



दूरभाष 91-22-25593141 (direct)  
Telephone: )

फैक्स संख्या: ) 91-22-2550 5185  
Fax Number )

**Saurav Bhattacharyya**

**SO/H, PSDD, NRG**

Email: sauravb@barc.gov.in



सत्यमेव जयते

भारत सरकार

**GOVERNMENT OF INDIA**

भाभा परमाणु अनुसन्धान केन्द्र

**BHABHA ATOMIC RESEARCH  
CENTRE**

**Nuclear Recycle Group**

**Process Development Division  
Equipment Development & Training Section**

**WIP Service Bld'ng,  
Trombay, Mumbai-85.**

Ref.: NRG/PSDD/ED&TS/EETF/MUA/2017/217096

Dt. 08/12/2017

**Subject: Invitation to quotations for Minor Fabrication Work.**

Sir,

**Sub: "On-site fitting of SS-leg supports to vessels, relocation & installation of; existing and new stainless steel vessels, pumps and other equipment, as per scope drawings and erection of SS 304L piping as per technical specifications at EETF, WIP-Complex, Trombay, Mumbai"**

We require the work of "On-site fitting of SS-legs supports to vessels, relocation & installation of existing and new stainless steel tanks, pumps and other equipment as per scope drawings and erection of SS 304L piping as per technical specification at EETF, WIP-Complex, Trombay, Mumbai" to be carried out on priority basis at EETF Site, BARC, Trombay. If interested, please submit your most competitive offer for this work, in a sealed envelope via Speed Post only, duly writing our letter reference number, **on or before 12.30 hrs. on 18/01/2018(Thursday)**. The offers will be opened on the same day at **3.00 P.M at the office of PSDD, NRG, CDCFT building**.

**Technical Requirements:**

1. The contracting firm shall have adequate knowledge of handling of SS /M.S materials.
2. The work shall be carried out as per instruction of BARC staff at site of work.
3. Enclosed technical specification gives the requirement of tendered work in details.
4. Safety of the operating personnel and material being handled is required to be maintained by the firm, at all time.

**Please note the following points:**

1. Our technical specification (Annexure I) shall form a part of the W.O.
2. FIM as per Appendix-1 Shall be provided by BARC as free issue material to the fabricator.
3. The work shall be completed within 120 (One hundred and twenty) days from the date of acceptance of the work order.
4. The labors/ contractor's personnel who have valid Police Verification Certificate (with issue date not beyond 6 months) can only be deployed for the job.
5. The firm is required to be security vetted as per BARC security policy.
6. Income tax @2% and S.C on the I.T, as applicable and educational cess on IT and SC, as admissible will be deducted from your bill.

7. **For supply of items, the GST to be charged at 5% (As per CBEC Notification no. 45/2017 dated 14 Nov 2017)**
8. **The enquiries should be sent only by speed post and should be addressed to following address:**

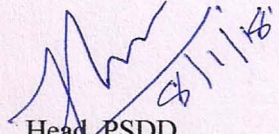
**Head ,  
Process Development Division (Kind Attn.: Shri Saurav Bhattacharyya, SO/H)  
PSDD Office, CDCFT Bldg.,  
Nuclear Recycle Group, Bhabha Atomic Research Centre, Trombay, Mumbai-400085**

**The Enquiries sent by any other mode (manual, courier etc) shall be rejected without assigning any reasons as per terms and conditions of Accounts, BARC.**

**The offer shall be kept valid for a period of 60 days from the date of opening. All taxes, levies and transportation charges if any, shall be brought clearly in your offer.**

**Full payment shall be made only after successful completion and acceptance of the work.**

**Encl.: Technical Specification (Annexure I).**

  
Head, PSDD  
डॉ. जयेश गो. शाह / Dr. Jayesh G. Shah  
अध्यक्ष, पीएचडी डी/Head, PSDD  
भारत सरकार/Government of India  
भाभा परमाणु अनुसंधान केंद्र/B.A.R.C.  
ट्रॉंबे/Trombay, मुंबई/Mumbai - 400 085.

SPEC. NO.	<b>BHABHA ATOMIC RESEARCH CENTRE</b>	SHEET 1 OF 12
	<b>PROJECT: EETF, BARC, TROMBAY</b>	
NRG/PSDD/ED&TS/E ETF/MUA/2017/217096  Dt. 08/12/2017.	Annexure-1 :TECHNICAL SPECIFICATION FOR <b>On-site fittings of SS leg supports, relocation &amp; installation of; existing and new stainless steel tanks, pumps and other equipment. And also erection of SS pipes; interconnecting pumps, tanks and other equipment as per specifications and drawings (to be given at execution time). The entire work to be done at EETF, WIP-Complex, Trombay, Mumbai.</b>	

## 1. INTRODUCTION:

This technical specification defines the scope of work and technical specifications for “On-site fitting of SS leg supports, relocation & installation of; existing and new stainless steel tanks, pumps and other equipment, per scope drawings and erection of SS 304L piping, connecting pumps and other equipment nozzles. The works are to be carried out as per technical specification, at EETF, WIP-Trombay, Mumbai”. The equipment and their associated piping are meant for modelling and performance studies of High capacity extraction equipment.

## 2. SCOPE:

**The responsibilities of contractor shall include but not limited to the following:**

- a. Mobilization of all requisite material and machineries (in working condition) to site.
- b. Deployment of qualified manpower both technical/non technical for the execution of the job.
- c. Identification of all Free Issue Materials (FIM), lifting of the same from the premises of departmental stores and cleaning of the same from inside and outside and proper storage/ stacking at site of fabrication.
- d. Procurement, inspection, testing and supply of complete raw material in the scope of the contractor except those listed in Annexure I (List of FIM) of the tender.
- e. Erection & welding of SS304L seamless pipe lines as per the approved drawings. Cutting, edge preparation/beveling, bending, fit-up inclusive of the edges of pipes, fit-ups, cleaning, drilling etc.
- f. Preparation of various QA documents etc for approval of BARC QA.
- g. Stage wise inspection & testing of the installation & piping work as per the relevant clauses of this technical specification including hydro/ pneumatic tests of piping, if required.
- h. Fabrication, installation, erection, inspection and testing of different sizes of SS304L pipe spools as per specification and applicable codes & standards.
- i. Supply, fabrication, installation and inspection of stainless steel pipe supports including support items and final alignment of pipes on these permanent supports.
- j. Welding of supports and verification of slopes of piping as per the scope drawings.
- k. Cutting of blanks on tank nozzles and beveling of ends for welding.

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Dt. 08/12/2017.		

- l. Cutting, edge preparation, fit-up inclusive of the edges of pipes, fittings, flanges etc. to match mating edges of uneven / different thickness wherever required.
- m. Bending and pre-fabrication of spools to suit site conditions.
- n. Welding of pipes/fittings by using GTAW process using certified argon gas for shielding and purging.
- o. LP examination for root and final passes of weld joints.
- p. End closure welding of nozzles after cleaning and flushing of pipelines.
- q. Tagging of lines and equipment nozzles using Stainless Steel tags (Tags are to be fabricated by the Contractor).
- r. Procurement, Supply, Installation, Inspection and Testing of 3-piece butt weld Pipe Fittings/valves in stainless steel process piping in sizes ranging from 8 NB to 200 NB (as per the quantity mentioned in item 3 below)
- s. Installation of SS legs (supplied as FIM) on vessels

**Salient features of the EETF piping are given as below:**

- a. Complete piping is in SS304L material of construction.
- b. Pipe lines constitute piping members in size range from 8 mm NB Sch40 to 100 mm NB Sch40.
- c. Piping members shall be installed in level and phased manner to avoid interference.
- d. Bend radius of piping shall not be less than 5D where D is the nominal diameter of the pipe. Ripples, wrinkles and crippling of pipe during bending process are not acceptable.
- e. The welding process adopted for the piping erection is GTAW with complete back purging.
- f. Stage wise inspection of the piping will be done by BARC or its authorized agency.
- g. Cleanliness of the pipes (internal as well as outer) is to be ensured.
- h. Piping work is required to be done within the tolerances and limits as specified in this technical specification and approved spool drawings.

SPEC. NO.

**BHABHA ATOMIC RESEARCH CENTRE**

PROJECT: EETF, BARC, TROMBAY

NRG/PSDD/ED&TS/E  
ETF/MUA/2017/217096Annexure-1 :TECHNICAL SPECIFICATION  
FORSHEET  
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Dt. 08/12/2017.

**On-site fittings of SS leg supports, relocation & installation of; existing and new stainless steel tanks, pumps and other equipment. And also erection of SS pipes; interconnecting pumps, tanks and other equipment as per specifications and drawings (to be given at execution time). The entire work to be done at EETF, WIP-Complex, Trombay, Mumbai.**

**3. QUANTITY: (As mentioned below)**

S. No.	Description of Work	Unit	Qty Required
1	Installation of SS 304L vessels & equipment on SS and MS lined floor/staging, this involves movement of tanks within EETF (50mx50m area) on the same ground floor within a maximum distance of 30 m.	Kg	12770
	(a) Conical Storage Tanks (06Nos.) (1150 Kg Each)		
	(b) LP Condensate Tank (01No.) (1150 Kg)		
	(c) MUA Tank (01No.) (450 Kg)		
	(d) MUA Tank (01No.) (1150 Kg)		
	(e) Scrubber Recirculation Tank (01 No.) (750 Kg)		
	(f) Off Gas Scrubber (01 No.) (220 Kg) (at a height of 15 m, on MS stage floor)		
	(g) Off Gas Blower (01 No.) (100 Kg) (at a height of 15 m, on MS stage floor)		
	(h) Installation of Centrifugal pumps (07Nos.) (100 Kg, each)		
	(i) Installation of metering pumps. (4 Nos.) (60 Kg, each)		
(j) Fitting of ready and available, at site, of SS legs to the Tanks (1110 Kg), both weld joints to Lugs as well as bolt joints are to be done.			
2	Erection of SS304L Piping (seamless/ welded) in sizes from 8 mm NB to 200 mm NB [Job involves study of piping GA drawing, identification of nozzles of equipment, taking site measurements, incorporating the required changes in GA drawings, preparation, modification & approval of pipe spool drawings as per site conditions, identification of all materials, taking delivery of the same from departmental stores, complete handling, transportation, cleaning, marking, cutting of existing pipes (wherever required) and existing blinds (e.g. nozzles) of pipes, edge preparation, fit-up, tack welding, alignment, complete erection etc and readying the same for GTAW welding as per approved spool drawings. The piping systems are to be hydro-tested and other formalities, cleaning etc. to be done as per specs.	Inch Meter	1618
3	Radiographic quality butt welding of stainless steel pipes & pipe fittings by GTAW process using high purity Argon gas (99.995% min) for shielding & back purging, Liquid Penetrant Examination for root & final welds as per approved procedures and technical specifications. (The payment of the joint will be done for the joints accepted by BARC).	Inch Dia.	530

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	Annexure-1 :TECHNICAL SPECIFICATION FOR <b>On-site fittings of SS leg supports, relocation &amp; installation of; existing and new stainless steel tanks, pumps and other equipment. And also erection of SS pipes; interconnecting pumps, tanks and other equipment as per specifications and drawings (to be given at execution time). The entire work to be done at EETF, WIP-Complex, Trombay, Mumbai.</b>	

4	<b>Procurement, supply, Installation, Inspection and testing of 3 piece butt weld valves used in stainless steel process piping in size ranging from 8 NB to 200 NB.</b>			
	a.	25 NB Ball Valves (3piece)	Nos.	<b>80</b>
	b.	40 NB Ball Valves (3 Piece)	Nos.	<b>32</b>
	c.	25 NB Gate valve	Nos.	<b>10</b>
	d.	40 NB Gate valve	Nos.	<b>10</b>
	e.	80 NB ball valve (2 Piece)	Nos.	<b>5</b>
	f.	80 NB Butterfly valve	Nos.	<b>2</b>
	g.	200 NB Butterfly valve	Nos.	<b>1</b>
	h.	25 NB Globe Valve	Nos.	<b>6</b>
	i.	40 NB Globe Valve	Nos.	<b>4</b>
	j.	40 NB Foot Valve	Nos.	<b>1</b>
	k.	25 NB Check Valve	Nos.	<b>15</b>
	<b>Procurement, supply, Installation, Inspection and testing of stainless steel butt weld fittings as used in process piping in size ranging from 8 NB to 200 NB.</b>			
	l.	50 NB x 40 NB Sch 40 Concentric Reducer	Nos.	<b>10</b>
	m.	40 NB Sch 40 Equal Tee	Nos.	<b>10</b>
	n.	40x25 Reducing Tee	Nos.	<b>10</b>
	o.	50x 32 Sch 40 Eccentric reducer	Nos.	<b>4</b>
	p.	40x32 Sch 40 Eccentric reducer	Nos.	<b>15</b>
	q.	40x25 Eccentric reducer	Nos.	<b>5</b>
	r.	25 NB (Y - Type) Strainer	Nos.	<b>5</b>
	s.	40 NB (Y - Type) Strainer	Nos.	<b>10</b>
	t.	50 NB (Y - Type ) Strainer	Nos.	<b>4</b>
	u.	SS 304L 25 NB SORF Flange	Nos.	<b>30</b>
	v.	SS 304L 200 NB SORF Flange	Nos.	<b>4</b>
	w.	8 NB Threaded Nipple	Nos.	<b>30</b>
	x.	15 NB Threaded Nipple	Nos.	<b>20</b>
	y.	20 NB Threaded Nipple	Nos.	<b>10</b>
	z.	25 NB Threaded Nipple	Nos.	<b>18</b>
	<b>Procurement, supply, Installation, Inspection of mild steel pipe-supports with SS poison plates over, to support the above mentioned SS piping, valves and fittings, at suitable locations. Existing 5-storey M.S. structure may also be used for pipe supports. MS supports are to be painted suitably.</b>			
	aa.	MS pipe supports as applicable with SS poison plates on top (at pipe contacts)	Kg.	<b>416</b>

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#### **4. DRAWINGS:**

The entire tank installation and pipe erection/modification, etc. work are to be done as per the approved piping GA drawings and spool drawings issued by BARC at site of work.

#### **5. MATERIALS:**

Materials other than those specified in Annexure I (List of FIM) of the tender will be in the scope of the contractor. All the other materials required for the work are under the scope of supply of the contractor.

The material being employed for the piping work shall be properly identified by the contractor and examined visually before using for the piping.

#### **6. FABRICATION OF STAINLESS STEEL MATERIAL:**

##### **6.1 General:**

- a. The area having SS piping fabrication shall be maintained clean for the entire period of fabrication activities.
- b. An exclusive and adequate stock of tools, tackles, consumables, grinding wheels, sanding discs, etc., shall be deployed for the SS job.
- c. Stainless steel wire brushes, wire brush wheels, acetone, etc., shall be provided to the welders for proper pass-by-pass cleaning of weld beads.
- d. Filler wires shall be kept in clean dispensers and should be stored at dry enclosed area.
- e. All stainless steel raw materials shall be in clean condition prior to any fabrication (viz., bending, forming, cutting, welding, etc.) activity. Cleaning shall comply with approved procedure.
- f. All welding works shall be carried out by providing suitable Argon gas back purging arrangement.
- g. All weld edge preparations shall comply with approved geometries. Weld edge preparation shall be made by proper means.

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### 6.2 Handling:

- a. During the various stages of installation and piping, all Stainless Steel materials shall be handled and processed with due care and attention, as required for critical applications.
- b. Direct welding of piping member with any structural materials is not allowed. Specially designed and fabricated clamps shall be used to support pipes.
- c. Proper tools and tackles shall be employed in handling of the Stainless Steel equipment, piping and other materials to avoid impact, dents, scratches, etc. Special care shall be exercised during all stages of handling of the process equipment, to prevent any damage to numerous slender nozzle pipes and other appurtenances.
- d. At no stage of handling, process equipment, piping or any other material of plant construction, from store yard(s) to its final location(s) and till testing and acceptance, shall come in contact with any other chloride or sulfur bearing materials, as encountered usually in identification marking, coding, cleaning, flushing, testing etc.

### 6.3 Piping Erection and Fabrication:

- a. During bending, care shall be taken that SS pipes should not come in direct contact with die made of MS material.
- b. Alignment of piping connected to equipment shall be achieved without bending or springing the pipe under any circumstances. Alignment shall be checked prior to final connection.
- c. Pipe erection shall follow a well-planned sequence to ensure space for welding.
- d. During all activities connected with In-Situ pipe joint fit-up, like; edge preparation, alignment, fit-up, tacking, etc. it must be ensured that no filings or burrs, cotton waste or any other material shall ingress inside the pipe.
- e. Temporary work platforms shall be erected using proper scaffolding mainly supported on the staging members at different elevations. Installed equipment, piping, etc. shall not be used for erection of support of these work platforms, or as a means to climb or descend by the workman.
- f. All the installed piping shall be adequately supported for guiding and load bearing at proper intervals. Welding of these shall be done using GTAW process only.
- g. Pipes shall be supported on pads with adequate bearing area to avoid point contact loading. Wherever possible pipes may be supported to the nearest structural members.



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Dt. 08/12/2017.		

- h. The Contractor shall adequately clean all the materials to make it ready and fit for use before using it for fabrication.
- i. Loading and unloading of piping materials shall be done by hoisting or skidding so as to avoid shock or damage. Under no circumstances materials shall be dropped.
- j. Equipment and piping shall not be used for temporary attachments.
- k. Repair welds, if required, shall be carried out at no extra cost.
- l. Effective precautions shall be taken to prevent mechanical damage and ingress of foreign matter inside the pipes.
- m. All erected pipe lines shall be suitably tagged with SS strips indicating service and line number at regular intervals and at ends. Tagging shall be carried out simultaneously along with pipe-line erection.
- n. Tolerances on fabricated assemblies shall generally conform to the following:
  - Tolerances on linear dimensions, intermediate and overall shall be as follow (these tolerances shall not be cumulative) :
  - Dimension < 250 mm : + 3 mm
  - Dimension 300 to 600 mm : + 5 mm
  - Dimension 650 to 900 mm : + 6 mm
  - For dimensions over 900 mm, tolerance is +6 mm, increasing by +2 mm, for every 300 mm increase over and above 900 mm.
  - Due to cumulative effects of tolerances on fittings and flanges, where joined without intervening pipe segments, deviations in excess of those specified in above paragraphs are permissible.
  - \*Axial as well as angular alignment of welding ends shall not deviate from the indicated position, measured across any diameter, by more than 1.0 mm per 25 mm or by 1 mm whichever is greater.

#### **6.4 Grinding Requirements:**

- a. Fabrication and welding should be such that repair by grinding work will be minimum.
- b. All grinding wheels which are employed for job should be suitable for stainless steel or for exotic materials.
- c. Grinding wheels used shall be separate for Stainless Steel and Carbon Steel materials. No grinding wheel or cutting wheel which has been earlier used for Carbon Steel or any other material other than Stainless Steel shall be allowed for grinding on Stainless Steel components.
- d. It should be ensured that the sander /flapper wheels applied on the job are suitable for use on stainless steel or on exotic materials.

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- e. No rough grinding/dent marks shall be allowed on the inside or outside pipe surface.

#### 7. WELDING:

- a. Welding fixtures, clamps or fixtures should not have any surfaces made from lead, zinc or copper/copper alloy that can cause contamination of the stainless steel work-piece. All fixtures shall be lined suitably to avoid any iron contamination of the material.
- b. Welding equipment and machinery shall be of good quality and shall be maintained in efficient working conditions. The fabricator shall be required to produce documents, if desired, by the Purchaser's Quality Surveyor, in support of proper calibration of the equipment.
- c. Fabricator shall ensure that there is a regular and systematic supervision of all welding work. The fabricator shall institute a system whereby all welds can be traced to the welder responsible for their production.
- d. Full penetration (FP) pipe welds shall be continuously back purged with High purity Argon gas throughout during welding. **Argon Gas back purging shall be maintained for all the weld passes of the joint. Purging method will be demonstrated by the contractor to QA, BARC.** Use of Dam paper (if proposed) for purging will be subjected to demonstration and approval by QA BARC w.r.t. its solubility, purging effectiveness etc.
- e. Surfaces to be welded plates/pipes/fittings etc., 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 approved solvents. Weld craters shall be examined for defects that shall be removed by grinding. Wire brushes used shall be of stainless steel to avoid contamination of weld surfaces and these brushes shall not be used for cleaning any Carbon steel material.
- f. Haphazard striking of electrode/weld torch on base metal or weld material for establishment of arc shall not be permitted. High Frequency unit shall always be used for arc starting. In case inadvertent arc strikes occur, the affected area shall be ground flush and surface examined by dye penetrant test.
- g. Tack welds on pressure part shall be DP examined for defects before continuing with further welding and any defects observed shall be rectified using the approved procedure. Only qualified welders shall do tack welding.
- h. Necessary precautions shall be taken to avoid distortion.
- i. Suitable welding fixtures shall be used in achieving the requisite fit-ups for welding as per approved WPS & PQRs.
- j. Due care shall be taken in weld edge preparation by grinding.

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k. Weld inter-pass temperature is restricted to 100<sup>0</sup> C.

### 7.1 Joint Preparation:

- a. Unless specified otherwise, all intersecting and abutting parts to be welded shall be joined by complete penetration groove butt welds. Permanent backing rings or strips shall not be used.
- b. Special care shall be taken to secure complete and thorough penetration of the fusion zone into the bottom of the weld. Root run and finished weld shall be checked by liquid penetrant testing for all welds.
- c. All joints shall be made by GTAW welding with full argon gas purging.

### 7.2 Inspection of welds:

- a. The Contractor shall provide all the testing & inspection services, facilities, manpower, except where otherwise specified, for the inspection and testing requirements covered under the scope of this specification.
- b. Inspection by the Engineer-In-Charge or his authorized representative shall not relieve the Contractor of inspection and conformity to this specification.
- c. All the materials procured by the Contractor including welding consumables, liquid penetrant material, etc. shall be of required quality as designated by applicable standards.
- d. All piping joints inside the vaults shall be of “**butt**” design and structural welds shall be of “**fillet/Groove & Fillet**” design. **Any other weld construction proposed by the contractor shall be got approved through Engineer-in-Charge.**
- e. All pipe to pipe welds shall be LP examined after root and final pass as per ASTM E 165. The LPE material shall be of quality suitable for stainless steel material.

### 7.3 Visual inspection:

Visual inspection shall be carried out for the following:

- a. Materials and components to ensure that these are as per the specifications and are free from defects.
- b. Joint preparation and cleanliness.
- c. Fit-up, joint clearance and internal alignment prior to joining.
- d. All welds shall be visually inspected by BARC QA after completion.

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#### **7.4 Liquid Penetrant Examination (LPE):**

Dye penetrant examination method shall conform to ASME Sec. VIII. Only visible dye-penetrant solvent (removable type) method shall be employed for all welds, and other metallic surfaces. When used on austenitic stainless steel surfaces, the penetrant materials (penetrant, developer and cleaner), Sulphur and total Halogen contents shall be less than 1% and 25 ppm respectively when tested in accordance to ASTM D129 (Sulphur) and ASTM D808 (Halogen).

#### **8 LOOP PRESSURE TESTING:**

- a. All systems shall be tested for test loops as approved by BARC.
- b. These installed piping system(s) shall be subject to pneumatic tests to ensure integrity of the erected system(s). The test medium used, at the test pressure, shall be moisture free air in accordance with project Line Designation Schedule. Air shall be provided by the department.
- c. Pressure testing shall be carried out only after the completion of non-destructive testing of welds.
- d. Pneumatic testing for all pipelines/spool segments shall be done by the Contractor as per the test scheme and procedures approved by the Engineer-In-Charge. Pneumatic Testing shall be discussed after erection of the piping and considering all the constraints.
- e. Contractor shall provide all isolations, temporary blanking, additional supports testing equipment, calibrated pressure gauges as needed for the job. For convenience of testing a system may be subdivided into various circuits and loops. Wherever required, spools fabricated at shop shall be tested at shop.
- f. After satisfactory completion of leak tests, system(s) shall be gradually depressurized.

#### **9. CLEANING AND FLUSHING OF PIPING:**

- a. During fabrication and installation, the Contractor shall prevent foreign materials such as oil, grease, sand, dirt, scale, loose particles from cutting, grinding, etc from entering the pipe or pipe component. If foreign materials have entered the pipe or pipe component, they shall be removed immediately before the assembly of the parts by a suitable cleaning method such as wire-brushing, blowing through with air or degreasing using a suitable cleaning agent or solvent.

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NRG/PSDD/ED&TS/E ETF/MUA/2017/217096  Dt. 08/12/2017.	Annexure-1 :TECHNICAL SPECIFICATION FOR <b>On-site fittings of SS leg supports, relocation &amp; installation of; existing and new stainless steel tanks, pumps and other equipment. And also erection of SS pipes; interconnecting pumps, tanks and other equipment as per specifications and drawings (to be given at execution time). The entire work to be done at EETF, WIP-Complex, Trombay, Mumbai.</b>	

b. Cleaning of erected piping systems shall be accomplished by one of the following methods:

- i. All air lines and all other lines, which are pneumatically tested, shall be blown with clean dry air.
- ii. Cleaning and flushing operations shall be done through open pipe ends or branches and not through equipment. Cleaning and flushing operations shall be carried out until all trash and construction debris are removed from the piping system(s).
- iii. Stainless steel piping systems shall be flushed with DM water.
- iv. Following flushing operations, lines shall be dried and all equipment/items isolated or removed during flushing operations shall be connected or reinstated.

#### **10. SUPPLY OF VALVES AND FITTINGS:**

Valves/Fittings mentioned in quantities, in item-2 should be of the following specifications. The contractor shall arrange and submit all the material and test certificates obtained from the manufacturers. Contractor shall offer the valves for hydro-testing/leak testing and other inspection prior to delivery of the valves at site for installation.

##### **Valves:**

- **Material of Construction:** Class 150, SS 304 (ASTM A351 Gr. CF8)
- **Seating material for valves:** Teflon
- **Valve Operation:** Manual
- **End connections:** Butt welded type
- **Leak tightness quality:** Steam type leak tightness

##### **Fittings:**

- **SS Reducer/Tee – ASTM A 403 WPS 304L, Bevelled End Seamless, ANSI 16.9, solution annealed.**
- **SS Flanges – ASTM A 182 F 304L, Class 150, SORF**
- **SS Nipples – ASTM A312 TP 304L, Seamless, Threaded on both ends, Thread: NPT.**

##### **Pipe Supports:**

- **MS : IS 226**
- **SS poison plates : 1.6 mm thick and material shall be compatible with SS pipe material.**

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**On-site fittings of SS leg supports, relocation & installation of; existing and new stainless steel tanks, pumps and other equipment. And also erection of SS pipes; interconnecting pumps, tanks and other equipment as per specifications and drawings (to be given at execution time). The entire work to be done at EETF, WIP-Complex, Trombay, Mumbai.**

**APPENDIX – I****FREE ISSUE MATERIAL (FIM)**

(Ref.: NRG/PSDD/ED&amp;TS/EETF/MUA/SS/2017/217096 Dt.08/12/2017)

Instructions Regarding Free Issue Materials (FIM):

1. The work shall be carried out at EETF, WIP-complex, site is inside BARC Premises, Trombay hence NO Insurance of FIM is required.

S. No.	Item	Material	Qty.	Remarks
1.	Seamless Pipe 15 NB Sch 40	S.S. 304L	10 Meters	As available
2.	Seamless Pipe 20 NB Sch 40	S.S. 304L	10 Meters	As available
3.	Seamless Pipe 25 NB Sch 40	S.S. 304L	980 Meters	As available
4.	Seamless Pipe 40 NB Sch 40	S.S. 304L	10 Meters	As available
5.	Seamless Pipe 50 NB Sch 40	S.S. 304L	10 Meters	As available
6.	Seamless Pipe 100 NB Sch 40	S.S. 304L	10 Meters	As available
7.	Seamless Pipe 200 NB Sch 40	S.S. 304L	20 Meters	As available

2. All filler wires in the required specifications and sizes, as per BARC standards for similar welding work, will be issued by BARC, as Free Issue Materials (FIM).

**No material, issued as FIM by BARC shall be taken out of the facility site or out of BARC at any time during the entire period of execution. No insurance coverage will be required for any of the FIMs mentioned.**