Ph. (Direct): 25596819/25593922
Ext.: 26819/23922
Email: jitenk@barc.gov.in

CFB, Trombay
MUMBAI – 400 085

GOVERNMENT OF INDIA
BHABHA ATOMIC RESEARCH CENTRE
Cryo-Technology Division

Ref: BARC/CrTD/JK/MF/2022/05 **Date: 16/03/2022**

Tender No.: BARC/CrTD/JK/MF/2022/05
Tender Due date: 30/03/2022

Sub: Invitation to submit quotation

On behalf of the President of India, Head, Cryo-Technology Division, Bhabha Atomic Research Centre invites lowest quotation in sealed envelope **(Technical and commercial quotation in separate sealed envelopes)** for the work given below as per the technical specifications enclosed herewith.

S. No.	Description of Job	Completion Period
1	**Cryogenic piping at CFB for the feedbox testing as per specification.**	9 months from date of W.O.

The terms and conditions are given below:

1. **Qualifying criteria for bidders**

1.1 Firms willing to bid for above mentioned job shall have been vetted by Security Section of BARC.

1.2 All the supervisors and workers should have valid Police Verification Certificate (PVC). The list of manpower available with firm shall be submitted along with their details of PVC.

1.3 The past experience of the firm in similar nature in BARC/DAE shall be made available with Work Order copy and satisfactory completion certificate from the user. Also the list of ongoing jobs inside BARC premises with expected completion period shall be provided.

1.4 Interested bidders shall contact the undersigned on Phone No. 2559 6819 (Ext. No. 26819) with above mentioned details for getting the Detailed Tender Specification.

2. The quotation envelope shall be superscripted with **Description of the job and the Tender Ref. No.,** mentioned above.

3. Envelops of technical and commercial quotations should be named as technical bid and commercial bid respectively along with tender reference no.

4. Technical quotation should contain :

4.1 Specification and catalogue/ datasheet of standard components.

4.2 Welder performance qualification as required by the technical specification.

5. Commercial quotation should contain price details of each every item. Taxes should be quoted separately.

6. The complete quotation shall reach the following address on or before **30/03/2022** by **Registered Post/ Speed post.** The quotations will be opened on the next working day at Cryo-Technology Division, BARC between 1400 to 1600 Hrs.

Head,
Cryo-Technology Division,
Bhabha Atomic Research Centre,
Trombay, Mumbai- 400 085

7. **There is no FIM.**

8. The bidder shall have to take an insurance policy against any material issued to him by the purchaser.

9. The fabrication work shall be subjected to inspection by our engineers from CrTD and TSD at site CFB, BARC, Trombay.

10. **Printed Letter Head**: Quotation should be printed on the letter head; computer generated quotation is not valid.

11. **Validity of the Offer**: Validity of the offer shall be 90 days from date of opening of quotation.

12. **Guarantee**: Vendor shall have to give guarantee of the quality and workmanship of work done for the period of 12 months from the date of completion of the work.

13. **Offer of Firm:** Offer of those firms, who do not submit their quotation as per the details given in the technical specification and incomplete quotations in any respect shall not be considered.

14. The department reserves the right to extend the date of opening the quotations.

15. **Payment Terms:** Accounts Division BARC Mumbai-400085 shall make full and final payment only after submission of the satisfactory work completion certificate issued from the undersigned, bill, guarantee certificate, delivery chalan and advanced stamped receipt. No advance is admissible.

16. **Income Tax Recovery Clause:** Income tax @ 2% will be deducted from the bill.

17. If any of the employee, consultant, or partner of the company is an Ex BARC employee, the same must be stated in the quotation clearly.

18. **Penalty:** Any delay which attributable to the contractor is liable for penalty @ 0.5 % per week (max 5 %) to be imposed on contractor.

19. **GST/PAN Number:** Quotation shall consists of GST Registration Number registered with local ST authority /CST authority, PAN number of the firm, service tax registration number etc.

20. **Quantity Variation Clause:** Quantity variation of ± 10% is possible during the execution of the job. Actual payment shall be made based on the actual work carried out by the contractor after completion of entire job.

21. **Safety & Security Rule:** The vendor shall follow all the safety procedures as per the normal industrial practice during the execution of the job at site. Any mishap occurring during the work due to unsafe workmanship shall be the vendor's liabilities. Security and transportation rules at BARC, Trombay premises shall be strictly followed.

22. Confidential Clauses:

i.Confidentiality : No party shall disclose any information to any third party concerning 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 shall not be disclosed to any third party without the prior written consent of the original disclosing party This clause shall apply to the sub- contractors, consultants, advisors, 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 of the Official Secret Act, 1923: Any contravention of the above mentioned provisions by any contractor, sub- contractor, consultant, advisor or the employee of a contractor will invite Penal consequences under the aforesaid legislation.

iii. Prohibition against use of BARC's name without permission for any publicity Purpose. The contractor or Sub contractor, consultant, advisor or the employees engaged by the contractor shall not be use any public purposes through any media like press, TV, or internet, without the prior written approval of BARC

जितेंद्र कुमार
Jitendra Kumar
वैज्ञानिक अधिकारी / Scientific Officer (E)
क्रायो-प्रौद्योगिकी प्रभाग / Cryo-Technology Division
भारत सरकार / Government of India
भाभा परमाणु अनुसंधान केंद्र / B. A. R. C.
ट्रॉम्बे, / Trombay, मुंबई / Mumbai - 400 085

(Jitendra Kumar)
Scientific Officer (E)
CrTD, BARC

TECHNICAL SPECIFICATIONS

This specification establishes the technical requirements for the "***Cryogenic piping at CFB for feedbox testing as per specification***".

Contents

1 Scope and Description of Job

This job includes supply of materials and fabrication of *cryogenic piping* at CrTD, CFB, BARC. Quantity of the materials to be supplied is listed in table 1.1 and fabrication

work is listed in table 1.2. Volume of the fabrication work is quantified as number of weld joints equivalent to 1" NB pipe. Procurement, testing (all the tests required in this specification) and supply is the scope of contractor. Fabrication of piping work shall be in the scope of contractor and will be done at buyer's site (CrTD, BARC). Detailed Specification is given in the following paragraph.

Table 1.1 - Scope of supply

#	Supply of material	Quantity	Details
1	Machined fittings	As per specification para. 2.1	As per specification, para. 2.1
2	Stainless steel tubes	As per specification para. 2.2	As per specification, para. 2.2
3	Vacuum valves as per specification	As per specification para. 2.3	As per specification, para. 2.3
4	CF flanges, gasket and bolts	As per specification para. 2.4	As per specification, para. 2.4
5	Vacuum vessel	01	As per specification, para. 2.5
6	Copper shell	01	As per specification, para. 2.6
7	DB 25 connector wire assembly	10	As per specification, para. 2.7

Table 1.2 – Scope of fabrication

#	Description of fabrication	Quantity	Details
1.	Stainless steel cryogenic piping. Material - 304 L / 316 L .	No of TIG weld joints equivalent to 1" NB pipe - **484**	As per specification, para. 2.8

2 Specification of Material and Work

2.1 Specification of machined fittings

i. Components shall be machined as per dimensions and tolerances given in the attached draft drawing (Reference draft drawing: Para 5.1 to 5.7). Final drawings will be provided with work order.
ii. Material – Stainless steel 304L (Material is in the scope of supplier)

iii. All the material used should be marked. Test and certificates required for all the materials are as following - a) Chemical test- ASTM A 751, b) Tension test- ASTM A-370 c) Inter-granular corrosion test - ASTM A 262, practice E.

iv. Testing as per specification is in the scope of supplier.

v. Quantity : as per table 2.1

Table 2.1 Quantity of machined components

#	Description	Quantity
1	Item - 1	5
2	Item - 2	01
3	Item - 3	01
4	Item - 4	01
5	Item – 5	01
6	Item – 6	01
7	Item- 7	02

2.2 Specification of tubes

i. Stress-Relived Annealed Seamless tube as per ASTM A-269 and ASTM A-450

ii. Material – Stainless steel 316 L

iii. Size : a) ¼ X 0.049 inch , b) 8 X 1 mm

iv. Quantity – 12 meter in both sizes

v. Material – bright annealed
Tests / mil certificate: Material test (chemical, mechanical, Inter granular corrosion test as per ASTM A -262, practice E) certificate, flaring test, hydrostatic test, and ultrasonic test report from manufacturer has to be provided with supply. All these tests are in the scope of supplier.

vi. It should conform to ASTM A-269 requirements.

vii. Tubes shall preferably be supplied in length of 5 to 6 meters without welding in between. Tube length less than 5 meters shall be rejected.

viii. Tubes should be supplied with both ends plugged with plastic cap.

2.3 Specification of vacuum valves:

Following bellow sealed vacuum valves of reputed make shall be supplied:

		Quantity
a)	Manually operated bellow sealed right angle isolation valve	1
b)	Manually operated bellow sealed gate valve	1

a) Specification of manually operated bellow sealed right angle isolation valve :

i. Quantity : 01

ii. Nominal size: DN 65
iii. End connection : CF 63 ends (Fixed) (Knife edged flange to be used with copper gasket)
iv. Valve conductance : 160 l/s
v. Operation : Manual actuation using handle suitable for operation with bare hand
vi. Centre to face distance 105 ± 0.5 mm
vii. Material :
- Main body with end flanges and bellow ends : SS 304
- Shaft retainer : SS 304
- Seat seal : Viton E 60 C
- Bonnet seal : OFHC Copper
- Bellow : SS 316 L or SS 316 Ti
- Bellow life : 10,000 cycles

viii. Operating Parameters :
- Pressure : 10^{-7} mbar to 5 bara
- Temperature : 30^{o} to 100^{o} C
- Differential temperature across seat : 5 bar

ix. Leak Tightness :
Minimum required leak tightness checked with helium mass spectrometer:
- Body and all weld joints: Less than 2 x 10^{-10} mbar. l/s
- Seat seal: Less than 2 x 10^{-9} mbar. l/s
- Bonnet Seal: Less than 2 x 10^{-10} mbar. l/s
- Under pressure at 5 bara using Sniffing method- leak rate should be less than 1 x 10^{-6} mbar l /s

x. Test / Test certificate :
Test certificates to be provided by contractor/ manufacturer of valve
- Pneumatic Test certificate (≥ 5.5 bara)
- Bellow material test certificate
- Bellow cycle guarantee certificate
- Helium leak test certificate showing the leak tightness equal to or better than the required minimum leak tightness.

b) Specification of manually operated Bellow Sealed Gate Valve

i. Quantity : 01
ii. Nominal size :DN 63
iii. End connection : DN 63 CF fixed and tapped end flanges
iv. Shaft seal : SS 321/ 316L hydro-formed bellow
v. Operation : Manual actuation using hand wheel
vi. End to end (face to face of CF flanges) distance: 64 ± 5 mm

vii. Material :

- Main body and end flanges : SS 304 L
- Seal Plate, bonnet flange : SS 304 L
- Shaft, Levers and all inside mechanism parts : SS 304/ SS 304L
- Gate seal : Viton E 60 C "O" ring
- Bonnet seal : Aluminum wire seal
- Drive arm to bonnet cover flange seal: Aluminium wire seal
- Lubrication for vacuum exposed parts – Fomblin grease / oil
- Secondary seal for bonnet flange, bonnet cover flange and bellow: VITON E 60 C 'O' ring
- Bellow : SS 316 L or SS 316 Ti
- Bellow life : 10,000 cycles

viii. Operating Parameters :

- Pressure : 10^{-10} mbar to 1.6 bara
- Temperature : 20° to 150° C
- Minimum differential temperature across seat : 1.6 bar in either directional
- Minimum design internal pressure for valve body : 1.6 bara
- Mounting : Any orientation

ix. Leak Tightness :

Minimum required leak tightness checked with helium mass spectrometer:

- Body, all weld joints, bonnet joints and bellow: Less than 2×10^{-10} mbar. l/s
- Seat seal: Less than 2×10^{-9} mbar. l/s
- Secondary seal: Less than 2×10^{-7} mbar. l/s
- Under pressure at 5 bara using Sniffing method- leak rate should be less than 1×10^{-6} mbar l /s

x. Test / Test certificate :

Test certificates to be provided by contractor/ manufacturer of valve

- Pneumatic Test certificate
- Bellow material test certificate
- Bellow cycle guarantee certificate
- Helium leak test certificate showing the leak tightness equal to or better than the required minimum leak tightness.
-

2.4 Specification of CF flanges, copper gasket and hexagonal head screw sets:

Conflat flanges and gasket with dimensions as per ISO 3669:2020.

i. Conflat flange material- 304 L
ii. Gasket material – OFHC copper of 2 mm thickness
iii. Hexagon Head Screw Set: Stainless steel A2 bolt, Stainless steel Nuts (1 nut per screw) and stainless steel washer (2 washer per screw).
iv. Quantity : as per table 2.2

Table 2.2 : Quantity of conflate flange, OFHC gasket and Hexagon screw

#	Material	QUANTITY
1	Welding flange, DN 35 CF, stainless steel 304L, tube 35 x 1.5	2
2	blank flange, DN 35 CF, Stainless steel 304L	1
3	Copper gasket, OFHC copper, DN 35 CF	10
4	Welding flange, DN 63 CF, stainless steel 304L, tube 63.5 x 1.65	2
5	weld flange rotatable, DN 63 CF, Stainless steel 304L, tube 63.5 x 1.65	2
6	Blank flange, DN 63 CF, Stainless steel 304L	2
7	Copper gasket, DN 63 CF, OFHC copper	10
8	Weld flange, DN 75 CF, stainless steel 304L, tube 76.1 x 2	1
9	Blank flange, DN 75 CF, Stainless steel 304L	1
10	Copper gasket, OFHC copper, DN 75 CF	5
11	Weldable flange, DN 100 CF, stainless steel 304L , tube 101.6 x 2.1 mm	2
12	Copper gasket, DN 100 CF, OFHC copper	10
13	Half nipple, DN 160 CF, stainless steel 304L, tube 159 x 2 mm, length= 167 mm	1
14	Half nipple rotatable , DN 160 CF, stainless steel 304 L, tube 159 x 2 mm, length =167 m	1
15	Blank flange, DN 160 CF, Stainless steel 304L	1

16	Copper gasket, DN 160 CF, OFHC copper	5
17	Hexagon Head Screw Set (bolt +nut+ washer) for DN 35 CF Flanges with Through-holes	2
18	Hexagon Head Screw Set (bolt +nut+ washer) DN 63 CF Flanges with Through-holes	2
19	Hexagon Head Screw Set (bolt + nut + washer) for CF 75 Flanges with Through-holes	2
20	Hexagon Head Screw Set (bolt + nut + washer) for CF 100 Flanges with Through-holes	2
21	Hexagon Head Screw Set (bolt + nut + washer) for CF 160 Flanges with Through-holes	2

2.5 Specification of Vacuum Vessel

- Vacuum vessel (Figure 2.7) shall be fabricated as per the rules of ASME BPVC Sec viii div 1 and dimensions as provided in this specification. Detailed drawing shall be given with purchase order.
- Vessel shall be delivered in two pieces which will be welded together in field by the purchaser. Vessel shall be cut into two parts along a horizontal plane passing through center of hole 1 (figure 2.8).
- Both pieces shall have separate handling fixtures.
- Bottom piece shall have support lug attachments to be welded with consent of purchaser.
- Tests Required: 100 % ultrasonic test of parent metal sheet, test chemical test of material and Mechanical test of material, 100 % Radiography test on but welds of vessel. All the tests are in the scope of supplier.
- Final drawing shall be given with purchase order.

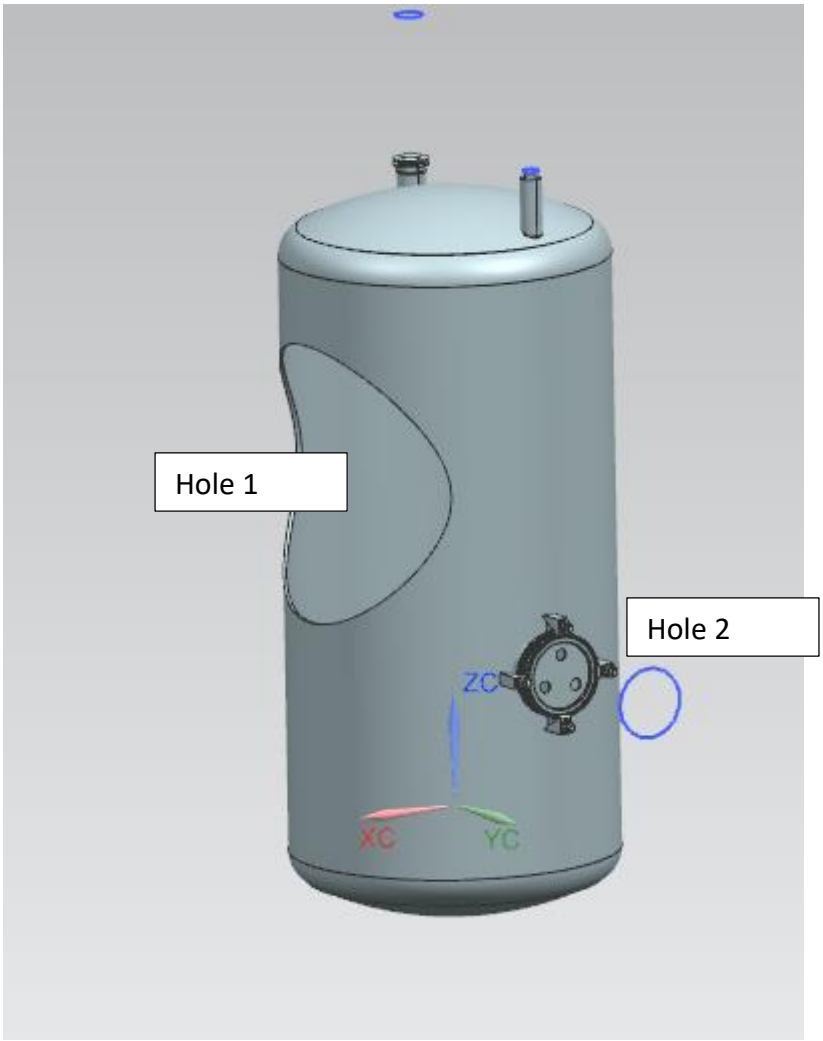


Figure 2.7: Vacuum vessel general arrangement

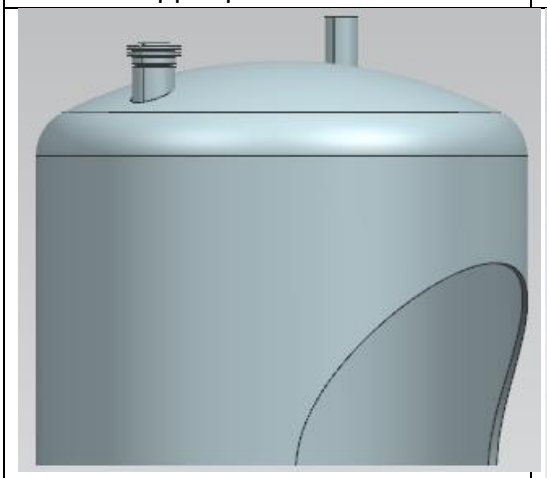
Upper part of vessel	Lower part of vessel
	

Figure 2.8 : Two parts of vacuum vessel

The vessel dimensions:

i. Cylindrical shell :

Dimensions of this shell is listed in Table 2.3. The cylindrical shell shall have two holes. Details of these holes are given in table 2.4. Location of these holes are shown in figure 2.9.

Table 2.3 Cylindrical Shell details

OD	508 mm (20 inches)
Thickness	4 mm
Length	920 mm
Material	SS 304 L

Table 2.4 : Details of holes in cylindrical Shell of figure 2.8 and 2.9

Hole 1 dia	430mm	
Hole 2 dia	108mm	To be provided with welded ISO 100 Flange, blind flange, sealing ring, o-ring and fasteners. (Picture 3.7)

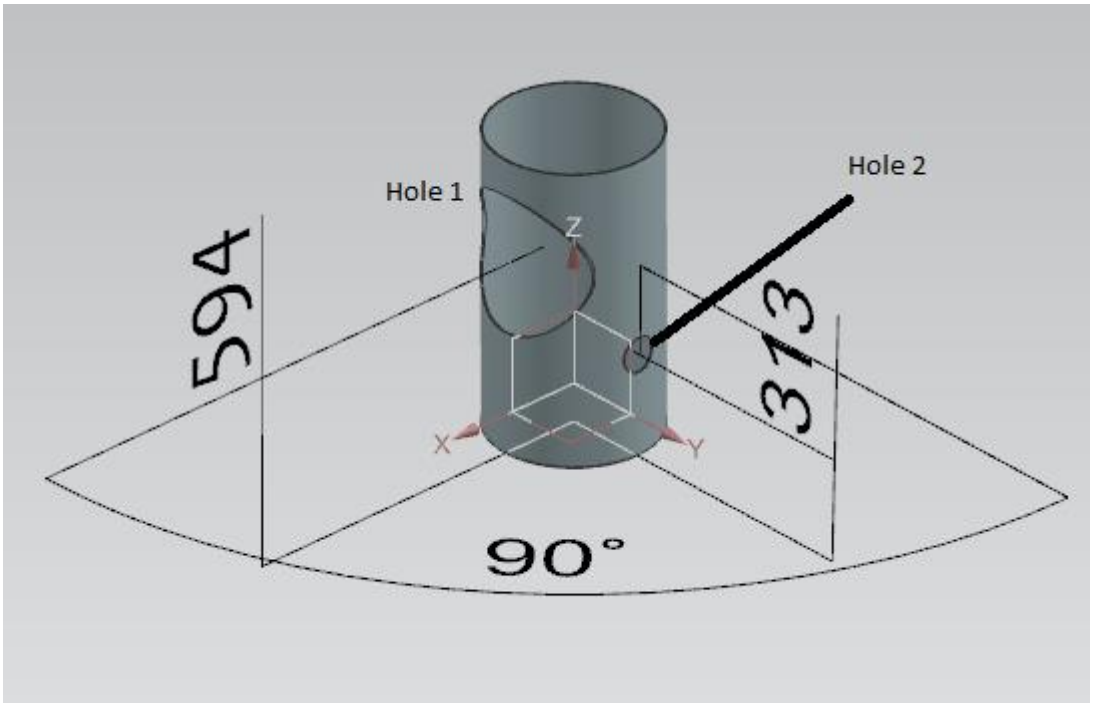


Figure 2.9 : Cylindrical shell details

ii. Torispherical head

Torispherical dish head shall be supplied welded to cylindrical shell. Torispherical head shall have dimensions as given in table 2.5. Top head will have two holes and attachments as described in table 2.5 and shown in figure 2.10. Attachments are the scope of supplier. Bottom head does not have any hole. Welding of fittings in hole no 3 and 4 should be done according to the practices of vacuum equipment manufacturing. OD of the weld fitting should match the ID of the holes.

Table 2.5 : Torispherical Head

OD	508 mm (20 inches)	
Thickness	4 mm	
Knuckle radius	10%	
Straight flange length	0 mm	
Bottom Head	No holes	
Top Head (Figure 3.10)	2 Holes	Hole No. 3 : KF 25 half nipple welded and supplied with KF blind.
		Hole No. 4 : 34 x 1 mm tube of 75 mm length welded.
Bottom Head	No holes	-

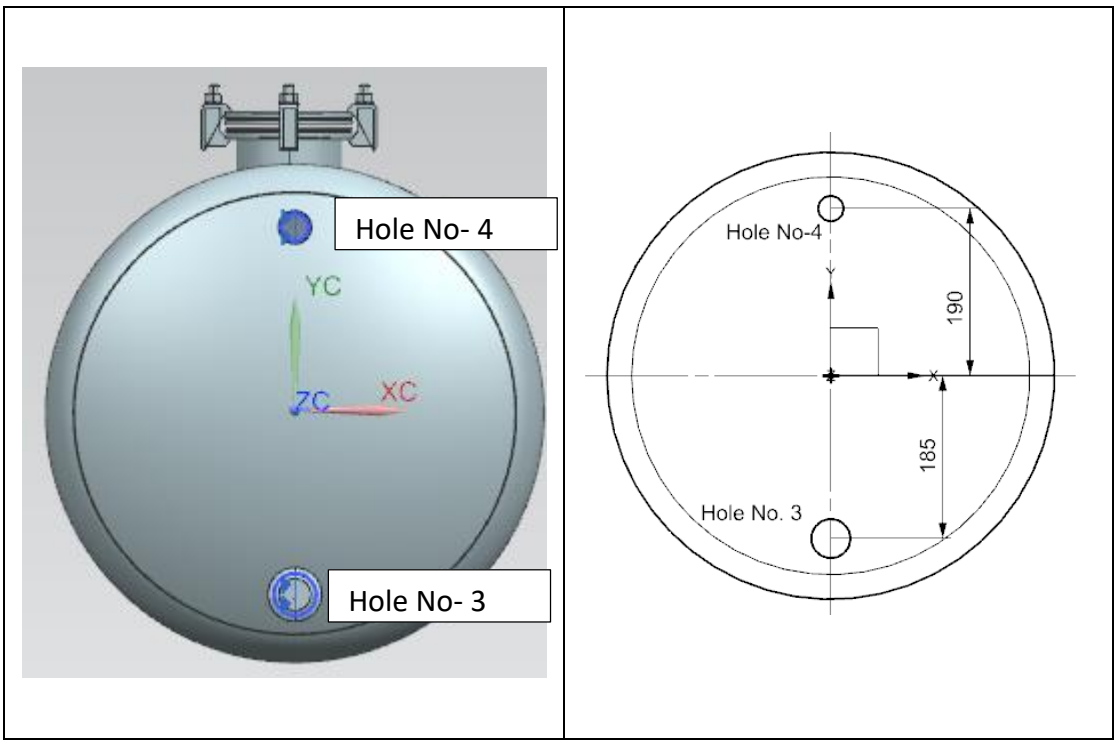


Figure 2.10: Figure showing the hole location on top Torispherical head

2.6 Specification of copper shell:

Copper shell fabricated (quantity -01 no) as per specifications of table 2.6 and fugure 2.11 should be supplied in bright condition without the trace of flux used for manufacturing.

Table 2.6 : Copper shell description

#	Description	
1	Material	Oxygen free copper (minimum copper% - 99)
2	Diameter	219 mm
3	Height	840
4	End Heads	2 mm thick flat sheet
5	Method of joining	Brazed Or TIG welded
6	No of holes	2 (figure 2.11)

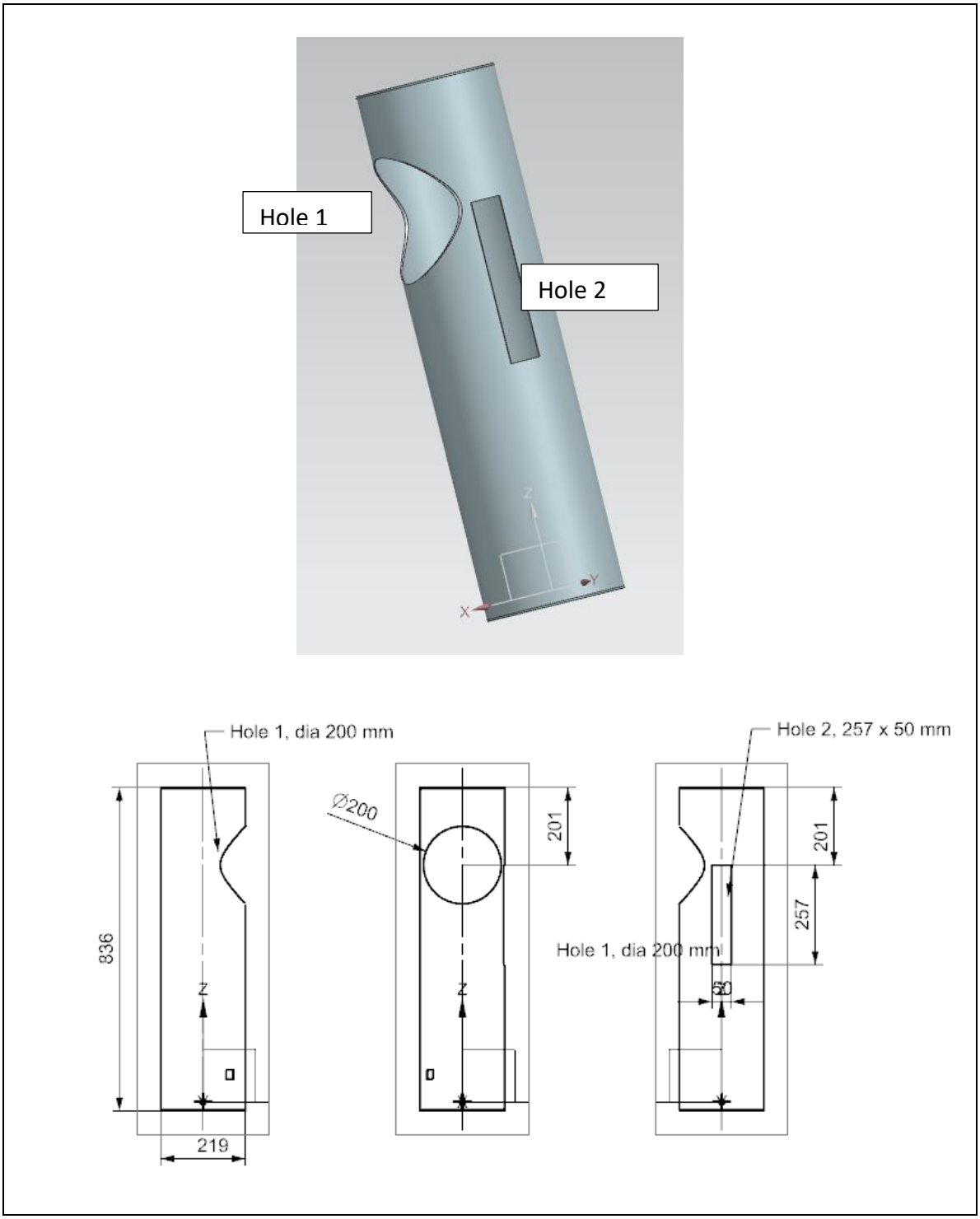


Figure 2.11 : Copper shell dimension and location of holes

- Final drawing will be given with purchase order.
- Test Report: Supplier shall produce material certificate indicating the chemical composition (testing/test certificate is in the scope of supplier).

2.7 Specification of DB 25 male connector and wire assembly:

DB 25 male connector as per specification and quantity given in table 2.7 should be supplied in appropriate packing.

Table 2.7 : Specification of DB25 connector- cable assembly

#	Specification	Quantity
1	DB 25 Male connector in metallic shell and soldered with 25 core unshielded cable of 7m length. Other end of the cable will be open.	10

2.8 Specification of fabrication work:

Numbers of TIG weld joints equivalent to 1" NB pipe – 484

Welding and fabrication shall be performed as per the following guidelines:
Specification of the welding work of SS 304 (L) and 316 (L) piping/ tubes:

- The fabrication of piping generally shall be in accordance with ASME Code Standard B31.3-2014.
- The welding procedure and performance qualifications shall be in accordance with ASME BPVC section IX.
- The welding procedure specifications (WPS) shall be in accordance with ASME code Section IX.
- The procedure qualification report (PQR) and welder performance qualification (WPQ) shall be as per ASME BPVC , section IX .
- Approved WPS, PQR, WPQ for stainless steel pipes welding in 6g shall be submitted before start of the work.
- All joints on the main piping shall be full penetration joints. Inside surfaces of the mating parts shall be matched and merged smoothly.
- Prior to welding, 50mm on each side of the weld shall be specifically cleaned using acetone or Alcohol. All surfaces 150mm on each side of the joint shall be free from scale, rust, slag, paint, surface oxide etc. These shall be removed by SS wire brushing, abrasive blasting or grinding.
- Weld edge preparation shall be machined smooth by machining or to a limited extent by grinding.
- All welding on stainless steel parts are to be performed by a qualified welder by TIG welding as per WPS. The weld is to be protected by purging with Argon gas during the welding. The Argon gas used for shielding and purging shall be of 99.995% purity. The gas flow shall be continued for a period sufficient to prevent oxidation of the weldment after arc is extinguished.

- Tack welds shall be wire brushed with a clean stainless steel brush and inspected for cracks and defects and corrected before first pass is made. After the first pass, the weld is to be DP tested carefully for cracks, craters, pin holes etc. Craters, cracks and rough spots are ground out before the weld is continued.
- When track welds are not removed but are to be incorporated into the final weld, they shall be ground so that they do not exceed 1.5mm in thickness and their ends shall be feathered prior to depositing subsequent weld metal. Welds with poor penetration, flux or slag inclusions, pockets, bubbles or surface flaking are not permitted.
- Repair of weld defects: All defects such as cracks, blow holes, lack of penetration inclusions etc. shall be removed by mechanical means or gauging process after which the joint shall be re-welded or re-inspected.

Surface finish and cleanliness to be adhered for welding:

- All welds shall be finished smoothly and merge with the parent metal without ridges or undercutting. Any gauging marks scratches etc. which occur during fabrication, testing and shipment shall be repaired to the satisfaction of the purchaser.
- All scale oxides, weld spatter, oil, machining chips and other foreign materials shall be completely **removed and buffed** on both the inside and the outside of the equipment. All surfaces that will not permit cleaning after complete fabrications shall be cleaned of all foreign material prior to assembly. Only certified and approved chemicals and cleaning agents shall be employed. After cleaning, the surface shall be free of chlorides and other injurious contaminants like Lead, Sulphur. Only potable water with a total free Halogen content not exceeding 50ppm shall be used for flushing operations. All traces of water shall be removed by using warm air or other acceptable means.
- All the internal as well as external surfaces of pipe and plate materials shall be cleaned and buffed.

Testing and Inspection for welded joints:

- Stage wise inspection shall be carried out during the fabrication and erection of the piping work. The entire weld joint will checked for fit-up, root and final weld pass.
- Helium leak test both vacuum and pressure shell be done by the user for each joint. Contractor shall guarantee the leak tightness of $1x\ 10^{-9}$ mbar-l/sec under vacuum and $1x\ 10^{-6}$ mbar-l/sec under pressure for each weld.

- The contractor shall maintain record for all inspections, which shall cover dimensional accuracy, surface finish, fit and alignment, workmanship and completeness.

- Purchaser may ask for die penetrant test on some joints. Die penetrant test shall be in the scope of supplier.

- The procedure for Liquid Penetrant Examination shall be as per section V of ASME boiler and pressure vessel code.
- Acceptable standards shall be as per Appendix 8, Methods for Liquid Penetrant Examination (PT) of ASME Section VIII Div 1.

3 Technical terms and conditions

3.1 RIGHTS AND PRIVILAGES

- Purchaser reserves the right to inspect any machinery, material, equipment or tool used by the manufacturer for the manufacture of equipment.
- Should the purchaser waive the right to inspect any equipment, tool, machinery item such waiving shall not relieve party in anyway of his obligation for supplying materials as per this specification.
- Purchaser or his representative shall be permitted free access to party's premises at all reasonable times for the purpose of inspection work at all stages of manufacture of the piping.
- Purchaser or his representative shall be given full assistance in the form of necessary tool, instruments, equipment, drawings, qualified operators and other facilities to facilitate inspection.
- The manufacturer has all the responsibility of providing the purchaser or his authorized representative with all specified information regarding manufacturing and of assuring that the quality control, the detailed examination specified herein are performed to permit them to be meaningful and to the satisfaction of the purchaser.
- Even though the inspection may be carried out by the purchaser or his representative, such inspection, shall not, however relieve part of the responsibility for furnishing equipment conforming to the requirements of this specification nor prejudice any claim, right or privilege which the purchaser may have because of the use of defective and unsatisfactory equipment.
- If the manufacturer fails to adhere to the approved manufacturing schedule or fails to supply equipment as per this specification, the purchaser will have the right to terminate the contract.

3.2 SPECIAL NOTES

- The manufacture shall prepare and submit the detailed manufacturing and inspection plan within two weeks of placing the purchase order for approval

by the purchaser. When approved in writing by the purchaser, these procedures and plans shall form a part of this specification.

- The purchaser reserve the right to make minor changes without significantly affecting the scope of work.
- Checking and approval of procedure by the purchaser do not relieve the manufacturer from full responsibility for ensuring correct interpretation and completeness of procedures.
- The manufacturing schedule shall be prepared by the party to suit the supply schedule given in the contract and get the approval of the purchaser. No slippage shall be allowed on the approved manufacturing schedule. Purchaser shall be notified immediately along with the reasons for the delay of more than two weeks and shall take appropriate steps to make up the lost time.
- The manufacturer shall also submit, within four weeks of placing the order, shop specifications, welding, inspection procedures in detail and a bill of material, which may be necessary for proper performance and control over the work.
- Deviation from specifications:
- If the manufacturer intends to make any deviations from specification they shall be clearly set forth in the quotation giving reasons for deviations.
- If the deviations are found acceptable they shall be included in the order specifications.
- No part of the work shall be subcontracted without written consent from purchaser. The manufacturer shall be responsible for the execution of the subcontracted work. Necessary inspection and quality measures shall be taken to ensure compliance of the work to this specification.
- Minor changes in the Schematic Drawing and specification sheet might be possible at a later stage.

4 PRESERVATION, PACKAGING AND DELIVERY

4.1 Preservation

- All the piping equipment shall be protected for the entire period of storage and dispatch against damage due to atmospheric factors and rough handling in transit.
- The piping equipment shall be preserved in their finished form retaining their surface finish and dimensions.
- The parts prone to atmospheric corrosion shall be given appropriate protective coating after purchaser's approval.

4.2 Packaging

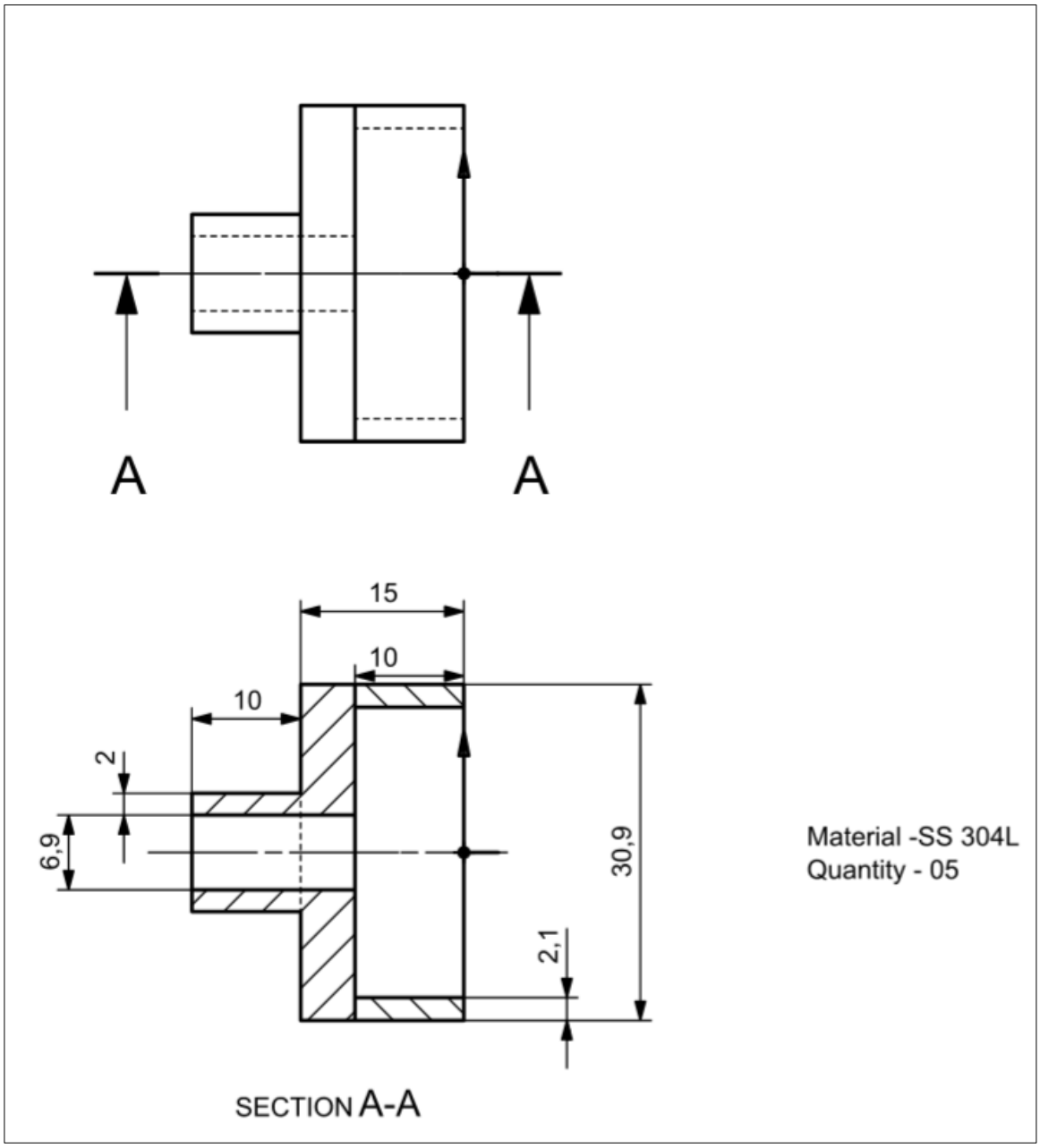
- Sound packaging material suitable to the size and weight of the contents shall be used.
- The packaging should be soft enough not to impair the surface and dimensions of the equipment. It shall be soft non-hygroscopic material.
- Bundled material shall be rigidly steel strapped over the protective covering such as wooden planks.
- The piping equipment shall be securely fastened and packed to prevent shifting, rolling or rattling.
- Following particulars shall be clearly marked on both sides of all packages in block letters, with water proof paint.
    - Destination b) Purchase order No and date c) Dimensions d) Gross weight and e) Handling instructions (if any).

4.3 Delivery

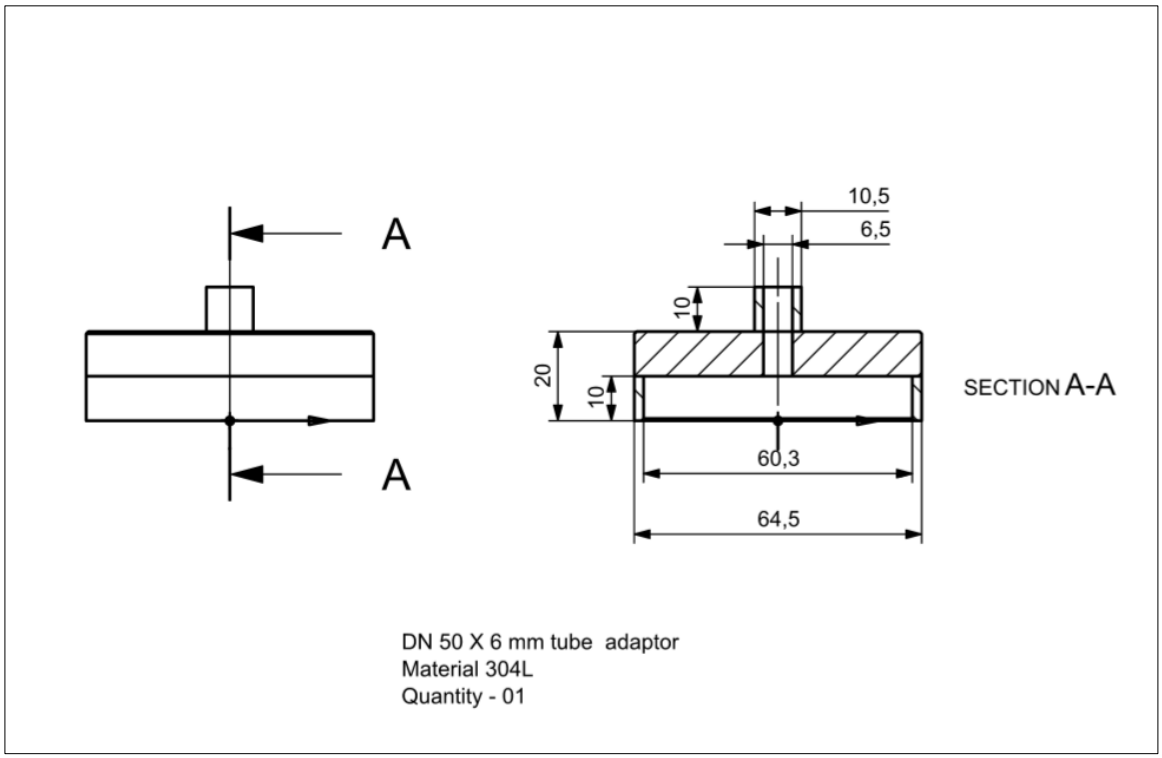
- It is the responsibility of the manufacturer to arrange for the delivery of the equipment at the purchaser's stores at B.A.R.C. Mumbai.
- The equipment shall not be dispatched without prior consent of the purchaser. The consignee as well as person concerned at the place of delivery shall be intimated at least 10 days in advance about the dispatch of the piping equipment.

5 Reference: Draft drawings

5.1 Item no. 1

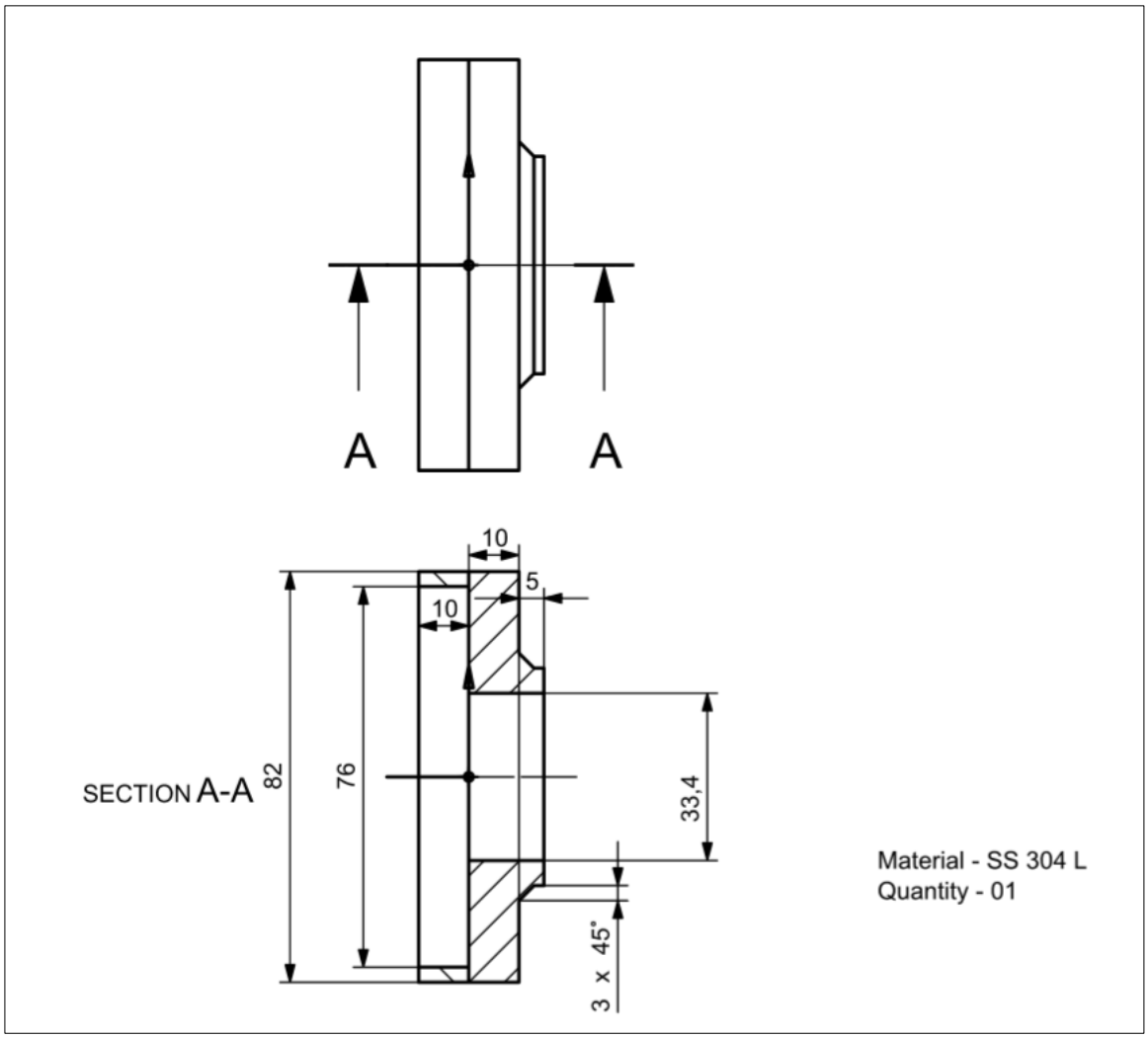


5.2 Item No. 2

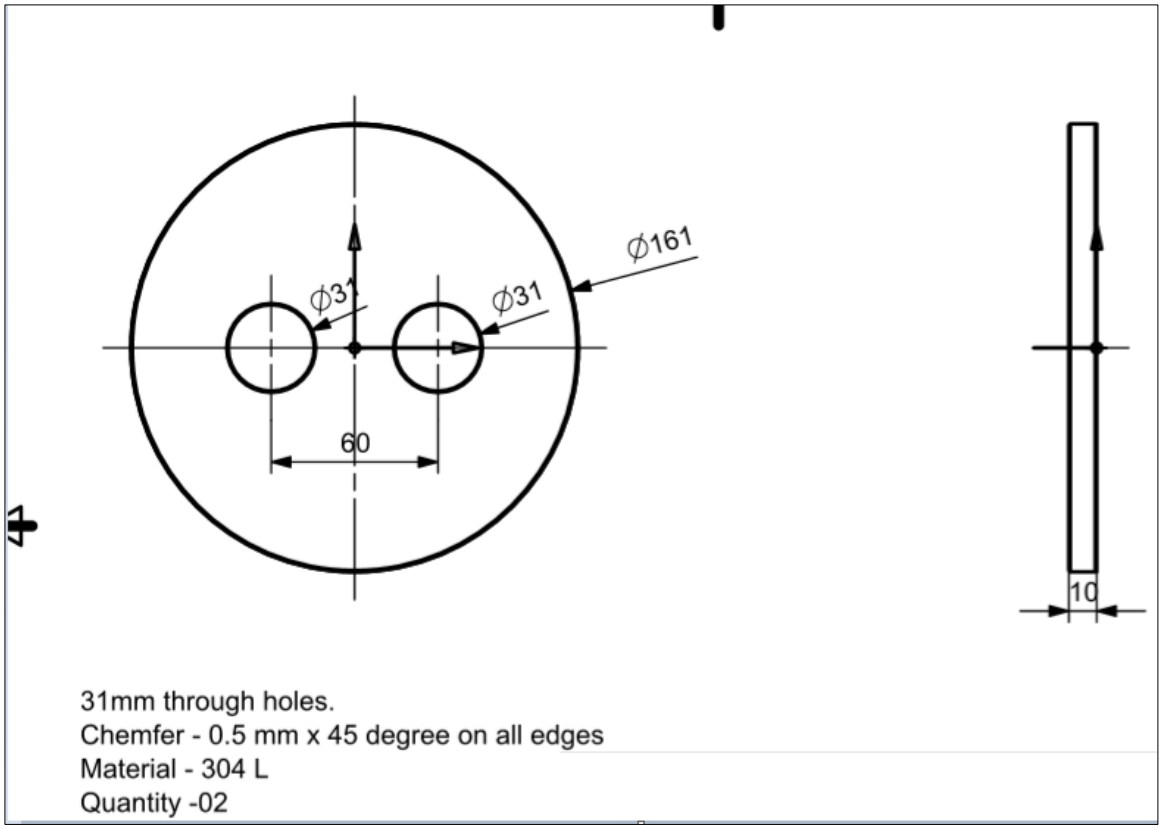


DN 50 X 6 mm tube adaptor
Material 304L
Quantity - 01

5.3 Item No. 3

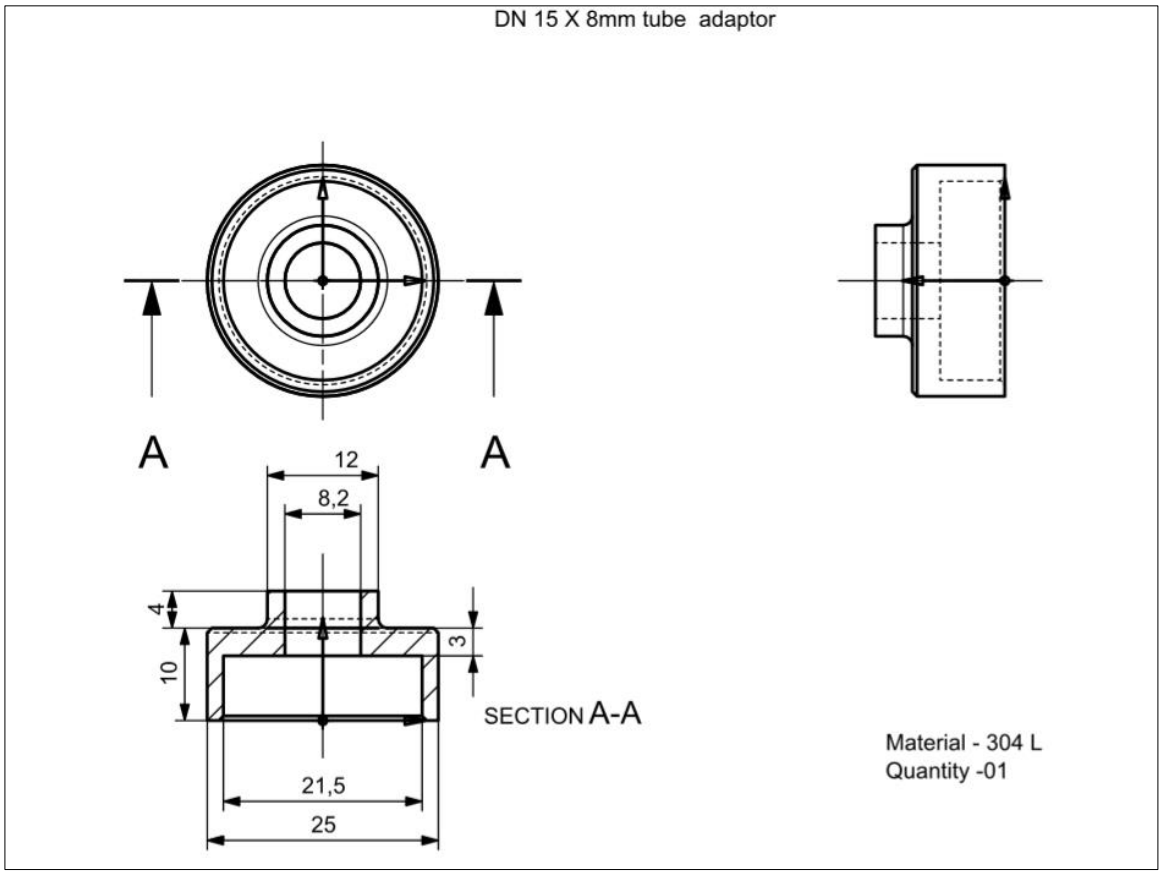

A
A
10
5
10
SECTION A-A
82
76
33,4
3 x 45°
Material - SS 304 L
Quantity - 01

5.4 Item No. 4

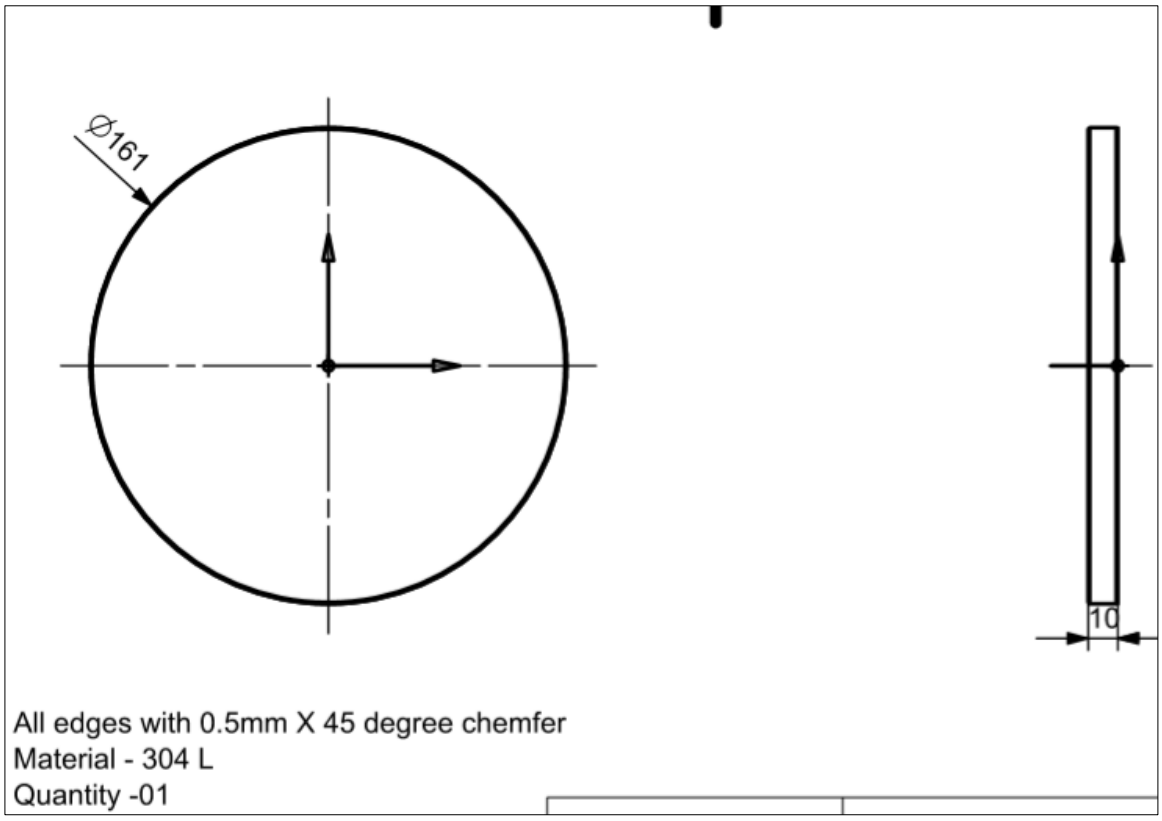


31mm through holes.
Chemfer - 0.5 mm x 45 degree on all edges
Material - 304 L
Quantity -02

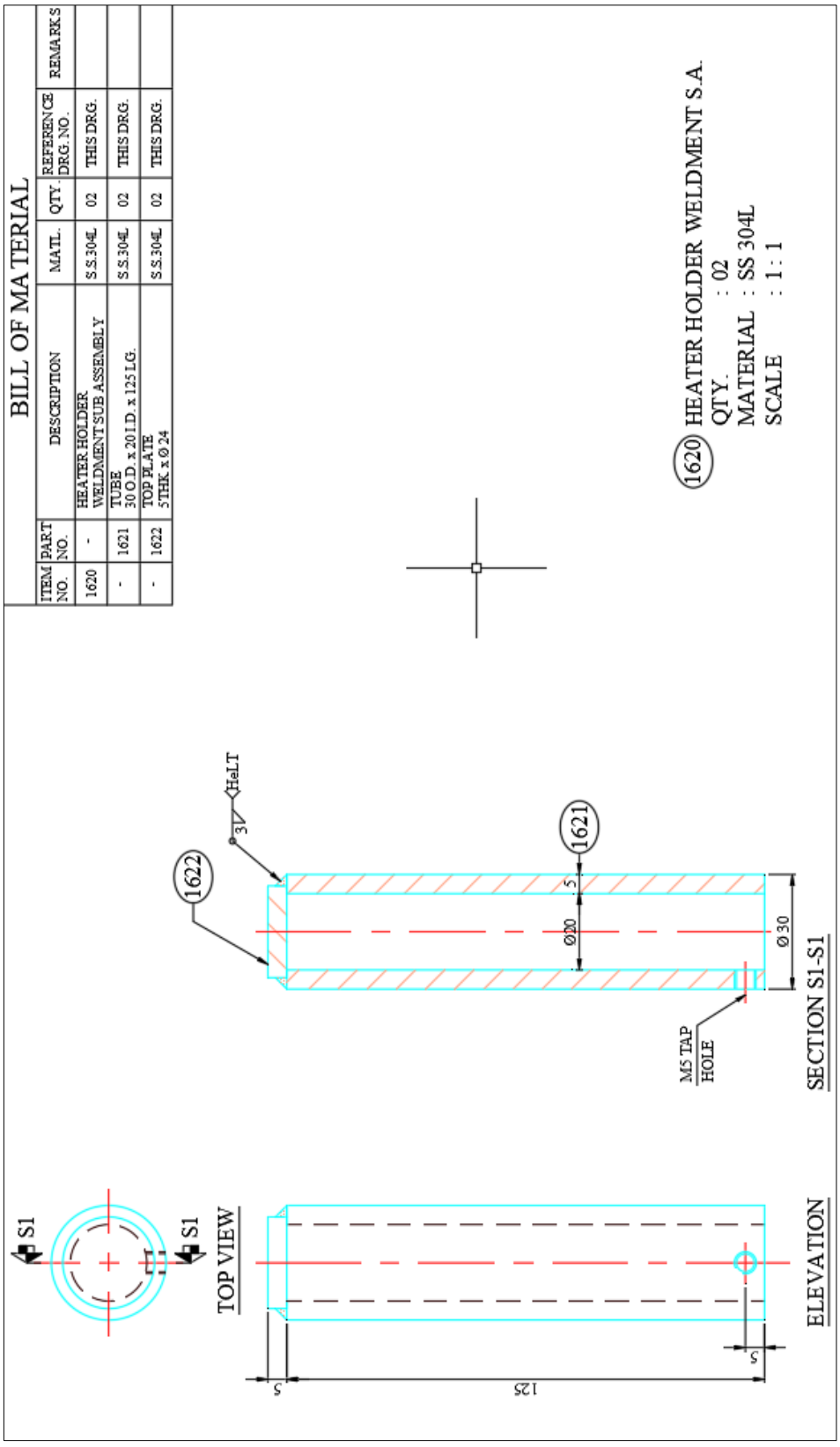
5.5 Item No. 5


DN 15 X 8mm tube adaptor
A
A
12
8,2
4
10
3
21,5
25
SECTION A-A
Material - 304 L
Quantity -01

5.6 Item- 6


Ø161
10
All edges with 0.5mm X 45 degree chemfer
Material - 304 L
Quantity -01

5.7 Item-7



BILL OF MATERIAL

ITEM NO.	PART NO.	DESCRIPTION	MATL.	QTY.	REFERENCE DRG. NO.	REMARKS
1620	-	HEATER HOLDER WELDMENT SUB ASSEMBLY	S.S.304L	02	THIS DRG.	
-	1621	TUBE 30 O.D. x 20 I.D. x 125 LG.	S.S.304L	02	THIS DRG.	
-	1622	TOP PLATE 5 THK. x Ø 24	S.S.304L	02	THIS DRG.	

(1620) HEATER HOLDER WELDMENT S.A.
QTY. : 02
MATERIAL : SS 304L
SCALE : 1 : 1