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Government of India
Bhabha Atomic Research Centre
Isotope & Radiation Application Division

A.K. Pradhan
Head, HCOS, IRAD

IRAD/ 14/ 367

September 25, 2019

Sub: Invitation of quotation for procurement of raw material, preparation of fabrication drawing, fabrication, supply & testing of 1 no's Cask Handling Fixture (SS 304L) for use at new hot cell facility (AHCAF), CFB A-block, BARC.

Dear Sirs,

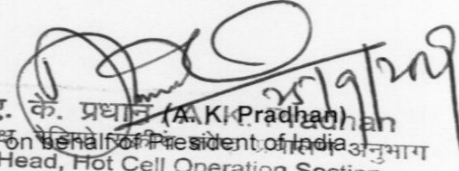
In connection with the above mentioned work you are requested to submit your detailed quotation/Agreement on the basis of the following requirements.

- The technical specification & scope of work is attached herewith.
- For any clarification regarding the specification, indenting Officer **Shri Amit Acharya, SO/D, IRAD (Contact- 022 25596878) may be contacted.** (Timing- 14.00 hrs to 16.00 hrs).
- The party should have valid Police Verification Certificate (PVC) for entry inside BARC. The list of manpower available with firm shall be submitted along with their details of PVC.
- The party shall procure all the raw materials required for the work. All material/component should be of tested quality.
- Quotation must reach by speed post/registered post to Head, Isotope & Radiation Application Division within **25th October 2019, 17.30 hrs** and should be sent in a sealed envelope superscripted with the above reference number and due date.
- The address on the envelope should read:

Kind Attention: - A.Acharya /A.K. Pradhan (Tel-25596878)
Head,
Isotope & Radiation Application Division,
Bhabha Atomic Research Centre,
Mumbai – 400085

- The party should furnish valid PAN/GST No along with the quotation, otherwise their quotations are **liable to be rejected** & it may also be emphasized that quotations are submitted in printed letter heads.
- The party must offer warranty on components & work for satisfactory performance for a period of not less than 12 months.
- The fabrication work is subject to inspection by our officers. The work will be inspected by our officers at party's site before supply of the material.
- **No advance payment** in full or in part will be admissible and payments will be made only after successful completion of job & onsite testing as per satisfaction of our engineers.
- The offer shall clearly indicate the **total cost & taxes or levy, if any. The offer shall be valid for a minimum period of 3 months from the date of opening the tender.**
- Head, IRAD, BARC reserves the right to accept / reject any or all quotations without assigning any reason.

Head, SIRD
For uploading in BARC website/ Tenders


ए. के. प्रधान (A.K. Pradhan)
For & on behalf of President of India
Head, Hot Cell Operation Section
आइसोटोप एवं विकिरण अनुप्रयोग प्रभाग
Isotope & Radiation Application Division
भाभा परमाणु अनुसंधान केंद्र
Bhabha Atomic Research Centre
ट्रॉम्बे, मुंबई / Trombay, Mumbai-400 085.

Tender Technical Specification (TTS)

CASK HANDLING FIXTURE

1. Scope

This tender technical specification (TTS) establishes requirements for procurement of raw material, preparation of fabrication drawings, fabrication, testing, inspection, guarantee & delivery in safe condition of Cask Handling Fixture. The MOC for entire job will be SS 304L. The structural material used will be ISMB 200, 100 mm SS Plate & 200 NB Sch-40 Pipe. Approx weight of the structural material to be used is approximate 2600 Kg \pm 10%

This fixture is intended for safe handling of cask by EOT crane in radioactive area at AHCAF, IRAD, CFB A-Block facility of BARC. The salient features & dimensions of the fixture is detailed below

Cask Handling Fixture

Salient Features & dimension

- The fixture height is 2.4 m (approx) consisting of a 100 mm thick rectangular plate (1250 x 1750 mm) on top & supported by horizontal & vertical beams (ISMB 200).
- The beams will be welded with the plate & the vertical members will act as columns (7 No's) while horizontal members will act as a support frame (3 No's- bottom, intermediate, top).
- A 200NB Sch 40 pipe 2250 mm length will be provided in the centre of fixture which is a functional requirement of the cask.
- The fixture will have proper lifting arrangement for movement by EOT crane.

The major scope of work includes:

- Preparation of detailed fabrication drawing.
- Preparation of Quality Assurance Plan including raw material procurement, inspection, testing, welding procedure, welding qualification, surface finish & manufacturing.
- Approval of fabrication drawings & QAP.
- Procurement of raw material, inspection & testing.
- Welding qualification & approval of welding procedures.
- Fabrication of fixture as per the final approved drawings.
- DP test (100%) & Radiography of welds which are approachable.
- Pre dispatch Inspection & testing.
- Package, transportation & Delivery at our RLGZ stores.
- Submission of inspection & test reports, history document & reproducible of as built drawings.

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Supplier shall not subcontract any or all of the work without written consent from the Indenter. Supplier shall be responsible for all work of the subcontractor of the Supplier. The Supplier shall also be responsible for carrying out inspection at subcontractor's works. The subcontractor's works also shall be accessible to the Indenter or his authorized representative at all reasonable times to carry out quality control and inspection if required.

2. Relevant National/International Codes

Sr No	Code	Details
1.	ASTM A-312	Specification for seamless & welded austenitic SS pipes
2.	ASTM A-240	Specification for Chromium And Chromium-Nickel plated steel plate, sheet and strips for pressure vessel
3.	ASTM A-262	Practice for detecting susceptibility to inter granular attacks
4.	ASTM: A-370	Test methods & definitions for mechanical testing of steel products.
5.	ASTM A 276	Specifications for Stainless Steel hot rolled or extruded structural shapes, including angles, tees, channels, beams, and unequal angles.
6.	ASTM E-165	Test methods for liquid penetrant Examination
7.	ASME Sec IX	Qualification of welds
8.	IS : 806	Dimension of hot rolled steel beams
9.	IS: 2102 – part 1 & 2	General & geometrical tolerances for linear and angular dimensions
10.	IS : 3815	Specification for lifting hooks
11.	PP-E-1214	General requirements for ultrasonic examination procedure.

3. Materials & workmanship

All the raw material shall be of reputed makes preferably (SAIL/JINDAL/TISCO etc) conform to national/international standards. All materials, parts & components shall be new. All the components shall be machined & finished to the dimensions, tolerances & surface finish as per the applicable drawing. The supplier shall do the assembly of machining components as per applicable drawing before delivery of items. Modification/alteration of components if any shall be done with prior permission of the indenter. The workmanship shall be in accordance with high grade practice. All parts shall be free of sharp edges, sharp corners, burrs, nicks, cuts, scratches & other visible defects.

The supplier shall produce mill test certificate at the raw material site inspection; Mechanical & chemical, Ultrasonic testing shall be followed for quantification. All materials shall be examined for conformance to the requirements ASME code for Nuclear Power Plant

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Components Section viii, Division 1 sub section NB. All materials shall be new & shall meet the special requirements listed in the specifications.

3.1 Materials

3.1.1 Stainless Steel Material

All raw materials shall be subjected to IGC test in accordance with ASTM A-262, practice A or practice E. All pickled and descaled surfaces shall be protected against pitting, corrosion etc by application of strippable paint. Paint used shall be halogen free.

3.1.1.1 Plate materials

The plates shall be corrosion resistant chromium nickel steel & shall conform to ASTM-A-240, Type 304L, Hot Rolled, Solution-Annealed, Pickled and Passivated. The plate shall have No.1 finish on both sides. Black plates will not be accepted. The plate shall be examined by Ultrasonic method in accordance with ASME B&PV code section III NB-2532 and shall meet the requirements specified therein.

3.1.1.2 Pipe

The pipe shall be seamless cold drawn, stress relieved, annealed, pickled and passivated. The pipe shall be inspected and tested and shall meet the requirements of specification ASTM A 312 TP-304L. The pipe inner and outer surfaces shall be free from scale, dirt, grease or any other foreign materials. The pipes shall be straight and shall have good surface finish.

The pipe material shall pass intergranular corrosion tests conducted in accordance with practice A -262, practice E. The pipe shall be examined by ultrasonic method in accordance with NB-2552 and acceptance shall be as per NB 2552.1.

3.1.1.3 Beam

Hot rolled ISMB 200 beam will be used in this fixture. The beam shall be inspected and tested and shall meet the requirements of specification ASTM A 276 TYP-304L. The material shall be subjected to a mechanical test to determine its tensile strength, yield strength, elongation, and Brinell hardness

3.1.2 Free Issue Material

There will be No Free Issue Material (NFIM) supplied to the fabricator.

3.1.3 Additional Tests

The indenter reserves the right to specify any additional test on the materials other than those covered in the pertinent specifications & this specification. Cost of such tests shall be borne by the indenter.

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3.1.4 Manufacturing Requirements

Detailed Quality Assurance Plan (QAP) along with manufacturing process sheet (to achieve the requirements specified) shall be prepared by the supplier & prior approval shall be taken before start of actual job. Manufacturing drawings as applicable shall be submitted to the indenter for prior approval.

3.1.5. Interchange ability & Machining Allowance

Wherever multiple quantities are indicated for the same items, general interchangeability of the components shall be ensured. Allowances for cutting, machining etc. are not included in Bill of Material given in the drawings.

3.1.6 Welding

All welding shall comply with requirements of ASME Boiler & Pressure Vessel Code Section III Subsection NF "Component Supports" and Section IX. Electrode designations and qualifications shall be as per AWS Standards.

Configurations of all weld joint preparation are shown on detail drawings by welding symbols as per AWS Standards. Detailing of the grooves for weld edge preparation shall be done by the Supplier and shown in the welding procedures. The weld joint configuration shown on the drawings shall be retained while detailing the joint edge preparations. Butt/fillet joints for making up lengths of plates from individual plates of shorter lengths shall be full penetration welds of radiographic quality.

a. All welders, welding machines and welding procedures shall be qualified in accordance with the requirements of Section IX of ASME Boiler and Pressure Vessel Code. Welder Qualification Record, Welding Procedure Specification (WPS) and Welding Procedure Qualification Records (PQR) shall be approved by BARC.

The supplier shall develop weld preparation and processes to obtain consistent welding. All surfaces to be joined shall be thoroughly cleaned to prevent weld contamination. All weld edge preparations shall be machined smooth. Approval of BARC shall be obtained prior to commencement of production welding.

The supplier shall establish the welding procedures and conduct all tests required by ASME Section IX in order to qualify the welding procedures and the performance of welders for the manufacture of the equipment. The supplier shall maintain a record of the "Welding Procedures" and "Welders" qualified in his shop. Only the electrodes and filler wires approved by the Indenter shall be used for welding.

b. T.I.G. method of welding is preferred for Stainless steel to Stainless Steel. The filler metal used shall conform to AWS class ER 308L. The SS welding electrodes and filler materials shall conform to ASME Section II part C, SFA 5.4 type E 308 L and SFA 5.9 type ER 308 L respectively or equivalent subject to BARC approval.

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c. Root and final passes of all butt/fillet welds, groove joints (or root and each layer of welds in specific cases as per drawings) and fillet welds shall be subjected to Liquid Penetrant examination in accordance with ASME section III NB-5111 and acceptance shall be as per NB-5352.

d. Unless otherwise specified, all butt/fillet welds shall be full penetration welds with 100% Radiography in accordance with ASME Section III NB-5111. Acceptance shall be as per NB-5320. Where Radiography examination of the weld is not feasible, alternatively, Ultrasonic examination shall be carried out in accordance with NB-5111 and acceptance shall be as per NB-5330.

8.7.5. After weld edge preparation, the surfaces shall be subjected to Liquid Penetrant Examination in accordance with ASME Section III NB-2546 and acceptance shall be as per NB-2546.3.

3.1.7 Surface Finish

All the external surfaces of the fixture should be buffed to mirror finish. All surfaces of all the components unless otherwise indicated, shall be finished by machining, grinding, polishing or anodizing. All machined surfaces shall be smooth (surface finish 3.2 $\mu\text{m}/\text{N7}$ or better) & free from any defects & irregularities.

3.1.8 Passivation Treatment

All SS components shall be passivated prior to assembly. The following Passivation procedure shall be adopted. Component to be passivated shall be cleaned free of grease, oil and/or dirt. Cleaning agent to be used shall be superior kerosene. After cleaning, the component shall be immersed in a solution of 40 B' e Nitric Acid to which has been added 2-3% Sodium Dichromate by weight at 45 °C to 55 °C for 15 to 30 minutes. If the component to be passivated is too large for the facilities available making immersion in a tank impractical, then the acid may be applied with a suitable swab. The component shall then be thoroughly rinsed with clean running water to remove all traces of acids. Thereafter, the component shall be dried in air.

3.2 Fabrication

Contractor shall prepare fabrication drawings based on tender drawings, indicating complete fabrication details, dimensional tolerances, weld sizes, bill of material etc & submit four copies of these drawings for indenter's approval.

Contractor shall submit the following documents for approval.

- i) Detailed fabrication drawings.
- ii) Fabrication procedure
- iii) Welding procedure.
- iv) Inspection & quality control plan.

Fabrication shall be done in accordance with above approved documents/procedures. The supplier shall submit a quality assurance plan along the offer.

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3.3 Quality Assurance cum Stage Inspection Plan

Sr. No.	Control Area	Type/extent of check	Check points	
			By Supplier	By Indentor
1	Fabrication Drawings	Checking & approval of Indenter	I	R, H
2	Identification and confirmation of raw materials to material designation.	Correlating test Certificates / Shipping Release for Free Issue raw materials and raw materials procured by Supplier	R	S
3	Testing	Testing as per Specification.(such as UT, Mechanical Testing, Chemical Composition check etc.) of raw materials.	R/I	R + W
4	Welding	Qualification of welders	I	R + W
		Qualification of welding procedures	I	W + H
		Material cutting	I	R + S
		Edge preparation LPE of prepared edges	I I	W (5%) W (10%)
		Welding of Components and Inspection of welds	I	R + W + I (10%)
		Dimensional Inspection after welding	I	R + I (10%)
5	Machining	Checking of dimensions, geometrical features, surface finish etc.	I	W (100% critical, 10% others)
6	Visual & dimensional inspection of finished components	Visual examination of finished components	I	I
		Non-destructive examination such as UT, MPI, LP where ever called up	I	W + H
		Cleaning of Components	R	W (10%)
		100 % dimensional inspection	I	I +R+ H
7	Final Inspection	Functional Check, Finishing as per fabrication Drawing	I	I

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LEGEND

W = Witness

R = Review of test certificates/procedure/reports etc

H = Hold Point (clearance is required to proceed further)

I = Inspect

S = Stamping by BARC/IRAD-QA

Inspections will be 100% by Supplier and numerical values of all dimensions, geometrical features and surface finish will be recorded. Inspection by indenter or BARC-QA will be on random basis.

BARC or authorized representative shall have access in the manufacturer's shop for inspection at all time during manufacture, inspection and testing. The supplier shall examine all the components and assemblies for full compliance with the drawings and specifications. All the inspection reports are be given to BARC. Mock-up performance and qualification performance test reports will be prepared by Supplier and submitted (5 copies) to BARC.

4. Inspection

4.1 Weld inspection

All the NDT tests on welds as detailed in drawings shall be carried out in conformity with ASME section V by the supplier .All welds should be checked by DP test for root run & final pass as per the acceptance standard of ASME section III ND.

4.2 Performance Test

Fixture & Container will be tested for smooth functioning of all its components.

4.3 Quality Surveillance

The supplier shall be responsible for & perform all inspection & testing required in accordance with the drawings & specifications. All work covered under this specification shall be subjected to quality surveillance by the indenter or his authorized representative. The indenter's representative shall at all times have access to the work, whenever it is fabricated. Supplier shall also provide facilities of, at sub contractors works etc for such inspection. The supplier shall arrange for testing & inspection to establish & maintain quality of workmanship in his works & that of his subcontractor's to ensure the mechanical accuracy of components, compliance with drawings & codes, identity & acceptability of all materials, parts & equipments.

The equipment covered under this specification shall be dispatched only after the indenter's quality surveyor issues a shipping release.

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5. Guarantee

The supplier shall give a guarantee for satisfactory workmanship & performance for a minimum period of 12 months from the date of delivery. The guarantee shall cover failure occurring to the units caused by defective workmanship or material found as being defective.

6. Packing/Delivery

The material shall be properly packed for safe transportation & storage. The items shall be delivered to the stores at

RLG Zonal Stores,
Bhabha Atomic Research Centre,
Trombay, Mumbai - 400085.

7. Proof of Ability

The bidder shall submit a brief list of similar works executed by him in the recent past.

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ANNEXURE-I

PROCEDURE FOR SURFACE PREPARATION

1) MECHANICAL CLEANING:

After completion of fabrication of the fixture the surface will be cleaned. Mechanical cleaning will involve scraping by stainless steel wire brush, grinding the high spots flush with the surface, smoothening weld runs and fillet welds. Rust, mill scales and other forms of imperfections will be removed as much as possible.

2) PASSIVATION OF MACHINED S.S. COMPONENTS

BATH:-

- a. 20 % BY VOLUME Nitric Acid.
- b. 2.5 % by weight Sodium Di Chromate.
- c. 80 % by volume Dematerialized water.

BATH TEMP: - $500C \pm 20C$

PROCESS: Immerse the component in the bath

OR

Keep the component wetted with the solution by continuous pouring or swabbing.

DURATION: 20Minutes

POST CLEANING: Wash down the component with dematerialized water till all traces of the solution is removed. Take care to force out solution from all cavities, thread roots, recess areas etc.

DRYING: Dry the component using air jet.

Procedure for Liquid Penetrant Examination (For Welds)

1.0 Scope

The procedure for Dye penetrant examination shall be in accordance with the methods of section V article 6 of ASME VIII.

Reference standard (ASTM-E-165)

Material –Following solutions Manufactured by M/c Pioneer Equipment Company (PEC), Baroda or equivalent shall be used for testing purposes.

- Visible red eye penetrant pp-15.
- Cleaner PC-21 Acetone or petrol.
- White Colored liquid developer PD-31.

Ionic Halogen- less than 5 ppm.

Sculpture- Practically Nil.

2.0 Detail Procedure

2.1 Surface preparation

The surface under test shall be made free from rust, scale spatter, dirt; grease etc. The irregularities shall be cleaned & ground.

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2.2 Surface Cleaning

All surfaces to be examined with DP testing shall be cleaned by swabbing with a clean cloth.

2.3 Application of the penetrant

The surface of component under examination shall be thoroughly coated with red color penetrant by brushing. Penetration Time will be 10-15 minutes.

2.4 Temperature

The temperature of the penetrant & part to be inspected shall be maintained between 600 F (160 C) & 1250 F (520C)

2.5 Removal of excess penetrant

After penetration time as specified above has elapsed, any excess penetrant should be wiped by clean cloth till most traces of penetrant have been removed.

2.6 Drying of the surface

Drying of the surfaces after excessive penetrant removal shall be by normal evaporation.

2.7 Application of developer

A wet developer shall be uniformly applied to the surface of component by spray gun. Care shall be taken that a developer is continuously agitated before the application. Drying should be at room temp.

2.8 Test results

Final interpretation of test results shall be made after allowing penetrant to bleed out for seven minutes.

3. Acceptance standards for weldments

As per ASME Sec IX

It is unacceptable if

- i) Any crack or linear indication
- ii) Rounded indications with dimensions greater than 3/16"
- iii) Four or more rounded indications in a line separated by 1/16"
- iv) Ten or more rounded indications in any six square inches or surface with major dimensions of this area not exceed six inches with area taken in most unfavorable location relative to the indications being evaluated.

Annexure- II
General Terms and Conditions

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1. It is not the intent to specify completely herein, all details of design and manufacture of the item. However, the item shall conform in all respect to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation up to the vendor's/contractor's guarantee in a manner acceptable to the indenter, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance there with.
2. Preparation/submission of detailed fabrication drawings along with design calculations for indenter's approval.
3. Preparation/submission of detailed Q.A. /Q.S program for indenter's approval.
4. Procurement of all materials in accordance with the material specifications as given in the approved drawings and in this specification and corresponding test certificates are to be submitted. Bidder shall note that all materials, parts, equipments & instruments required for manufacture of the fixture & container shall have to be procured by him.
5. Submission of test certificates for all raw materials procured for manufacturing the jobs as and when required.
6. Obtaining approval of the indenter for any materials used or intended to be used as alternative to the specified materials.
7. Fabrication of the components as per approved drawings.
8. Inspection and testing at the Vendor's/contractor's works.
9. Preparation of inspection reports of all components and subassemblies at the appropriate stage during fabrication. Submission of these reports to the indenter as and when required during the execution of the contract for verification and records.
10. Obtaining approval of any deviations in design with necessary reasons for the same from indenter.
11. Offering the components, subassemblies or the full equipment for inspection to indenter's representative as and when required by him to do so during the execution of the contract.
12. Carrying out any necessary modifications or improvements until satisfactory performance of the items for which it is intended. Such modifications shall be carried out by the contractor at free of cost if they are required for reasons arising from poor designs, bad workmanship or non-conformity to the specifications.
13. Incorporating the as built changes in the manufacturing drawings and submission of as built drawings (reproducible prints) in soft as well as hard copy.
14. All drawings will be the property of BARC.
15. Submission of History Dockets (6 sets) consists of Q.S. documents, operation and maintenance manual, design report, and as built drawings.
16. Offering a guarantee of the equipment for a period of ONE year from the date of testing and supplying at site. This guarantee shall cover free repairs or replacement of parts, which have failed during normal operation within the guarantee period of ONE year due to defective design, material of construction, workmanship etc.
17. NOTICES :-
Any notice, order, direction or other communication to be given to the contractor under any of the provision of the Work Order shall without limitation be conclusively deemed

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to have been received by the contractor if delivered or mailed to the contractor at the address mentioned in the Work Order or to the contractor's last known place of business or residence or to his superintendent or foreman.

18. SUB-CONTRACTS:-

The contractor shall not sub-contract any part of the erection work without the written consent of the Indenter. In the event of the Indenter giving consent for sub-contracting the full/part of the erection work, the Bidder shall be responsible to the Indenter for all the work of sub-contractors.

Any sub-contractors shall be bound to the contractor by the terms of the drawings and specification, and shall assume towards the contract or assumes towards that contractor all the obligations and responsibilities that the Bidder assumes towards the Indenter.

19. PACKING, TRANSPORTATION AND PLACE OF DELIVERY:-

After carrying out the tests at manufacturing works and after lead pouring, the RWTF be properly packed, crated and protected from damage during transport, transit and storage at site. The packing shall include adequate cushioning, blocking, bracing, skidding, hoisting and tie down provisions.

Supplier shall be responsible for any damage to the equipment during transport, transit and storage at the site. The supplier without any extra cost shall supply any short supply inside the intact package. The intact packages shall be safely transported to the following destination:

Radiological (RLG) Zonal Stores,
Isotope Production & Applications Division,
Bhabha Atomic Research Centre (BARC),
Trombay, Mumbai-400 085, Maharashtra

20. ACCOMMODATION AND TRAVEL :-

Contractor shall at his own cost, make arrangements for transport of his personnel to and from the site. It shall be supplier's responsibility to make all accommodation arrangements. The contractor's lump sum prices shall include all travelling, transportation and accommodation cost of all his site staff including supervisory personnel.

21. SECURITY RULES:-

The contractor shall follow at site all security rules as may be framed by Indenter from time to time regarding removal of materials from site, issue of identity cards, control of entry of personnel and all similar matters. The contractor and his personnel shall abide by all security measures imposed by the Indenter or his duly authorized representative from time to time. Contractor is required to produce police verification certificate issued by police commissioner for his Engineers/ Supervisors deputed to BARC site for supply of fixtures & container.

22. PERFORMANCE AND QUALITY

Contractor guarantees that on completion of work, all portions thereof are in full accordance with the requirements of the contract and are new, of high quality and free

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of defect in design, materials or workmanship till the expiry of twelve (12) months, from the date of successful commissioning. If within the expiry of the above stipulated guarantee period, the subject goods or any parts thereof are found defective or performance guarantees are not fulfilled, contractor shall expeditiously repair or furnish and install replacement parts of design, workmanship and material at his own cost.

23. INDEMNITY

Contractor shall be solely responsible for all injury to persons and animals and for any other damage due to any cause in any way connected with carrying out this contract. Contractor shall indemnify indenter/owner in respect of all claims brought against the indenter/owner by anybody in this regard.

24. COMPLIANCE WITH LAWS

Contractor warrants that all actions taken by him in this execution of the contract shall conform to all applicable city, state and central laws, ordinances and regulations. Further contractor shall defend and save indenter/owner harmless from loss, cost or damage by reason of any actual or alleged violation thereof

25. INSURANCE

Insurance of supplier's personnel working at site for installation purpose shall be taken care of as per stipulation of Government of India. Indenter shall not be held liable for any damage to person or property resulting from the use of construction tools and equipment furnished, rented or loaned to the contractors by the indenter.

(Saroj Kumar)
Designer

(Amit Acharya)
Indenter

(V.K. Kumbhaj)
QA In Charge

Approved By

(A. K. Pradhan)
Head, HCOS, IRAD