



सत्यमेव जयते

**Government of India
Bhabha Atomic Research Centre
Technology Development Division**

NRG/TDD/ELCELL/02/2017/165245

20/09/2017

To,

TENDER No.: NRG/TDD/RSWF/02/2017/165245

Sub: Procurement of material & Bought out items, Fabrication, Shop Assembly, Testing and supply of Electrolytic Cell consisting of Teflon Vessel and Titanium electrodes with platinum coating as per technical specifications and tender drawing.

Dear Sir,

In connection with the above mentioned work the valid quotations are invited from the suppliers meeting BARC Security regulations and having valid Police Verification Certificates of the technical staff on the basis of the following:

The scope of work covers:

Procurement of material & Bought out items, Fabrication, Shop Assembly, Testing and supply of Electrolytic Cell consisting of Teflon Vessel and Titanium electrodes with platinum coating as per technical specifications and tender drawing.

Description of Work:

Procurement of material & Bought out items, Fabrication, Shop Assembly, Testing and supply of Electrolytic Cell consisting of Teflon Vessel and Titanium electrodes with platinum coating as per technical specifications and tender drawing.

1. Scope:

This technical specification enlists the salient technical requirements for procurement of required raw material, fabrication, Platinum plating, inspection, testing and supply of Platinum Metal Plated Titanium Electrode as per the scope drawings.

The scope of the work also includes the preparation & compilation of fabrication drawings and Quality assurance procedures and reports applicable for the job.

Following drawing shall be used for fabrication of the platinized electrode based electrolytic cell.

Drawing Number: A1-6911-M-318

Qty.: 01 Set (Consisting of Teflon Vessel 01 No. and Titanium electrodes (set of 03 electrodes) with Platinum coating as per tender drawing.)
 Platinum Coating surface Area is approximately 600 cm² in total for all 03 electrodes.

The above drawing provides the general construction details and dimensions of the electrode. The fabricator is required to prepare their own fabrication drawing for the components and submit to the purchaser for the approval.

2. Material:

- a. No material will be issued by BARC as Free Issue Material (FIM).
- b. The fabricator shall arrange their own material at their own cost for fabricating all the components. No charges will be paid by BARC towards the scrap or unutilized material.
- c. The material being used for the construction of the electrode shall be new and as per the relevant ASTM or equivalent international standard.
- d. The base material of the electrode shall be as per ASTM B265 Grade 2.

3. List of Standards:

Following applicable standards will be applicable for the fabrication of electrode:

Sr. No.	Standard/Code	Details
a)	ASME Section II Part B, C	Non-ferrous materials (Part B) Welding rods, electrodes and filler wires (Part C)
b)	ASME Section V	Non-destructive tests
c)	ASME Section IX	Welding/welder qualification
d)	ASTM - E – 165	Liquid penetrant test
e)	ASTM B 265	Annealed Titanium Sheets
f)	ASTM B862	Seam-welded Titanium Pipes
g)	ASTM B348	Titanium Rods
h)	ASTM B898	Titanium Clad Copper bar
i)	ASTM E8	Test Methods for Tension Testing of Metallic Materials
j)	ASTM E390	Test Methods for Bend Testing of Material for ductility
k)	ASTM B600	Descaling and cleaning of Titanium & Titanium Alloys
l)	ASTM E1409	Test Method for Determination of Oxygen and Nitrogen in Titanium and Titanium Alloys by the Inert Gas Fusion technique
m)	ASTM E1941	Test Method for Determination of Hydrogen in Titanium and Titanium Alloys by the Inert Gas Fusion Thermal Conductivity/Infrared Detection Method
n)	IS 2102	Dimensional Tolerances (for dimensions without specific tolerance covered by ASME Section –III Subsection ND and the scope drawings)

In case the standard of any of the component or material is not listed here, then the relevant international standard for the same will be applicable which shall be communicated to the Purchaser for acceptance.

4. Sub-contracting:

Sub-contracting of the entire work shall not be permitted. Fabricator shall make clear in his offer the names and full details of the sub-vendors whom they propose to employ for part work and also specify those parts of the work which are proposed to be sub-contracted.

5. Fabrication Requirements:

a. General:

- a. Fabrication of Titanium electrode shall be carried out in a separate enclosed dust free area, isolated from other fabrication activities and exclusively reserved for exotic metal fabrication work. This exclusive fabrication area shall be adequately protected against any air borne contamination, dust, etc.
- b. Fabricator shall maintain a system of identification for the materials to be used in fabrication in order that all materials used in the completed vessel shall be identifiable with respect to test certificates.
- c. All material should be cut preferably by mechanical cutting process like shearing/hacksaw etc.
- d. All shop floor staff, technicians, supervisors, engineers, etc., deployed for the above work shall be familiar & experienced in handling and fabrication of Titanium material.
- e. An exclusive and adequate stock of tools, tackles, consumables, grinding wheels, sanding discs etc., shall be made available exclusively for the fabrication of Titanium electrode.
- f. All filler wires shall be stored in dry and enclosed area. All filler wires shall be kept in clean dispensers and cleaned with proper cleaning medium prior to use.
- g. The Titanium raw material procured shall be stored in dry enclosed area as per standard practice for such materials ensuring safety from cross contamination and damage.
- h. All raw materials shall be properly cleaned prior to any fabrication (viz., forming, cutting, welding, etc.) activity.
- i. All material shall be properly cleaned after any forming process.
- j. All temporary fixtures in direct contact with the Titanium material shall be made from the same material.
- k. The internal & external surfaces shall be free from surface irregularities.
- l. All welds shall be carried out by providing suitable arrangement for purging (back, front and trailing).
- m. Weld surfaces of the electrodes shall be ground smooth before carrying out the Titanium plating.
- n. The raw material (sheets etc.) shall be properly cleaned and degreased prior to taking up any manufacturing operation. All rollers etc. used for forming shall also be thoroughly cleaned and degreased prior to commencement of rolling operation. Suitable liners shall

be used on the forming tools to avoid direct contact of Titanium sheets with the roll material.

b. Welding:

- a. The GTAW welding process shall be employed for fabrication of the Titanium Electrode. Argon Gas used for the Titanium fabrication work shall be ultra-purity type (min. 99.999%)
- b. Only qualified welders shall be employed for all welding jobs.
- c. Welding procedures shall be qualified on the same grade(s) of Titanium to be used in actual production.
- d. No production welding shall commence until procedure qualification is completed and approved by the Purchaser/Quality surveyor. Fabricator shall submit to the Purchaser copies of the approved procedure and performance qualification reports. In case the fabricator has the previously approved procedure & performance records, the same shall be submitted to BARC for review and acceptance before start-up of the fabrication. Tests for welding procedure & performance qualification shall be carried out in conformity with requirements of ASME BPVC Sec IX.
- e. Cost of conducting all the tests shall be borne by the fabricator. Purchaser shall have the right to call further qualification tests from time to time for any welder who is not producing finished welds of required quality or who has discontinued welding by the particular process for more than three months.
- f. Surfaces to be welded shall be free from paint, oil, grease, dust or any other contamination. Cleaning of surfaces/weld edge preparations/ completed weld shall be done only by use of appropriate solvents.
- g. Haphazard striking of electrode on base metal for establishment of arc shall not be permitted. High Frequency unit shall always be used for arc starting.
- h. Heat input to the job shall be minimized by suitable techniques.
- i. Suitable welding fixtures shall be used in achieving the requisite fit-ups for welding.

c. Repair:

In general the defects in the welding of the Titanium material is not expected on the production weld. The fabricator shall apply the best suitable fabrication and welding practices to achieve the basic intent of quality. The defective areas, as revealed by visual or applicable NDT method shall be repaired as per approved procedure and re-inspected as per the original NDT method.

d. Welding Documentation:

Fabricator shall maintain a proper record of the welding being performed by the welder. It is required to maintain the traceability of a particular weld to the welder responsible for its production, together with the heat / batch number (s) of the filler wires used and the welding technique adopted.

6. Platinum Plating:

- a. **Pre-cleaning:** The Titanium electrode surfaces to be plated with platinum shall be pre-cleaned using mechanical and chemical methods which are recommended by the relevant standards of the ASTM and practices followed by the electroplating industries.
- b. All the surfaces of the fabricated Titanium electrode shall be coated with Platinum using **Electrochemical plating process**.
- c. The Platinum thickness shall not be less than 6 microns. This will be verified by weight and area measurement process. The fabricator is required to prepare a report in this regard which shall form a part of the QA documentation. The thickness of Platinum coating/plating shall be uniform in nature.
- d. Following inspection tests shall be carried out by the fabricator:
 - a. **Visual Examination:** The plated surfaces shall be free from any irregularity visible to naked eyes. There should not be blackening of the surfaces. The platinized surface shall have a bright and uniform surface.
 - b. **Dimensional Inspection:** Dimensional inspection of the platinized electrode shall be carried out. The observed dimensions shall be within the limits specified in the scope drawings and this technical specification.
 - c. **Adherence Test:** The plated sample coupon shall be tested for its adherence to the Titanium base in accordance with the relevant standards.
 - d. **Thickness Verification:** Average thickness measurement shall be carried out using weight method or by appropriate thickness measurement gauge.

7. Machining of Teflon vessel:

A Teflon shell shall be manufactured from the defect free monolithic rod of Teflon material. It shall be manufactured by machining process as per the dimensions indicated in the tender drawing.

8. Inspection & Testing:

a. Certificate of Manufacture & Inspection:

The case history of manufacture, certification and inspection shall be prepared concurrently with the manufacturing activities. The fabricator shall, upon completion of each stage of the fabrication, certify that it has been manufactured inspected & tested in accordance with these specifications, relevant drawings and applicable documents. If any deviations have been made during manufacture these shall be clearly stated and covered by authorized documents. This certificate shall form part of the completed documentation for the fabricated item.

b. Dye Penetrant Examination:

- a. Acceptance of the Dye Penetrant (DP) examination method shall conform to ASME Sec. III Div 1 ND together with the requirements given in relevant clauses of this specification.
- b. Dye penetrant examination shall be carried out on all the weld layers together with their HAZ (minimum ½ inch on either side of the weld) as well as other areas wherever specified.

- c. Only visible dye-penetrant solvent (removable type) method shall be employed for all welds and other metallic surfaces. The residual amount of total sulphur in the penetrant, developer and cleaner used shall not exceed 1% by weight and halogens shall not exceed 25 ppm. Fabricator shall obtain certification of these tests for the penetrant materials used giving batch numbers and test results.
- d. Acceptance Standards: No indications of are acceptable. The defects shall be repaired using approved procedure.

9. Packaging:

The finished electrode shall be in a thoroughly clean and dry condition before packaging for shipment. The finished electrode shall be packed in **wooden crate with weatherproof packaging**. The electrode shall be properly secured inside the packaging by soft material like foam or thermocol to prevent transit damages. Necessary indicators such as “Fragile”, “This side up” etc shall be marked in bold fonts on the package. The package shall have provisions for handling by fork lift and also it should have hooks provision.

10. Guarantee: The finished electrode shall be guaranteed for material and workmanship for duration of 1 year from the date of acceptance by BARC.

11. Consignee: Consignee will be

**ASO, WMZ Stores,
Waste Immobilization Plant
Bhabha Atomic Research Centre, Trombay, Mumbai-400085**

12. Completion period: Four calendar months from the issue of work order.

13. Workmanship:

Workmanship shall be in accordance with the best shop practices. There should be no damage in the specified area and all the equipments, tools and tackles lying in the area.

Notes:

1. Your offer shall be valid for minimum 30 days from the date of opening. Quoted price shall be inclusive of all taxes, duties etc and remain firm during the period of execution of the order.
2. Any deviations from specification shall be clearly mentioned in your offer.
3. Payment will be made within thirty days of supply, installation and successful completion of work at our site.
4. Delivery shall be completed within 40 days from the date of issue of the Work Order.

The quotation shall be submitted in sealed envelope super scribed with the Tender No. mentioned in this letter to reach the undersigned by **SPPED POST** only before **1400 hrs on 05/10/2017** at the address mentioned below and quotations will be opened on same day-

S. B. Patil, SO/G
Technology Development Division (NRG),
CDCFT Building,

BARC, TROMBAY, MUMBAI – 85.
Tel. 022-25591012

The offer shall clearly indicate the time required for completing the entire work.

Confidentiality Clause:

I. Confidentiality: - No party shall disclose any information to any third party concerning the matters under this contract generally. In particular, any information identified as “Proprietary” in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior consent of the original disclosing party. This clause shall apply to the sub-contractors, consultants, advisers or the employees engaged by a party with equal force.

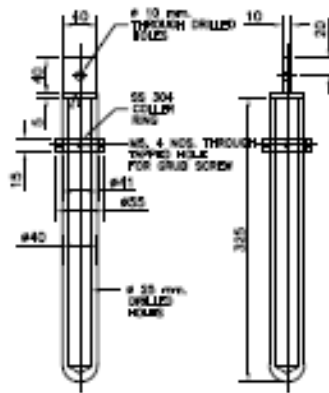
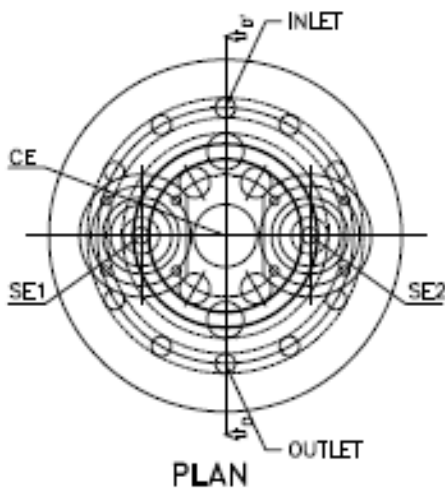
II. “Restricted information” categories under section 18 of the Atomic Energy Act, 1962 and “Official Secrets “ under Section 5 of the Official Secrets Act 1923: -Any contravention of the above-mentioned provisions by any contractor, sub contractor, consultant, adviser or the employees of a contractor will invite penal consequences under the aforesaid legislation.

III. Prohibition against use of BARC’s name without permission for publicity Purposes:-The contractor or sub-contractor, consultant, adviser or the employees engaged by the contractor shall not use BARC’s name for any publicity Purpose through any public media like press, Radio, TV or Internet without prior written approval of BARC.

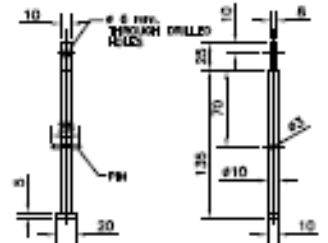
Yours truly,

(S. B. PATIL)
Scientific Officer / G

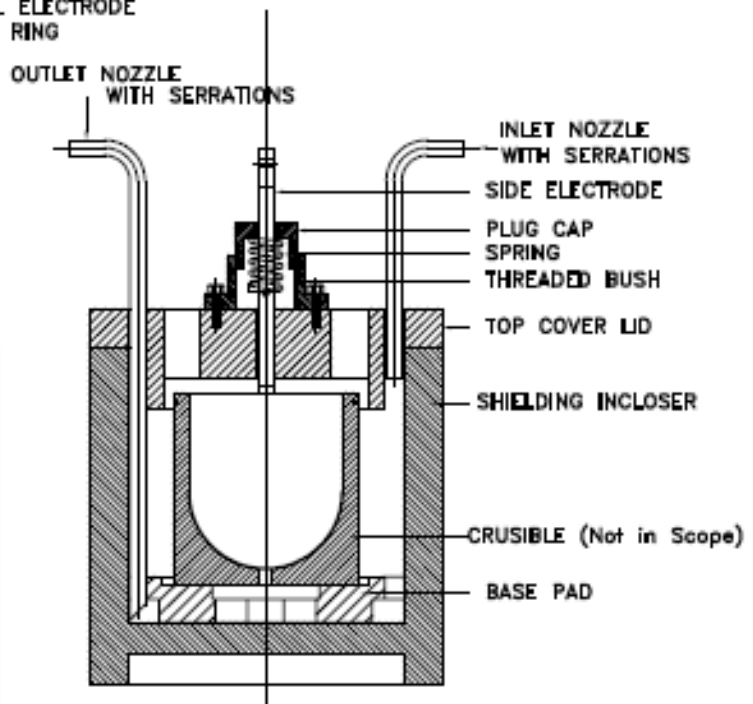
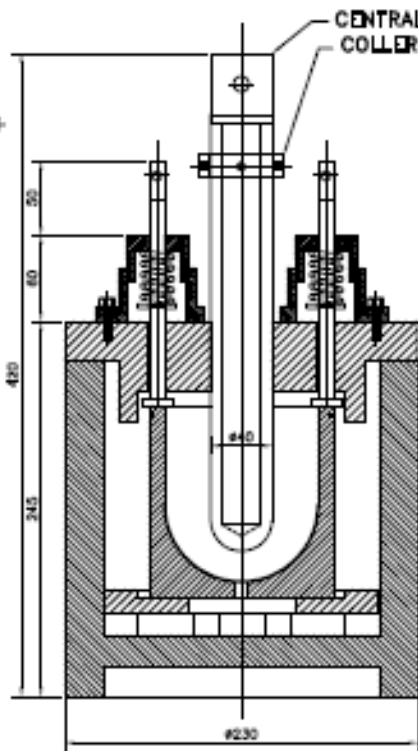
ASSEMBLED VIEW



CENTRAL ELECTRODE QTY. : 1 no.
 MOC : TITANIUM + PLATINUM COATING (6 micron)



SIDE ELECTRODE QTY. : 2 nos.
 MOC : TITANIUM + PLATINUM COATING (6 micron)



DRG. NO.
 A1-6911-M-318