safety along with positive mounting.

6. MARKING

6.1. Notice "Jointly developed by IR and DRDO" and traceability plate of stainless steel either engraved or punched shall be welded on suitable visible location of retention tank as indicated in drawing, describing; Firm's name, Year of manufacture and manufactured by In-house CNC laser cutting machine or from outside agency.

6.2. Notices for users and maintenance personnel will be in the scope of tenderer. This will be supplied and fixed in the coach, as decided between the tenderer and IR in three languages. Quantity in numbers will be the same as the firm has order for IR-DRDO retention tank.

7. TESTING AND APPROVAL OF PROTOTYPE

7.1. Tenderer must submit and get approval of Quality Assurance Plan and drawing of water re-circulating arrangement from CDE/RCF before taking up prototype manufacture.

7.2. One prototype of each variant shall be inspected at firm premises on test stand by CDE/RCF. After inspection at firm premises on test stand same prototype will be fitted on coach for fitment approval before bulk supply. Supplier has to incorporate any changes noticed during the inspection without any additional cost. Bulk manufacturing will be commenced only after clearance of prototype by CDE/RCF.

7.3. Test certificates to be submitted by the manufacturer for raw material and testing of all critical components/assemblies.

7.4. If supplier upgrades any component/sub-system on this equipment, he shall get it approved by RCF before its implementation.

8. WARRANTY

Tenderer shall ensure warranty for 36 months from the date of supply or 30 months from fitment, whichever is earlier. During warranty, the tenderer shall rectify the equipment by replacing or repairing components at his cost. The warranty period would get extended on a pro-rata basis if warranty replacement/repairs is not provided within 5 days of notice. If tenderer fails to provide warranty in 5 days of notice, Railway reserves the right to cancel balance contract.

Annexure-A

Infrastructure Requirements

1. Separate covered area for manufacturing of stainless steel components to avoid iron contaminations and also having adequate space underneath for storage of raw materials. The covered area should have display board showing different colour shades nominated to different grades of steel to avoid mix up of materials.
2. Either at least one CNC laser profile cutting machine in working order in-house.

   OR

   Should have a valid tie-up in the form of MoU with the agency, having in-house CNC laser cutting machine in working order, for cutting components of bio-digesters. A copy of MoU to be submitted along with the tender. During inspection of material, the firm should be able to submit documentary evidence in form of challan, invoice, transport bill etc, in support of having cut the components from CNC profile laser cutting machine from outside agency. Railway or inspecting agency on behalf of railways may visit/verify the availability and use of laser cut machine with tied up agency.
3. Adequate drilling facilities of suitable capacities and standard make should be available.
4. The firm shall have at least one press brake of suitable capacity along-with punch and dies for component forming.
5. Only TIG welding with Argon shielding gas should be used for fabrication of tanks. For this minimum two TIG welding plants should be available with the tenderer.
6. Adequate Nos. of hand grinders for removal of fins & burrs shall be available.
7. Handling equipments such as slings, hooks and lift truck forks should be protected with clean wood, cloth or plastic buffers to reduce contact with the iron surface.
8. Proof of procurement of raw material from reputed stainless steel manufacturer and their test certificate shall be enclosed by inspection agency along-with the inspection certificate.
9. The raw materials e.g. electrodes and hardware should be procured from the authorized distributor of original manufacturer and firm should procure material with test certificate.
10. The welder shall have adequate experience of the same type of welding.
11. The fabricator shall have adequate fabrication and process capability to obtain all the tolerances and geometrical tolerances and shall have arrangement of jig/fixture/clamping device for main assembly & sub-assembly work.
12. The firm should have the immersion tanks with FRP lining for acid cleaning, neutralization and water rinsing.
13. **Testing Facilities:**
    a. Chemical Lab: The firm shall be ready for carrying out spectrographic analysis of the material from NABL certified Lab at their own expense as and when required.

    b. Physical Testing Lab: The firm shall be ready for carrying out testing for UTS, Yield strength from NABL certified Lab at their own expense as and when required.

    c. Other Testing Facilities: The firm shall possess the following:
       i. The firm shall have suitable arrangement in house for testing the leakage's etc.
       ii. The firm shall have adequate facilities for preparation of test sample. Facilities like machining, grinding, polishing etc. should be available in house.
       iii. Adequate number of fine punches for stamping marking particulars on finished components.
       iv. Adequate numbers of measuring instruments such as:
       v. Digital Vernier Calipers - 0 mm to 300 mm.
       vi. Inside & outside Micrometers - Ranging from 0 to 150 mm
       vii. GO & NO-GO gauges.
       viii. Profile gauges

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Annexure-B

1) Guidelines for selection of material and welding consumables:

a) **Stainless steel sheets:** Selection of Stainless steel sheets for manufacture of Stainless steel IR-DRDO retention tank must be according to the drawings. The state of material, condition, finish etc. should be as per following guidelines:

Heat treatment condition	The material must be cold rolled skin Passed, solution annealed and de-scaled
Finish	2B
Material grade and Designation	As per drawing provided with tender
Protection procedure	The SS sheets must be protected with LDPE film of 90±10 µms thickness

i) The steel sheets shall be cleanly rolled to the dimensions, weights and tolerances specified. These shall be free from cracks, surface flaws, laminations, rough, jagged and imperfect edges, unevenness and other harmful defects detrimental to the end use.

ii) Supplier must ensure above information on the WTC obtained from SS sheet supplier prior to purchase of the material for IR-DRDO retention tank manufacturing. The inspection agency should also ensure above details on material WTC.

b) **Welding consumables:**

i) All the joints shall be TIG welded by a filler rod confirming to table given below:

Parent metal A	Parent metal B	Filler metal (material no. as specified in DIN8556
X04Cr17Ni12Mo2Ti to IS: 6911-92, Equivalent to AISI: 316Ti, AISI 316, and AISI 316L.	X04Cr17Ni12Mo2Ti to IS: 6911-92, Equivalent to AISI: 316Ti, AISI 304 and AISI 316L.	**SG 1.4430**
X04Cr19Ni19 to IS: 6911-92 Equivalent to AISI 304	X04Cr19Ni19 to IS: 6911-92 Equivalent to AISI 304	**SG 1.4316**

ii) Acceptance standards for welds shall be as per EN25817-1992 TIG welding intermediate(C).

iii) Argon gas: Gr.1 of IS: 5760-1983.

iv) Grinding wheels shall be free from iron, iron oxide, zinc or other undesirable materials that may cause contamination on the surface.

2) **Recommended practice for welding, cleaning and passivation processes:**

i) **Welding process:**

Welding process to be used is DC TIG welding in pulsing mode with digital TIG welding machine only.

Annexure-B

ii) **Cleaning and Passivation:**

(a) Surface contaminants such as free iron, oxide scale, rust, grease, oil, carbonaceous or other residual chemical films, soil, particles, metal chips, dirt or other nonvolatile deposits might adversely affect the metallurgical or sanitary condition or stability of a surface. These may impair the normal corrosion resistance or result in later contamination of the stainless steel or cause product contamination at a later stage and should be cleaned and de-scaled.

(b) Remove all solid floating particles steel chipping, filing, dust, welding slag before start of the acid cleaning process.

(c) Acid Cleaning: Nitric-Hydrofluoric acid solution is to be used to remove both metallic contamination and welding and heat treating scales.

(d) Surface to be de-scaled are to be pre-cleaned prior to chemical treatment. The component/assembly should be totally immersed in the pickling solution. The surface should be in contact with the immersion solution until inspection shows that complete scale removal has been accomplished

(e) Rinse the assembly thoroughly with water. Over pickling must be avoided.

(f) A neutralizing treatment, after completion of acid cleaning and passivation, by using aqueous caustic solution containing NaOH 10% by weight for a period of 5-60 minutes should be used as a final dip to remove smut. After that thorough water rinsing and drying operation is to be carried out. The pH of the rising water shall be from 6-8

(g) **NOTE:**The process of acid cleaning, water rinsing, neutralization treatment, final fresh water rinsing must be done in sequence without giving any waiting time between the processes to avoid staining on the surface.

(h) Free iron examination test (Ferroxyl test) should be carried out immediately after acid pickling and neutralization treatment to confirm that there is no free iron available on the surface. In case of positive test for free iron the whole process of acid pickling neutralization and water rinse should be repeated.

iii) **Solutions in water are as follows:**

For acid cleaning:

Conc. HF4	6% by volume
Conc. HNO3	15-20% by volume.
Immersion Time	10-15 Minutes (max.)
Temperature	30-40 ºC (When temp. is low exposure time may be increased)

For neutralizing treatment:

NaOH	10% by weight

For ferroxyl test solution;

Distilled water	01 liter
Nitric acid (Conc.)	20 ml
Potassium Ferricynide	30g

Annexure-B

Note: Tanks for acid cleaning, neutralizing treatment and water rinsing should be made of stainless steel plates with FRP lining.

3) **Handling, Storage and Transportation**

b) Walking on the stainless steel surface should be avoided, where unavoidable, personal should wear clean shoe covers each time. Kraft paper, blotting paper, paper board or flannel or other protective material should be laid over areas where personals are required to walk. Supplier needs to make all these arrangements.

c) Shearing tables, press brakes, layout stand and other carbon steel work surfaces should be covered with clean kraft paper, blotting paper, paper board or flannel or other protective material to reduce the contact with carbon steel.

d) Hand tools, brushes, molding tools and other tools and supplies required for fabrication should be segregated from similar items used in the fabrication of carbon steel equipment and should be restricted to use on one material. Tools and supplies used with other materials should not be brought into the SS fabrication area.

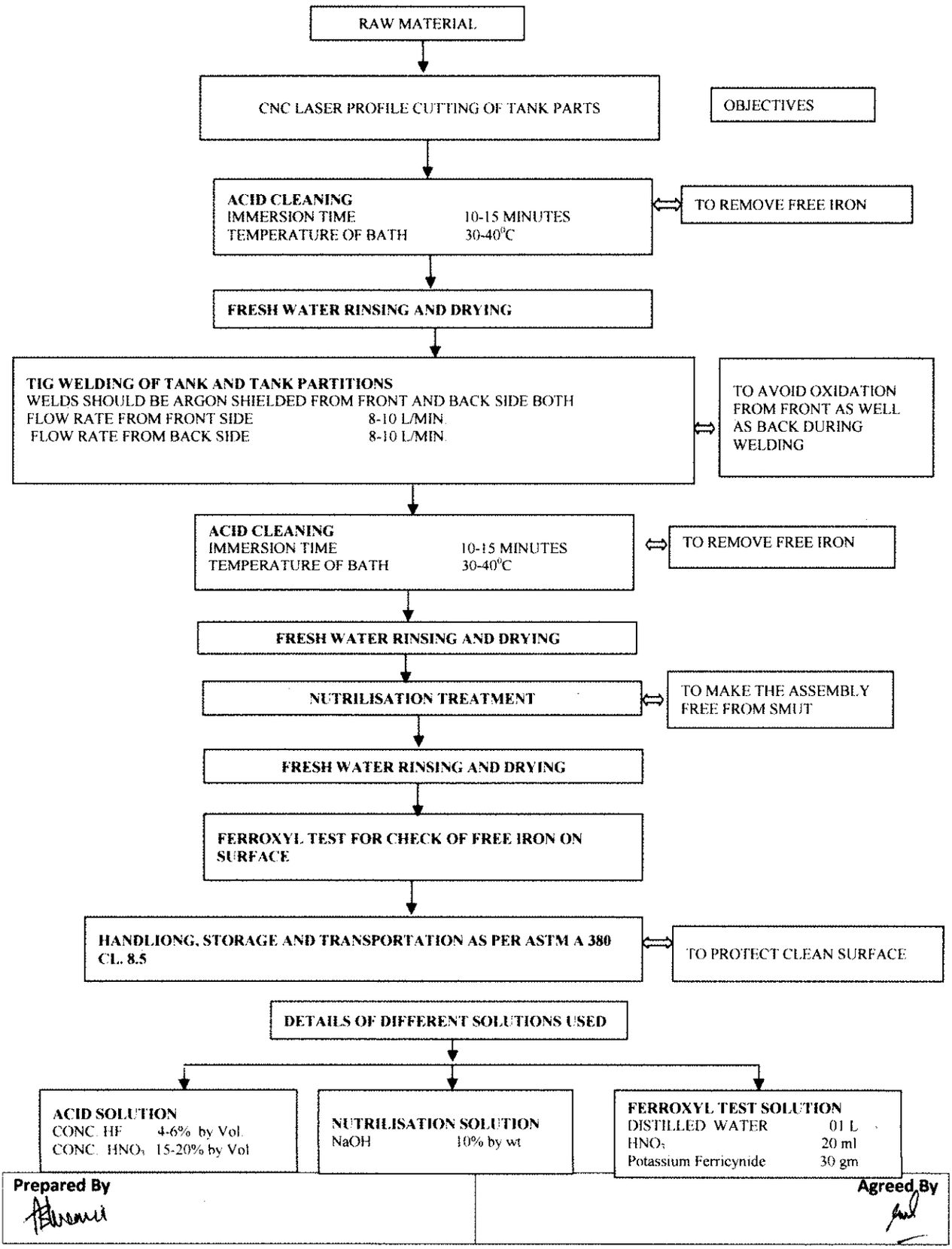
e) Grinding wheels and sanding material should not contain iron, iron oxide, zinc or other undesirable materials that may cause contamination on the surface. Grinding wheels and sanding material and wire brushes previously used on other metals should not be used on stainless steel. Wire brushes should of stainless steel which is equal in corrosion resistance to the material being worked on.

f) Measures to protect the cleaned surfaces should be taken as soon as final cleaning is completed and should be maintained during all subsequent fabrication, inspection, storage and installation. The basic guidelines are as follows:

g) Do not remove wrappings and seals from incoming materials that is IR-DRDO retention tanks until they are at use site, ready to be used or installed.

h) Do not store the finished cleaned materials and components stored directly on the ground or floor and do not permit these to come in contact with galvanized or carbon steels, Zinc, lead Brass etc.

i) Do not use carbon or galvanized steel wire for bundling and galvanized steel identification tags.



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