दूरभाष :
TELEPHONE :
तार : बार्क–मुंबई, चेम्बुर.
TELEGRAMS: BARC-MUMBAI, CHEMBUR.
टेलेक्स : ०११-६१०१७/०११-६१०२२ बार्क ईन
TELEX: 011-61017/011-61022 BARC IN
फेक्स संख्या : 91 – 22 – 550 5151
FAX NUMBER: 91-22-5505151

ट्रॉम्बे,
मुंबई-४०० ०८५.
TROMBAY,
MUMBAI-400 085.

सत्यमेव जयते
भारत सरकार
GOVERNMENT OF INDIA
भाभा परमाणु अनुसंधान केन्द्र
BHABHA ATOMIC RESEARCH CENTRE
Research Reactor Design & Projects Division

Telephone: 022-25595610 / 25596696

Ref: RRDPD/PDS/2022/42783 Date: 06/06/2022

Subject: Fabrication, Supply and Installation of parts of NCV and other components as per schedule for Experimental Flow Test Facility at BARC, Visakhapatnam site

Sir,

Sealed quotations, in two parts in the prescribed format, are invited for and on behalf of the President of India for "Design, preparation of fabrication drawings, procurement and quality testing of raw materials, fabrication, inspection, testing, documentation, guarantee, forwarding, transportation, delivery and installation of NCV components along with other materials as per schedule B at BARC Vizag UC-1 site (Atchutapuram, Visakhapatnam -531011)" as per tender document, drawings & specifications.

i.	Name of Work: Fabrication, Supply and Installation of parts of NCV and other components as per schedule for Experimental Flow Test Facility at BARC, Visakhapatnam site	
ii.	Period of Completion: 2 (Two) months	
iii.	Quotation Submission 1) Quotation is to be sent only through **registered post or speed post** to, **Room No. 40, RRDPD Drawing Office, Cirus Complex, BARC, Mumbai-400085. Hand delivery or courier of tenders will not be accepted.** 2) Tender document is to be prepared in **two parts** viz. Part 'A' (Technical Bid) and Part 'B' (Price Bid). Part 'A' (Technical Bid) consists of Technical details as per Annexure-I & Annexure-II. Part 'B' consists of price bid as per Annexure A. 3) Quotations are required to be submitted in separate sealed and super-scribed envelopes containing and indicating the following. First Envelope: Part 'A' (Technical Bid) stating compliance/non compliance of all clauses in technical specification Second Envelope: Part 'B' (Price Bid). All the sealed envelopes shall then be placed in another envelope, sealed & super-scribed as **"Quotation for the Fabrication, Supply and Installation of NCV components for EFTF at UC-1, Vizag site"**, with reference number of this inquiry letter. 4) Your offer should reach this office latest by **15.00 hrs. on 28th June, 2022.**	
iv.	Tender Part 'A' Opening date	**30-06-2022**
v.	Tender Part 'B' Opening date	Will be decided after technical evaluation.

1. **Technical Specification**

   Natural Circulation Valve (NCV) components are to be designed and fabricated for study of flow resistance characteristics for various flow rates and various % opening conditions for both forward and reverse direction. Technical specification and drawings are attached with this tender enquiry.

Vendors are required to visit the Facility (EFTF) at BARC Vizag site to familiarise himself with the location, EFTF components & facilities where parts need to be installed. **Site visit for the vendor is compulsory for submission of quotation**. Prior intimation by 2 working days with details of persons visiting the site shall be provided for arranging the site visit. Quotations along with details as per annexure-A shall be sent by vendor through speed post only.

Period of Contract: Two months (Period of contract for the above work in all respect is 2 months and the same should be reckoned from the 15th day after the date of issue of minor fabrication work order).

2. **Applicable Drawings**

Drawings are attached with the technical specification. However in case more details are required, bidders may contact Shri Vijaya Kumar Veluri. (25596696/25595610, vijayv@barc.gov.in)

3. **Scope of work**

Scope of the work includes Fabrication, supply, installation of NCV and other components along with uninstallation, repair, cleaning and installation of various components (e.g., strainer, filter, tank, valves, etc.) for operation of Experimental Flow Test Facility in UC-1 Plant area at BARC campus, Visakhapatnam (Atchutapuram, Visakhapatnam-531011) as per tender document, drawings & specifications.

4. **For carrying out the above scope of work, the contractor needs to do the following**

i) Preparation of fabrication drawings, job schedule & procedure and obtain the approval of Engineer-in-charge.

ii) Quality control, inspection & testing of the work.

iii) Submission of reports concerning the quality of work, progress of work etc.

iv) Any other work not specifically mentioned above but is required for efficient execution of work.

5. **Material to be supplied by Department**

No free issue material will be supplied to the manufacturer.

6. **Payment Terms:**

a. Payment will be released for the above activities by ECS within 6 weeks after satisfactory completion of works and submission of bills with advanced stamped receipt and bank details.

b. Taxes: Income tax, surcharge / service tax on income tax and works contract tax will be deducted at the prevailing rates.

7. **CONFIDENTIALITY CLAUSES.**

(i) **Confidentiality:**

No party shall disclose any information to any third party concerning the matters under this contract generally. In particular, any information identified as **"Proprietary"** in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party.

This clause shall apply to the sub-contractors, consultants, advisers or the employees engaged by a party with equal force.

(ii) **"Restricted information" categories under section 18 of the Atomic Energy Act, 1962 and "Official Secrets" under Section 5 of the Official Secrets Act, 1923 :-**

Any contravention of the above mentioned provisions by any contractor, sub-contractor, consultant, adviser or the employees of a contractor will invite penal consequences under the aforesaid legislation.

(iii)Prohibition against use of BARC's name without permission for publicity purposes:

The contractor or sub-contractor, consultant, adviser or the employees engaged by the contractor shall not use BARC's name for any publicity purpose through any public media like Press, Radio, T.V. or Internet without the prior written approval of BARC.

8. General

a. You may contact Shri. Vijaya Kumar Veluri, SO/E, RRDPD on Tel no. 022 25596696, (email : vijayv@barc.gov.in) for technical queries and clarification if any.

b. Mention GST & PAN number in your quotation, otherwise quotation will be invalid

c. Price quoted shall be filled up in the format given in Annexure-A of the detailed tender document with applicable Goods & Services Taxes if any shown separately. No other charges will be payable.

d. Quotations received with prices given in any format other than Annexure-A will be rejected.

e. The offer should be valid for consideration for at least 60 days from due date of the offer.

f. Quotation received after the due date and time shall be summarily rejected.

g. Please indicate whether any of your relatives are employed in BARC or you or any of your employees were employed in BARC or any other units of DAE.

h. Only experienced manufacturers/fabricators of heaters will be considered for evaluation of the bids.

i. The progress of work will be reviewed periodically. If the work is not carried out by the contractor satisfactory (in terms of performance and time) and any deficiency is noticed, recovery towards the deficiency will be made from the contractor's bill and the decision of Head, RRDPD or his nominated officer shall be final and binding on the contractor.

j. Department (BARC) reserves the right to terminate the contract at any stage of execution of the contract, without assigning any reasons.

9. Time Schedule

The duration of the contract is 02 (Two) months (Period of contract for the above work in all respect is two months and the same should be reckoned from the 15th day after the date of issue of minor fabrication work)

Yours faithfully,

06/06/2022

(Samiran Sengupta)
Head, RRDPD
BARC, Mumbai-400 085

डॉ. समीरन सेनगुप्ता / Dr. Samiran Sengupta
अध्यक्ष, आरआरडीपीडी / Head, RRDPD
भापअके / BARC

Cc:

1. AO (Works), GSS, CC, BARC
2. Shri Vijaya Kumar Veluri, SO/E, RRDPD
3. RRDPD Office

SCHEDULE-B

Items to be supplied /Works to be executed by the contractor

Name of the work: **Fabrication, Supply and Installation of parts of NCV and other components as per schedule B for Experimental Flow Test Facility at BARC, Visakhapatnam site**

Sl. no.	Description of materials to be supplied	Qty	Unit
1.1	250 X 300 mm spool piece as per drawing (PART-1)	1	Number
1.2	250 X 350 mm spool piece as per drawing (PART-2)	1	Number
1.3	NCV Float as per drawing (PART-3)	1	Number
1.4	Acrylic sheet 1355.0 mm (L) x 510.0 mm (W) x 10.0 mm (thick) with holes	4	Number
1.5	Under water LED Light (36W) with driver and 10m electrical wire attached to lights	4	Number
1.6	Pump Bush and couplings 150 x 100 mm	3	Number
1.7	3 mm thick Neoprene rubber gasket sheet required for flange joints as per the technical specifications given in the tender.	10	Kilogram
1.8	5 mm thick Neoprene rubber gasket sheet required for flange joints as per the technical specifications given in the tender.	10	Kilogram
1.9	25 micron Filter Cartridges	8	Number
1.10	6 inch Steel Vernier Callipers With Digital Indication	1	Number
1.11	Cotton Hand Gloves	30	Pairs
1.12	Industrial and construction Safety Helmet with adjustable Knob	5	Number
1.13	Chrome plated Adjustable Spanner with soft grip of size 6 inch, 8 inch, 10inch, and 12 inch Confirming to IS 6149-1984 Grade II	1	Set
1.14	Installation of Part-1, NCV after removal of internal components	1	Number
1.15	Installation of Part-2, NCV after removal of internal components	1	Number
1.16	Installation of Part-3, after removal of Spherical Float	1	Number
1.17	Dismantling, repair, cleaning and installation of strainer, valves, instrumentation tubing of 100m, and instrumentation equipment's.	1	Number
1.18	Dismantling of NCV components, repair of side windows of experimental tank, replacement of existing filter cartridges with new cartridges	1	Number

Annexure-A

Price Quotation

Sub-: Fabrication, Supply and Installation of parts of NCV and other components as per schedule B for Experimental Flow Test Facility at BARC, Visakhapatnam site

The Vendor shall furnish here the cost of items along with applicable taxes indicated separately.

Sl. no.	Description	Qty (A)	Unit	Unit Rate (Rs.) (B)	Amount (Rs.) C=A X B
1.0	**Materials to be supplied**	---	---	---	---
1.1	250 X 300 mm spool piece as per drawing (PART-1)	1	Number		
1.2	250 X 350 mm spool piece as per drawing (PART-2)	1	Number		
1.3	NCV Float as per drawing (PART-3)	1	Number		
1.4	Acrylic sheet 1355.0 mm (L) x 510.0 mm (W) x 10.0 mm (thick) with holes	4	Number		
1.5	Under water LED Light (36W) with driver and 10m electrical wire attached to lights	4	Number		
1.6	Pump Bush and couplings 150 x 100 mm	3	Number		
1.7	3 mm thick Neoprene rubber gasket sheet required for flange joints as per the technical specifications given in the tender.	10	Kilogram		
1.8	5 mm thick Neoprene rubber gasket sheet required for flange joints as per the technical specifications given in the tender.	10	Kilogram		
1.9	5 micron Filter Cartridges	8	Number		
1.10	6 inch Steel Vernier Callipers With Digital Indication	1	Number		
1.11	Cotton Hand Gloves	30	Pairs		

1.12	Industrial and construction Safety Helmet with adjustable Knob	5	Number		
1.13	Chrome plated Adjustable Spanner with soft grip of size 6 inch, 8 inch, 10inch, and 12 inch Confirming to IS 6149-1984 Grade II	1	Set		
1.14	Installation of Part-1, NCV after removal of internal components	1	Number		
1.15	Installation of Part-2, NCV after removal of internal components	1	Number		
1.16	Installation of Part-3, after removal of Spherical Float	1	Number		
1.17	Dismantling, repair, cleaning and installation of strainer, valves, instrumentation tubing of 100m, and instrumentation equipment's.	1	Number		
1.18	Dismantling of NCV components, repair of side windows of experimental tank, replacement of existing filter cartridges with new cartridges	1	Number		
2.0	**Total Cost**	---	---		
2.1	**GST (18%)**				
3.0	**Grand Total Cost**	---	---		

Government of India
Bhabha Atomic Research Centre
Research Reactor Design & Projects Division

TECHNICAL SPECIFICATION

Sub: Fabrication, Supply and Installation of parts of NCV and other components as per schedule B for Experimental Flow Test Facility at BARC, Visakhapatnam site

1.0 GENERAL

1.1 Scope of the work includes Fabrication, supply, installation of NCV and other components along with uninstallation, repair, cleaning and installation of various components (e.g., strainer, filter, tank, valves, etc.) for operation of Experimental Flow Test Facility in UC-1 Plant area at BARC campus, Visakhapatnam (Atchutapuram, Visakhapatnam-531011).

1.2 The contractor is specifically requested to visit the site and familiarise himself with the location and facilities available for this work and obtain any other information which may influence or affect this tender, before submitting quotation. Prior intimation by 2 working days with details of persons visiting the site shall be provided for arranging the site visit. Contractor has to make arrangement on his own for all the lifting & handling tools & tackles required like scaffolding, tripod, chain pulley blocks, etc. for handling various equipment, shifting to site and placement inside the site on the floor at desired location.

2.0 SCOPE OF WORK:

The work consists of the following.

i) Fabrication & Supply of NCV components as per drawings
ii) Installation of NCV components
iii) Supply of manpower for removal and cleaning of various components, strainers, filter cartridges, cleaning of tank, etc.
iv) Supply of 3mm and 5mm neoprene rubber gaskets, industrial safety helmets, adjustable spanners, underwater LED lights,
v) Testing of components, DPT of Weld joints

The brief scope of work is given below:

Fabrication, supply, installation of NCV and other components along with uninstallation, repair, cleaning and installation of various components (e.g., strainer, filter, tank, valves, etc.) for operation of Experimental Flow Test Facility in UC-1 Plant area at BARC campus, Visakhapatnam.

2.1. Fabrication of NCV components (as per the attached drawing) as per ASME Section-VIII Division I.

2.2. Dye penetrant inspection of the welds on 100% basis for root and final pass as per Technical specification (Appendix- A). Supply of materials for dye penetrant inspection is in the scope of contractor.

2.3. Uninstallation of existing NCV components in the experimental tank.

2.4. Supply and Installation of NCV components as per drawing and specification.

2.5. Supply of 3mm and 5mm neoprene rubber gaskets, industrial safety helmets, adjustable spanners, underwater LED lights etc. as listed in schedule 'B' and technical requirements given in the tender document.

2.6. Supply and installation of Nitrile Rubber Spider for flexible coupling of pump

2.7. Checking of misalignment of pump and necessary repairs for alignment of pump and motor.

2.8. Dismantling, repair, cleaning and refitting of strainer, repair of side windows of experimental tank, opening, cleaning and refitting of filter cartridges, valves replacement, and uninstallation of NCV components.

2.9. Any other work not specifically mentioned above but is required for efficient execution of work.

3.0 VARIATION OF SCOPE OF WORK

Variation of scope of work shall be reckoned with respect to the total contract value.

Any change in scope of work shall be documented as follows:

i) Revision of drawing and reference list.
ii) Revision of Technical Specification.
iii) Technical design concession report.

4.0 DETAILS OF THE CONTRACTOR'S SCOPE OF WORK:

4.1 Preparation of detailed fabrication drawings, isometrics etc., bill of material based on the drawings supplied by the BARC, for engineer's approval.

4.2 Supply, Inspection & testing, delivery, installation & commissioning of various equipment's, gaskets, acrylic sheets etc. and keep an account.

4.3 Supply of all consumables, structural materials, water proofing materials, materials required for all civil works.

4.4 The supply of skilled and unskilled manpower, supervisor and technical staff and competent management.

4.5 Provision of required temporary supports, temporary protection and temporary scaffolding and similar items.

4.6 Preparation for welding procedure qualification and for welder's qualification for approval of BARC.

4.7 To carry out necessary non-destructive tests such as dye penetrant inspection etc. for root and final pass of welds, as per tender specification.

4.8 Repair and replacement of parts damaged during handling and erection.

4.9 Field alteration as required due to design changes, site constraints/ minor modifications or to correct errors in detailing of fabrication.

4.10 After completion of the job, clearing the site of debris, tools & tackles and any other materials used for the job.

4.11 Carry out the final alignment of the pump and motor with the help of the dial gauges attached to the coupling halves. The acceptable limits of the radial and angular misalignment shall be as per 75 microns. The procedure of alignment and acceptable limits may also be based on the manufacturer's recommendation or as directed by Engineer-in-charge. Dowel, the pump and driver with base plate after alignment is completed in all respect.

5.0 SUPERINTENDENCE AND LABOUR

The contractor shall provide supervision of erection which, shall include without limitation:

5.1 A competent Supervisor who shall be regularly at site and shall give his whole time to the superintendence of the erection of the works and whose duties shall include the supervision of welding, assembly and installation, etc. repair and replacement of any damaged components and find alterations required to correct errors, in detailing of fabrication.

5.2 The employment of sufficient number of competent assistants to the Supervisor to complete the work within the time period specified.

5.3 The employment of competent Inspection Authority and supporting staff familiar with the welding quality requirements as stated in this document.

5.4 The contractor shall employ only such persons who are skilled and experienced in their trades.

6.0 TECHNICAL SPECIFICATION

6.1 General

The design, manufacture, fabrication, inspection and testing of the NCV components shall comply with the requirements of the latest edition of codes and standards specified hereunder, the NCV components specification sheet and the applicable drawings. The contractor / bidder shall indicate date of issue of such applicable documents which form the basis of his quotation. In the event of any conflict between the requirements of this specification and the documents listed below, the more stringent requirements shall apply.

6.2 Codes and Standards

The fabrication of NCV components shall conform to the latest editions of the following Codes and Standards:

a) ASTM-A-106 : Grade B seamless carbon steel pipes Sch.40.

ASTM-A-234 : Gr. WPB latest - for pipe fittings.

ASTM A-105 : Forged carbon steel slip on raised face (SORF) flanges

ASTM-A-6 – Specification for general requirements for rolled steel plates, shapes, sheet piling, and bars for structural use

ASTM-A-240 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels

ASTM-A-312 -Seamless and Welded Austenitic Stainless-Steel Pipe

ASTM-A-182 -Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

ASTM-A-480 -General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

ASA B-16.21 -Non-Metallic Gaskets for pipe flanges

b) IS-2062 : Indian Standard Specification - Steel for General Structural purposes.

c) IS-816 : Code of practice for use of metal arc welding for general construction.

d) IS-817 : Code of practice for training and testing of metal arc welders.

e) IS-2825 : Indian Specification for unfired boiler and pressure vessel.

f) ASME Sec. (VIII) Div. I : - Unfired boiler and pressure vessel code.

g) ASME Sec.(IX) : Welding qualification.

h) IS - 1367 : Technical Supply Conditions for Threaded Steel Fasteners

i) ASA B-16.21 : Non-metallic Gaskets for pipe flanges

j) ANSI B 16.5 : Pipe flanges and flanged fittings

6.3 Design and Fabrication

6.3.1 The NCV components shall be designed and constructed in accordance with the latest edition of the ASME Boiler and Pressure Vessel Code, Section VIII, Division I and its subsequent addenda. The Contractor shall shop fabricate, maximum extent possible under properly controlled cleanliness requirements. All machined surfaces shall be protected from dust and mechanical damage. The Contractor shall visually examine all materials to be erected or being used in the fabrication and shall report any defects to the engineer. Any repair of materials shall be as per the engineer's instructions with prior approval.

6.3.2 Prior to fabrication, all the materials shall be checked and conformed to be of the required quality for the intended purpose. Materials shall be subjected to mechanical tests, chemical analysis and any other supplementary tests as required by this specification

6.3.3 Prior to cutting out plates and drilling, the dimensions shall be rechecked

6.3.4 Since the NCVs to be installed at the existing site. Necessary templates to be prepared to get accurate dimensions for proper fitting and alignment during installation.

6.3.5 Plates and other parts may be cut to shape and size by mechanical means such as machining, shearing, grinding, or by oxygen or arc cutting. After oxygen or arc cutting, all slag and detrimental discoloration of material which has been molten shall be removed by mechanical means prior to further fabrication or use.

6.3.6 Machining of flanges, plates, etc. shall be done accurately and surfaces shall conform to as indicated in the approved drawings. In any case, the thickness shall not be less than the minimum required thickness specified.

6.3.7 Parts that are to be joined by welding may be fitted, aligned, and retained in position during the welding preferably by the use of tack welds, or temporary attachments and shall meet the requirements of UW-31 of ASME, Section VIII, Division I.

6.3.8 Weld joints and connected components shall meet the requirements of UF-32 with applicable requirements of Parts UW, UCS of ASME, Section VIII, Division I.

6.3.9 Tolerances:

All NCV components, welded utilising materials in accordance with the drawings approved by the engineers. Unless otherwise specified on the drawing, tolerance on any linear dimension shall be within 3 mm and tolerance shall not be cumulative. The bolt holes of flanges in the vertical plane shall straddle the vertical centerline of the pipe in the erected position. For flanges in the horizontal plane, bolt holes shall straddle the point north-south axis unless otherwise indicated on the drawing. The deviation measuring in any direction on flange face alignment shall be within $1/2^{o}$ + 0.5 mm. Maximum deviation from centerlines of bolt hole location shall be + 1.5 mm.

6.3.2 Tightening of Bolts:

In bolting gasket joints, the contact faces of the flange shall bear uniformly on the gasket and gasket shall be properly compressed in accordance with the design principle applicable to the type of gasket used. The bolt stress on all flange joints shall be relatively uniform.

6.3.3 Welding:

All welding has to be carried out by qualified welders and as per qualified welding procedures. Regarding the type of joint the Code establishes requirements based on service, material and location of the welding. The welding processes that may be used in the construction of test sections are also restricted by the Code as described in Para graph UW-27 of ASME Section VIII, Division I. Welding shall meet the design, fabrication and inspection and testing requirement given in codes and standards indicated in Appendix-B.

7.0 DISCREPANCIES AND FIELD CHANGES

Any discrepancy in or omissions from drawing, specifications or other documents or any doubt arising as to the meaning or intent of any part thereof, shall be referred to the engineer. The engineer will then issue written instructions of explanations as soon as possible. Verbal communication should be avoided. Whenever the Contractor is unable to comply with the engineer's requirements, be it dimensional or technical or whenever field changes are inevitable for any reason, the contractor must obtain the appropriate authorisation from the engineers. This authorisation shall be in one or more of the following forms:

(a) Amendment of applicable specification.

(b) Revision of applicable drawing.
(c) Approval of design concession requirement.

8.0 QUALITY CONTROL AND INSPECTION

8.1 The contractor shall be responsible for and shall provide for and perform all the inspection and testing required by the Engineer-in-charge's Specifications.

8.2 A Quality Surveyor shall be designated by the Engineer-in-charge. The Quality Surveyor and his designated staff will be responsible for checking the quality of work to the extent necessary to assess compliance with the provisions of the specifications. His surveillance shall not be limited to examination of the end product, and he shall have complete access to the work and the right to intervene where bad (non-standard) practices are detected. He shall also have the right to conduct or ask the contractor to perform, any additional inspection or testing he feels necessary. If any unacceptable defects are noted by such tests, the contractor shall repair the defects free of charge.

8.3 The surveillance provided by the Engineer-in-charge or the approval by the Quality Surveyor of finished work shall not relieve the contractor of any of his responsibilities under this specification.

8.4 The Contractor shall maintain quality control records, which shall record fully all the quality control operations that were performed. The Quality Surveyor shall have the right to witness any or all such operations.

8.5 Inspection of Welds:

8.5.1 Butt Welds: For all butt welds, root passes and final passes will be D.P. checked 100%.

8.5.2 Fillet welds: All fillet welds will be subjected to D.P. check for root pass and on completed weld.

8.5.3 For guidelines of testing welded joints by D.P. check, refer Appendix A.

9.0 DRAWING/SKETCH

NCV components drawing is enclosed along with the tender to show the fabrication components. The new NCV components need to match with existing NCV flanges, a revision of drawing has to be carried out by taking dimensions of existing flanges (bolt holes PCD, raise face dimensions etc.) at site by the contractor. The revised drawing needs to be approved by the Engineer-in-charge before actual fabrication is done.

10.0 COMMISSIONING OF NCV

The commissioning of the EFTF after installation of NCV components in the tank shall be carried out as per commissioning procedure issued by the Engineer-in-charge. In case of any leak observed during commissioning, the same will be rectified as per the procedure. The contractor will supply all manpower and tools required for this at no extra cost.

11.0 PAYMENT TERMS & TAXES

11.1 Payment will be released for the above activities by ECS within 6 weeks after satisfactory completion of works and submission of bills with advanced stamped receipt and bank details.

11.1 Income tax, surcharge / service tax on income tax and works contract tax will be deducted at the prevailing rates.

12.0 GUARANTEE

The contractor shall guarantee satisfactory performance of the entire work executed by him including the materials, equipment supplied by him against defects and improper/bad workmanship for a period of 12 months from the date of commissioning or 18 months from the date of completion of all works whichever is later.

13.0 MATERIAL & SERVICES TO BE PROVIDED BY THE DEPARTMENT

Free issue materials, which will be supplied to the contractor are as follows:

13.1 Water:

Water for the work will be made available to the contractor free of cost at the site and place determined by the Engineer-in-Charge and the contractor shall make, at his own cost, other required arrangements.

13.2 Electric Power:

The electric power of 440 volts, A.C., 3 phase for construction purposes will be made available to the contractor at a single point close to site free of cost. The contractor shall make his own arrangements for distribution of power to all his works from the point of supply provided by the purchaser.

It shall be the responsibility of the contractor to provide and maintain the complete installation on the load side of the supply with due regard to safety requirements at site. All cabling and installation shall be carried out by licensed electrical contractors only with appropriate statutory requirements given below:

a) Indian Electricity Act, 1910 (as amended)
b) Electricity Supply Act, 1948 (as amended)
c) Indian Electricity Rules, 1956 (as amended)

All the wiring shall be done along routes approved by the Engineer. Wherever power lines cross any temporary or permanent roads at site, proper clearance below lines should be provided as per IEE regulations and as required by the Engineer to facilitate easy movement of heavy machinery. The lines shall have to be shifted any time during the progress of work at contractor's own cost if the same are found to obstruct any work in progress at site. All wiring and switch power board installed by the contractor during the progress of work shall be removed by him on completion of work. He shall also reinstate and make good any work disturbed by temporary wiring etc. at his own cost to the satisfaction of the Engineer-in-charge.

The department will not be liable for any loss or damage to the contractor's equipment as a result of variation in voltage or frequency of interruptions/stoppage of power supply for a continuous period not exceeding 24 hours, the contractor shall have no claim whatsoever against Government. For any power failure/stoppage resulting in interruptions for a continuous prolonged period, the contractor will be eligible only for reasonable extension of time and not for any compensation on this account.

The department will not be liable for any loss to the contractor arising from failure or interruption of stoppage of works, any attendant delay consequent upon such failure, interruption or stoppage of power supply of variations in voltage or frequency.

14.0 AREA FOR CONTRACTOR'S PLANT & MACHINERY

Suitable area near the site of work will be provided to the contractor free of cost for carrying out the work. The contractor shall be solely responsible for proper storage and safe custody of his material/equipment or materials issued to him.

15.0 HOISTING & SCAFFOLDING:

The contractor shall make his own hoisting & scaffolding arrangement for the execution of the job. In the work areas where the facility of hoisting equipment and scaffolding is available, the contractor will be permitted to utilize them free of charge, for the execution of his work. Neither in the event of the Engineer's permanent hoisting equipment or scaffoldings not being available to the contractor for his work, or being out of order shall be the cause for claims of extra payments or an excuse for delays in executing the contract scope of work.

16.0 HISTORY DOCKET REQUIREMENTS

Three (3) bounded copies of history dockets shall be provided by the contractor for the piping work apart from the history dockets of individual equipment/component (to be provided separately). This docket (3 copies) shall consist of the following documents:

(a) Work Order Technical Specification
(b) Approved inspection/test procedures
(e) Welder/welding qualification test reports
(f) DPT test report
(g) Hydrostatic test reports
(h) As built isometric drawings with weld joint details
(i) Any other document required for completion of work

17.0 TRANSPORTATION

No material shall be dispatched without prior written consent of Purchaser or his representative.

Vendor shall intimate at least fifteen (15) days in advance to the consignee as well as to the concerned Engineer at site, the probable date when the test sections are to be ready for dispatch. A packing list also shall be sent along with this.

18.0 DELIVERY

The delivery of all the components listed in schedule B shall be within Two (2) months after the placement of the purchase order.

A P P E N D I X 'A'

Liquid Penetrant Examination

Method of liquid penetrant inspection shall conform to ASTM E-165

1.0 Requirements

1.1 Surface Preparation - In general, satisfactory results may be obtained when the surface is in the as welded condition. When surface irregularities mask the weld, surface will be required to be grounded smooth.

1.2 The surface to be tested and its adjacent area shall be free from dirt, scale, welding flux, spatter or any extraneous matter that would interfere with the test.

1.3 Typical cleaning agents, which may be used for removing contaminants, are detergents, organic solvents, de-scaling solutions and paint removers.

1.4 Drying - Drying of the surfaces to be tested after cleaning can be accomplished by normal evaporation. A minimum period of time shall be established and included in the written procedure to assure that the cleaning solvents have evaporated prior to the application of the penetrant when employing the non-volatile solvents, it is recommended that forced hot air be used to accelerate drying.

1.5 Penetrant Application - The penetrant shall be applied by brushing or spraying. At temperature between 30°C to 50°C the penetration time shall be at least 15 minutes. As a practice, the temperature of the surface should not exceed 50°C.

1.6 Excess Penetrant Removal - After the penetration time specified in the procedure has elapsed, any penetrant remaining on the surface shall be removed. Care shall be exercised to limit the removal of the penetrant from any defect as little as possible. Excess penetrant shall be removed by using clean dry cloth. The operation shall be repeated until most traces of penetrant have been removed. With clean dry cloth moistened with solvent, the surface shall be wiped lightly until all remaining traces of excess penetrants have been removed. Care shall be employed not to use an excess of the solvent in order to avoid removing penetrant from defects. Flushing the surface with solvent following the application of the penetrant and prior to developing is prohibited.

1.7 Developing - The developer shall be applied as soon as possible after the penetrant removal operation and the interval shall not exceed the time established during procedure qualifications. The quality of the developer and the method of application in a fine spray are important and shall be demonstrated to the satisfaction of the quality surveyor.

2.0 Examination

It is good practice to observe the surface during the application of the developer in order to detect the nature of certain indication, which might tend to bleed out profusely. Final interpretation, however, shall be made after allowing the penetrant to bleed out for a minimum of seven minutes to a maximum of thirty minutes. The developer should form a more or less uniform white coating. Bleeding out the penetrant, which is normally of a deep red colour, indicates surface defects. Indications which exhibit a light pink colour may be due to excessive or inadequate cleaning. Illumination shall be provided which is

adequate to ensure that there is no loss in the sensitivity of the test.

3.0 Qualification Procedure

Required procedure for liquid penetration test shall be qualified on test pieces with respect to the pipe material supplied by the purchaser.

4.0 Evaluation of Indications & acceptance standard

Defects, which occur as mechanical discontinuities at the surface, will be indicated by bleeding out of penetrant, however, local surface imperfection as may occur from machining marks or surface conditions may produce similar indications which are not relevant to the detection of defects. Any indication, which is believed to be non-relevant, shall be regarded as a defect until surface conditioning either eliminates the indication or it is demonstrated to be non-relevant. Non-relevant indications and broad areas of pigmentation, which would mark indication of defects, are unacceptable. Relevant indications are those, which result from mechanical discontinuities. Linear indications are those indications in which the length is more than three times the width. Rounded indications are indications, which are circular or elliptical with the length less than 3 times the width.

Liquid penetrant examination acceptance standard shall be as per ASME Section VIII Div. I.

A P P E N D I X 'B'

WELDING REQUIREMENTS FOR THE FABRICATION OF PIPING

1.0 Scope

1.1 This specification defines the requirement concerning welding of piping. It is applicable to shop welding at site or elsewhere, and to field erection welding.

1.2 The requirements of this specification are generally in conformance with ASA-B-31.1, ASME Boiler & Pressure Vessel code Section VIII/ IS 2825. In addition, specification covers all standards mentioned in ASME Section V. Reference shall always be made to the latest codes. Weld joints and connected components shall meet the requirements of UF-32 with applicable requirements of Parts UW, UCS of ASME, Section VIII, Division I.

1.3 The requirements stipulated are based on review of piping systems and materials specified for the construction at the time of writing this specification. Any subsequent design changes or authorised materials substitutions will require review of the appropriate sections of this specification and the issue of amendments, if required.

1.4 Wherever the term Quality Surveyor appears in this specification, it shall be taken to mean the Engineer's agent unless otherwise stated.

2.0 Welding Processes

The welding processes that are used in the welding of the joints shall be TIG welding unless otherwise specified in design code. Only those welding process which are capable of producing qualification requirements of Section IX and ASME Section VIII, Division I shall be followed.

3.0 Welding Procedures

3.1 The qualification of welding procedures shall be in accordance with the Section IX of ASME Boiler and Pressure Vessel Code and acceptance standard as per ASME Sec. VIII Div. I.

3.2 The welding procedure tests shall demonstrate that all details are satisfactory, the welds are free from unacceptable defects and that they have the necessary mechanical properties.

3.3 The welding procedure specification form shall describe the following in detail:

a) Application i.e. particular work for which the procedure is qualified.
b) Welding process employed.
c) Specification and processed condition of base metal.
d) Thickness of base metal.
e) Joint design, (Sketch)
f) Power source (AC or DC) and polarity of D.C.
g) Classification and size of filler metals and electrodes (Consumable and non-consumable) and drying requirements for electrodes.
h) Current and voltage ranges

i) Position
j) Progression (upward and downward in vertical welding)
k) Number of passes
l) Preheat and inter-pass temperature control
m) Post weld heat treatment
n) Surface condition before welding
o) Shielding and backing gas requirements
p) Welding technique and arc manipulation
q) Inspection requirements
r) Results or welding procedure qualification test (on form indicated in Section IX of ASME Boiler and Pressure Vessel Code).

3.4 Procedure qualification tests shall be performed at site and the qualifying authority shall be Quality Surveyor appointed by the Engineer.

3.5 No work shall start on prefabrication or installation of piping until the Quality Surveyor has accepted the procedure qualification tests for the particular type of welding and the procedures have been distributed to the parties concerned.

3.6 The Contractor shall deposit with the Engineer five copies of each qualified and accepted procedure for use & retention.

3.7 All test specimens shall be properly tagged and preserved for the duration of the construction. The disposition of test specimens shall be as directed by the Engineer.

3.8 The cost of performing the procedure and performance qualification tests described in 4.0 shall be borne by the Contractor except that the pipe, filler metals and other consumables shall be supplied as described in the contract documents.

3.9 Any party undertaking project piping work shall verify the actual requirements of the Boiler and Pressure Vessel Code and shall qualify any additional procedures required.

4.0 Qualification and Performance record of welders

4.1 All welders working on Project piping shall have passed the performance qualification test prescribed by Section IX of the ASME Boiler and Pressure Vessel Code/IS 2825.

4.2 The qualification tests shall be performed at site and the qualifying authority shall be the Quality Surveyor appointed by the Engineer.

4.3 The Quality Surveyor shall have the right to call for further qualifications from time to time, from any welder who in the Quality Surveyor's opinion is not producing finished welds in accordance with his qualifications, or who has discontinued welding by the particular process for more than three months.

4.4 For each welder, a record card shall be maintained showing the procedure for which he is qualified. These cards shall show the date on which each procedure is used, the type of defects produced and their frequency. This record shall be reviewed once a week by the Quality Surveyor and those welders, whose work requires a disproportionate amount of repair, shall be disqualified from welding on the permanent piping joints. Re-qualification of welders disqualified more than three times shall be entirely at the discretion of the Quality Surveyor.

4.5 When repairs are to be made, the welder whose work is defective shall have the nature of the defects explained to him. It is preferable if a welder can repair his own defective welds.

4.6 Each welder shall be assigned a letter, number or symbol. Each weld shall be clearly identified as to its welder either by marking on the pipe adjacent to the weld or by maintaining a chart on which every weld is detailed. Stamping and vibro-etching are not permitted except that on pipe with over 1/4 inch wall thickness. Low stress, round-nose continuous or round-nose interrupted dot die stamps may be used. Stainless steel may be marked by an electro etching method.

5.0 General welding requirements

5.1 No welding shall be done on surfaces, which are wet or exposed to rain or excessive draft. Surfaces to be welded shall be free from paint, rust, oil, grease, dust or any other contamination. Cloth used for cleaning shall be lint free with hemmed edges.

5.2 Welds shall be cleaned between passes to remove all tracks of slag and flux before successive beads or layers are deposited. Completed weldments shall be cleaned to the same extent. The craters at the starting and stopping points of each individual bead shall be carefully examined and any defect shall be removed by grinding. Grinding wheels wire brushes chisels etc. for use on stainless steel shall not be used on any other material.

5.3 Peening of welds shall not be permitted.

5.4 Inspection and Quality surveillance shall not be limited to examination of the finished weld. All aspects of the materials, fabrication procedures and examination procedures used, that could affect the quality of the finished weld, shall be subject to the approval of the Quality Surveyor. The equipment to be used shall be suitable for the quality of work specified and the technique employed shall be based on methods which are known to produce good results and which have been verified at site by actual demonstration.

5.5 The welding technique and manipulation shall be controlled to ensure the following

a)Full penetration
b)Full fusion into the base metal without undercutting along the sides of the weld.
c)Full fusion into the preceding bead or layer.
d)Uniformity of surface in both single run passes and beaded layers.
e)Floating all slag, oxide and gases to the surface behind the advancing arc.
f)Delay in electrode travel until base metal fusion at the starting point is assured and until the crater is well filled at the completion of the weld.

5.6 Haphazard striking of the electrode on the base metal in establishing the arc shall not be permitted. The arc should be struck either in the joint where the metal surface will be used into the weld or on a starting tag. Starting tags shall be of the same material or a material compatible with the base metal being welded. When inadvertent arc strikes occur, the area affected shall be ground flush and then examined by the magnetic particle or liquid penetrant method. High frequency arc starting devices may be used for TIG welding.

5.7 Care must similarly be taken when stopping the arc to avoid unfilled crater and crater

cracks. The following techniques are recommended for stopping the arc: The arc should be drawn off to the side of the joint and stopped on the beveled surface of the joint while extending the arc length rapidly.

5.8 When welding carbon steel with covered electrodes, the width of the deposited pass shall not exceed three times the nominal core wire diameter.

5.9 Vertical welds shall be made in an upward direction. On pipes over 300 mm (12") in diameter, welding shall be done whenever possible, by two welders working simultaneously on both sides of the pipes.

6.0 Joint Design

6.1 In all instances the end preparation for welding shall be as per the Engineer's drawings.

6.2 Where counter-boring or any other machining is done, the remaining wall thickness of pipes or fittings shall not be less than that shown on the joint design drawings.

6.3 All circular butt-welded joints shall have their end preparations formed by machining, preferably on a lathe. Any machining equipment to be used for this purpose must achieve the accuracy specified for the particular end preparation. Joints of other geometry may be prepared by drilling and grinding and shall be checked with profile gauges.

6.4 Where the circumstances do not permit machining or grinding, flame cutting may be used on carbon steel material to form the end preparation, provided the cut edge is grounded back at least one/sixteen inch below the deepest indentation.

7.0 Fit-up

7.1 All weld joint fit-ups shall comply with the tolerances specified on the design drawings.

7.2 Prior to starting fabrication, the relevant purchase specifications for materials (BARC or ASTM) shall be studied to establish the tolerance on supplied materials and their compatibility with specified fit-up tolerances.

7.3 Before fitting-up the weld joint, the profile and dimensions of the weld end preparation shall be checked. If the specified tolerances are exceeded this shall be corrected by grinding or machining.

7.4 The Quality Surveyor prior to welding the root pass shall examine all fit-ups.

8.0 Weld Profile

8.1 Butt welds shall be full penetration and the weld thickness shall exceed the minimum wall requirements of the pipe. The external surface of the weld shall be free from undercuts, overlaps and abrupt ridges or valleys. The weld metal reinforcement on the outside surface of the pipe shall not exceed the following limits.

Component Thickness (MM)	Maximum reinforcement (mm)

Up to (1/2") 13 mm(1/16") 1.5 mm
Over (1/2") to (1")-13mm to 25 mm (3/32") 2.38 mm
Over (1") to (2")-25mm to 50 mm (1/8") 3.18 mm
Over (2") 50 mm (5/32") 3.97 mm

The reinforcement shall be crowned at the centre and shall taper smoothly to the surface being joined.

8.2 The surface smoothness of the finished weld shall be suitable for proper interpretation of the non-destructive examination of the weld. If grinding is necessary, the weld shall be blended into the present metal without gouging or thinning the parent metal in any way. Uneven or excessive grinding may cause rejection or re-work at the discretion of the Inspector.

8.3 When components of different outside diameters are welded together there shall be a gradual transition between the two surfaces. The length of the transitions shall be such that the length to offset ratio shall not be less than 3 to 1.

8.4 The root pass of butt welds made without inserts shall have less than 1/16-inch internal reinforcement. Defects such as icicle, burn-through and excessive "suck-back" etc. shall be cause for rejection of the weld.

8.5 Fillet welds shall preferably be slightly convex and shall be free from undercutting and overlap at the toe of the weld. Convexity/concavity shall not exceed 1.5 mm (1/16'). Full penetration shall be obtained at the root of the fillet and in no case shall the leg length of the fillet be less than the nominal weld size stated in the drawings or specifications. The leg length shall not exceed the specified size by more than 1.5 mm (1/16").

8.6 The profiles of welds on branch connections depend on the type of the attachments and shall be as per the detailed drawings issued by the Engineer.

9.0 Attachment welds

9.1 Attachments such as lugs, brackets, rings and other non-pressure parts that are welded to the pipe to form an integral and permanent attachment shall be in accordance with the details shown on the Engineer's drawings.

9.2 Temporary attachments, which may be required to retain fit-up for welding, shall be of material compatible with the material to which it is attached.

9.3 All attachment welds shall be done by qualified welders and in accordance with qualified procedures. Welds shall be preheated and post weld heat-treated as called for in the appropriate welding procedure.

9.4 Temporary attachments shall be removed in a manner that will not damage the pipe. The removal can be done by grinding, chipping, sawing or in the case of heavy weldments by arc gouging or flame cutting. The attachment may be reduced to a very small cross-section and then the attachment "knock-off". "Knocking-off" of full size attachment welds or tacks is not permissible. When arc or flame gouging is used at least 3 mm (1/8") of metal shall be left free of the pipe surface, which will then be removed by grinding. Such gouging shall be done tangentially to the pipe surface and the pipe

surface shall be suitably protected.

9.5 The areas from which temporary attachments have been removed shall be dressed smooth and be examined by the magnetic particle or liquid penetrant method. Defects shall be removed and material re-inspected to ensure their removal. If weld repairs are necessary, they shall be made using qualified procedures and welders and shall again be examined by the magnetic particles or liquid penetrant method.

10.0 Tack Welds

10.1 All tack welds shall be made using a qualified procedure and by qualified welders. Any preheat requirements specified in the welding procedure shall also apply to tack welds.

10.2 The number and size of the tack welds shall be kept as small as is consistent with adequate strength and joint alignment.

10.3 All tack welds shall be examined visually for defects and if found defective shall be completely removed.

10.4 As the welding proceeds, tack welds shall be either removed completely or shall be properly prepared by grinding or filling their stopping and starting ends so that they may be satisfactorily incorporated into the final weld.

11.0 Repairs

11.1 Any weld repairs shall be subject to the approval of the Quality Surveyor.

11.2 Unacceptable defects shall be removed by grinding, machining or chipping. Arc gouging or flame cutting are also permitted provided gouged surfaces are ground at least 1.5 mm (1/16") below the deepest indentation.

11.3 If preheat is specified in the appropriate welding procedure, then the same preheat must be maintained during flame or are gouging.

11.4 Dye penetrant shall be used to check that the defect has been completely removed prior to weld repair. In the event of any doubt regarding complete removal of a defect, radiography may be required at the discretion of the Quality Surveyor.

11.5 Weld repairs shall be made using qualified procedures and welders. The preparation for the weld repair shall have the prior approval of the Quality Surveyor.

11.6 In the event of several unsuccessful repair attempts or if the Quality Surveyor feels that a satisfactory repair is not feasible the joints shall be completely remade. However, the number of weld repair attempts shall be restricted to 2 (two).

11.7 The re-welded area shall be re-examined by the methods specified for the original weld. Where radiography is required, a minimum amount of 50 mm (2") film overlap beyond the repair edges must be ensured.

11.8 Repairs of any base material utilised in fabrication of piping shall not be undertaken unless specifically permitted by the Quality Surveyor.

12.0 Seal Welds

12.1 Seal welding shall be done by qualified welders, and in accordance with approved procedures.

12.2 Threaded joints that are to be seal welded shall be made without the use of a thread lubricating compound.

12.3 The surfaces to be welded shall be clean & free from paint, grease, oil, rust, seal compound etc.

12.4 The threads shall be adequately prepared by grinding and entirely covered by the seal weld. The surface of the seal weld shall merge smoothly into the component surface and shall be suitable for the proper interpretation of non-destructive examination of the weld.

12.5 Seal welds shall not be considered as contributing to the strength of the joints. Backing off to correct alignment of screwed connections is not permitted. A qualified welder shall do the seal welding.

12.6 All threaded piping will be seal welded as specified.

13.0 Filler metals/electrodes

13.1 The selection of filler metals/electrodes for welding of piping shall be as per Section V Chapter I of this document.

13.2 The brands of electrodes to be used by the contractor shall be submitted for approval of BARC Engineer. For each batch of each approved band, certificates showing compliance with the specification shall be secured and shall be submitted to the Quality Surveyor before being released for use on project piping.

13.3 All electrodes shall be stored in their original sealed containers and under any conditions (50% maximum Relative Humidity). The electrodes shall remain identified until consumed.

13.4 All electrodes shall be dried before use in accordance with manufacturer's instructions. Drying ovens shall be provided in work areas for this purpose. Each lot of electrodes withdrawn from the oven shall be used within two hours. During periods of high humidity shorter periods may be required. Electrodes not used during this period shall be returned to ovens. Electrodes shall not be left at work locations whether in metal containers or otherwise. In the event that electrodes are left out for periods longer than two hours they shall be re-baked following the electrodes Supplier's re-baking procedure.

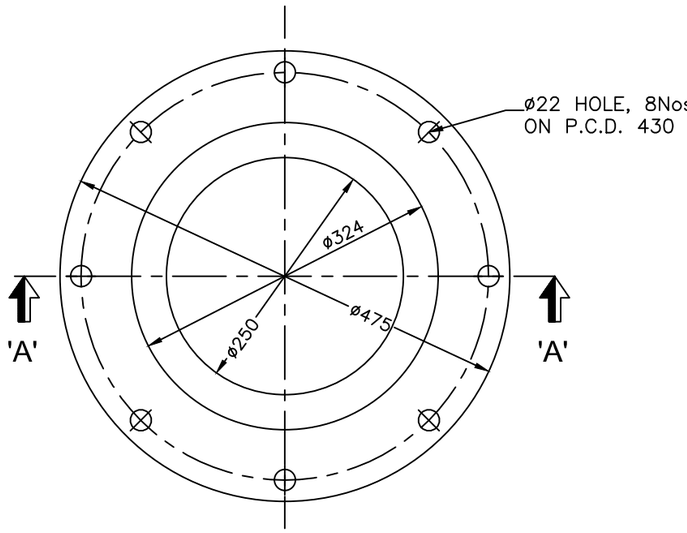
13.5 Electrodes which have been exposed to rain or which have been other wise exposed to water however shall be discarded. No re-baking of such contaminated electrode will be permitted.

SCHEDULE-B

Items to be supplied /Works to be executed by the contractor

Name of the work: **Fabrication, Supply and Installation of parts of NCV and other components as per schedule B for Experimental Flow Test Facility at BARC, Visakhapatnam site**

Sl. no.	Description of materials to be supplied	Qty	Unit
1.1	250 X 300 mm spool piece as per drawing (PART-1)	1	Number
1.2	250 X 350 mm spool piece as per drawing (PART-2)	1	Number
1.3	NCV Float as per drawing (PART-3)	1	Number
1.4	Acrylic sheet 1355.0 mm (L) x 510.0 mm (W) x 10.0 mm (thick) with holes	4	Number
1.5	Under water LED Light (36W) with driver and 10m electrical wire attached to lights	4	Number
1.6	Pump Bush and couplings 150 x 100 mm	3	Number
1.7	3 mm thick Neoprene rubber gasket sheet required for flange joints as per the technical specifications given in the tender.	10	Kilogram
1.8	5 mm thick Neoprene rubber gasket sheet required for flange joints as per the technical specifications given in the tender.	10	Kilogram
1.9	25 micron Filter Cartridges	8	Number
1.10	6 inch Steel Vernier Callipers With Digital Indication	1	Number
1.11	Cotton Hand Gloves	30	Pairs
1.12	Industrial and construction Safety Helmet with adjustable Knob	5	Number
1.13	Chrome plated Adjustable Spanner with soft grip of size 6 inch, 8 inch, 10inch, and 12 inch Confirming to IS 6149-1984 Grade II	1	Set
1.14	Installation of Part-1, NCV after removal of internal components	1	Number
1.15	Installation of Part-2, NCV after removal of internal components	1	Number
1.16	Installation of Part-3, after removal of Spherical Float	1	Number
1.17	Dismantling, repair, cleaning and installation of strainer, valves, instrumentation tubing of 100m, and instrumentation equipment's.	1	Number
1.18	Dismantling of NCV components, repair of side windows of experimental tank, replacement of existing filter cartridges with new cartridges	1	Number



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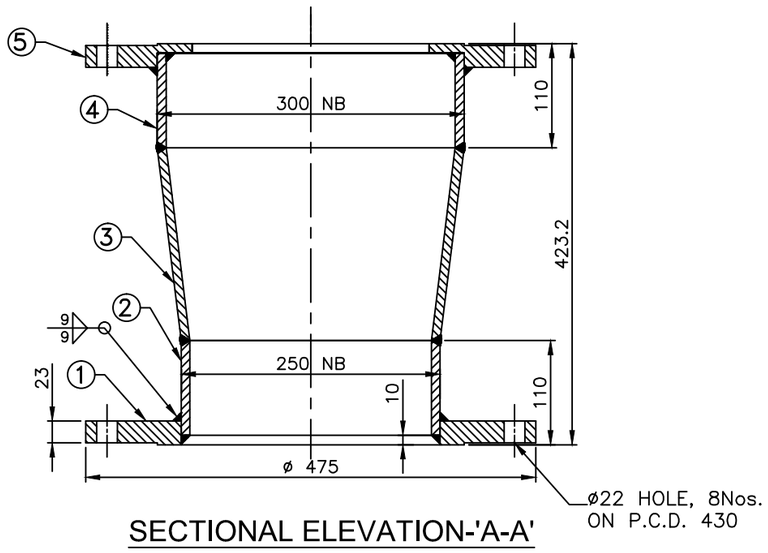

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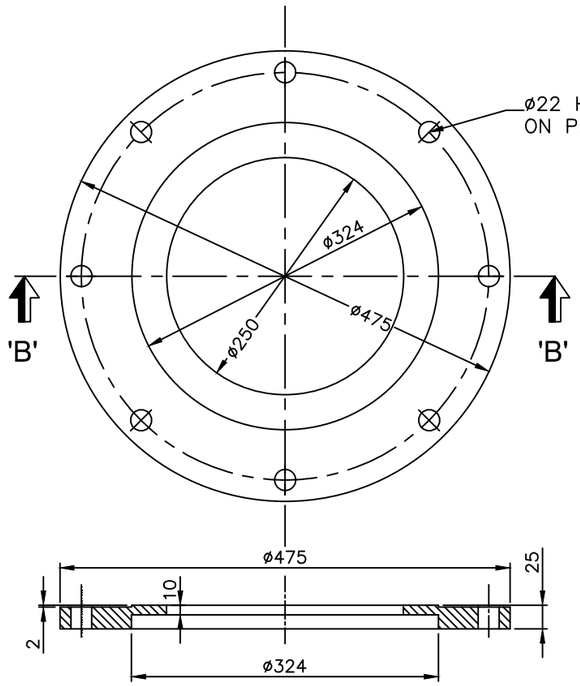
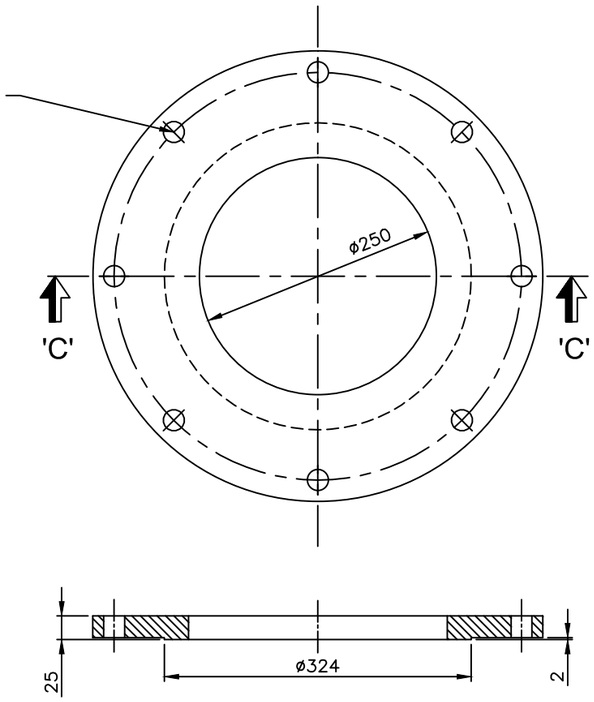


PART-1



PART-5

NOTE:–

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.

PART NO.	DESCRIPTION	QTY	MTRL	SIZE	REMARK
5	FLANGE	1	SS 304 L	AS PER DRG.	
4	PIPE	1	SS 304 L	300 NB SCH 40	
3	REDUCER	1	SS 304 L	CR 250x300 SCH.40	
2	PIPE	1	SS 304 L	250 NB SCH 40	
1	FLANGE	1	SS 304 L	AS PER DRG.	

BILL OF MATERIAL

GENERAL TOLERANCE UNLESS OTHERWISE SPECIFIED

LINEAR DIMENSIONS		LENGTH OF SHORTER SIDE OF ANGLE	
UPTO – 6	± 0.1	1 – 6	± 1°
6 – 30	± 0.2	6 – 30	± 0.30'
30 – 120	± 0.3	30 – 120	± 0.20'
120 – 315	± 0.5	120 – 400	± 0.10'
315 – 1000	± 0.8		

SURFACE FINISH 3.15/63 IN MICRONS CHAMFER 1x45°

NOTE :– 1) IF IN DOUBT ASK.
2) ALL DIMENSIONS ARE IN MILLIMETERS.
3) REMOVE SHARP CORNERS AND BURRS.

NO.	LOCATION	DESCRIPTION	DRAWN	APP'D.

REVISIONS

TITLE: PART - 1

DES'D.	DRN.	DATE: 01/05/2022	APP'D. DATE:
DES. CHK'D.	DRG. CHK'D.	DATE:	PROJECTION:

TENDER DRAWING

SCALE: –

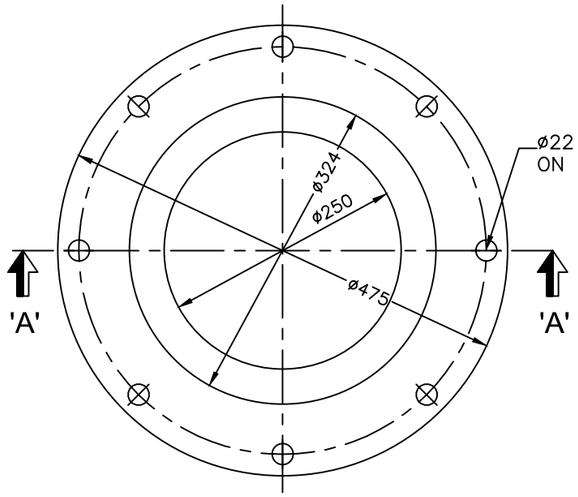
FILE NAME: –

GOVERNMENT OF INDIA
BHABHA ATOMIC RESEARCH CENTRE

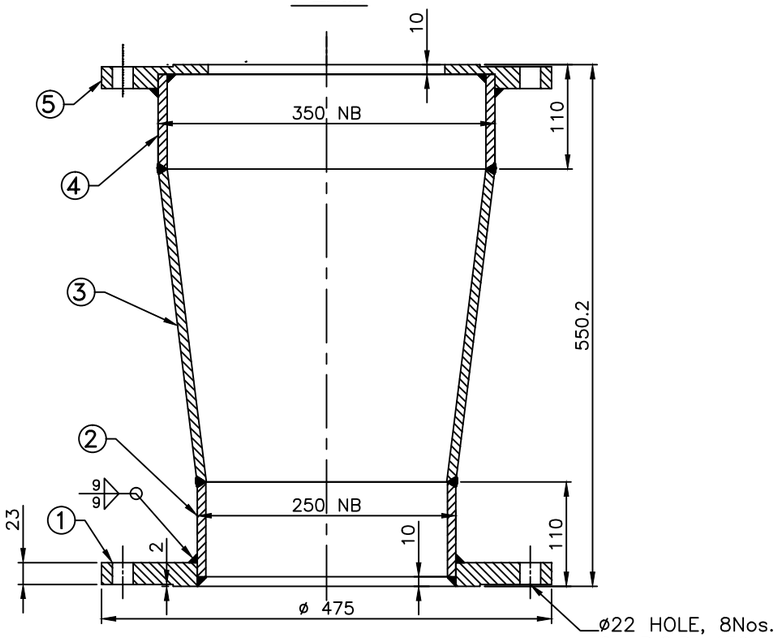
DRG. NO.

SHEET OF REV.

A3– 1:1



PLAN



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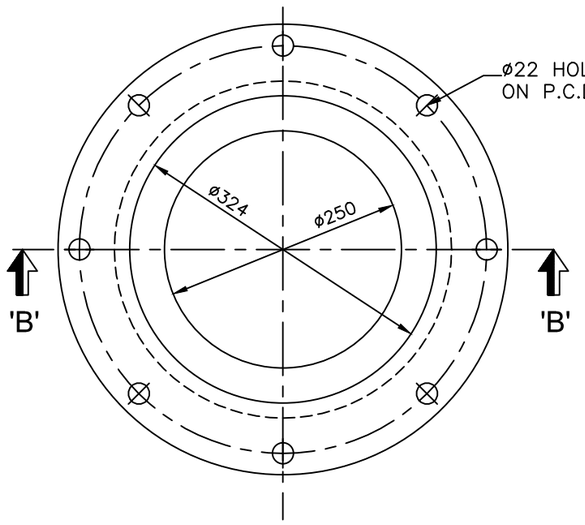
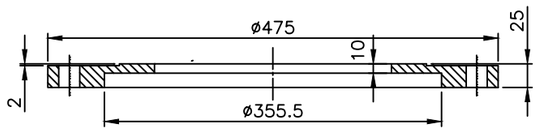
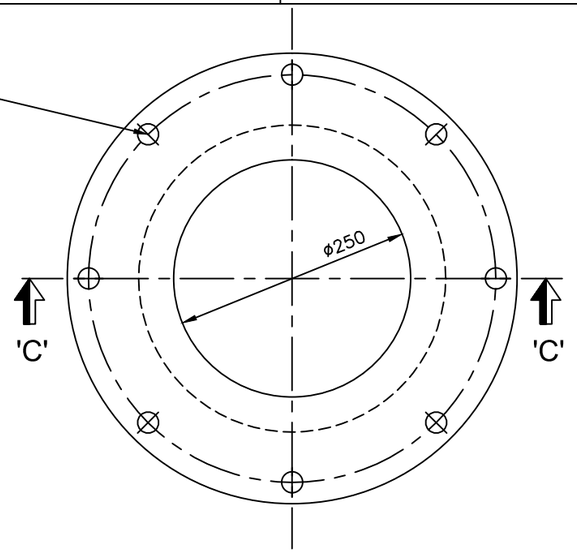
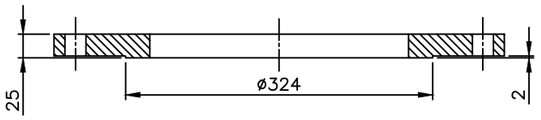




PART-1





PART-5

NOTE:–

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.

PART NO.	DESCRIPTION	QTY	MTRL	SIZE	REMARK
5	FLANGE	1	SS 304 L	AS PER DRG.	
4	PIPE	1	SS 304 L	350 NB SCH 40	
3	REDUCER	1	SS 304 L	CR 250x350 SCH.40	
2	PIPE	1	SS 304 L	250 NB SCH 40	
1	FLANGE	1	SS 304 L	AS PER DRG.	

BILL OF MATERIAL

GENERAL TOLERANCE UNLESS OTHERWISE SPECIFIED

LINEAR DIMENSIONS		LENGTH OF SHORTER SIDE OF ANGLE	
UPTO – 6	± 0.1	1 – 6	± 1°
6 – 30	± 0.2	6 – 30	± 0.30'
30 – 120	± 0.3	30 – 120	± 0.20'
120 – 315	± 0.5	120 – 400	± 0.10'
315 – 1000	± 0.8		

SURFACE FINISH IN MICRONS 3.15/ CHAMFER 1x45°

NOTE :– 1) IF IN DOUBT ASK.
2) ALL DIMENSIONS ARE IN MILLIMETERS.
3) REMOVE SHARP CORNERS AND BURRS.

NO.	LOCATION	DESCRIPTION	DRAWN	APP'D.

REVISIONS

TITLE: PART - 2

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DES. CHK'D.	DRG. CHK'D.	DATE:	PROJECTION:

TENDER DRAWING

SCALE: –

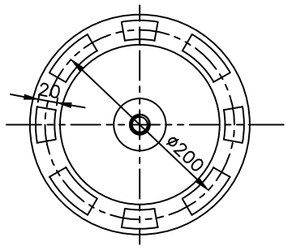
FILE NAME: –

GOVERNMENT OF INDIA
BHABHA ATOMIC RESEARCH CENTRE

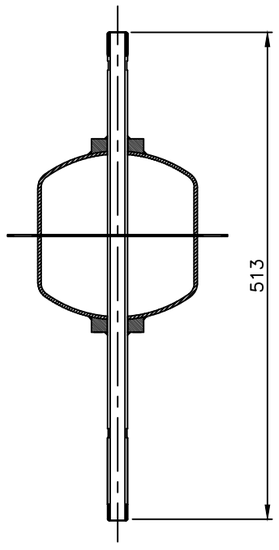
DRG. NO.

SHEET OF REV.

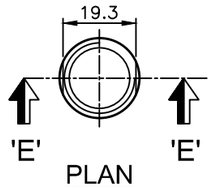
A3– 1:1



PLAN



SECTIONAL ELEVATION
NCV FLOAT ASSEMBLY



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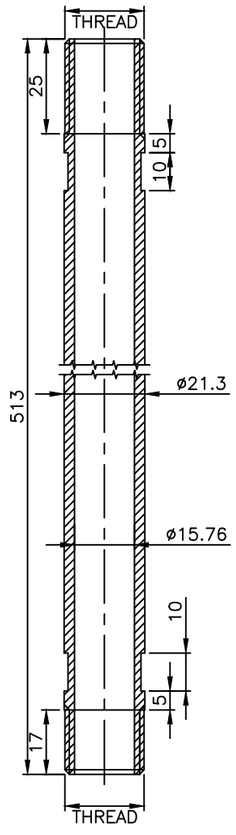
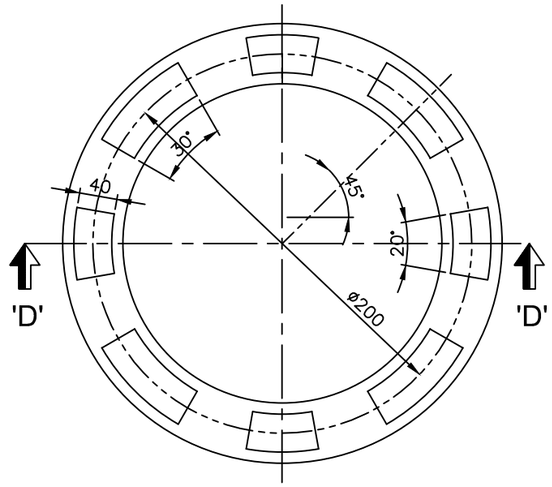
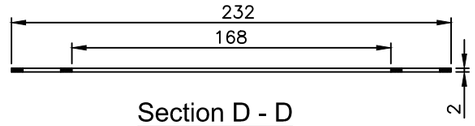


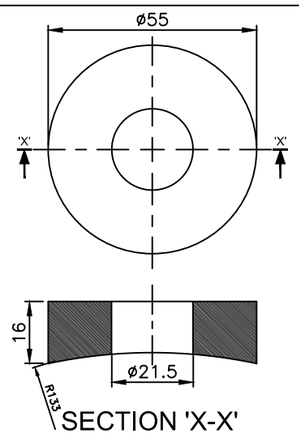
SECTION 'E-E'
STEM



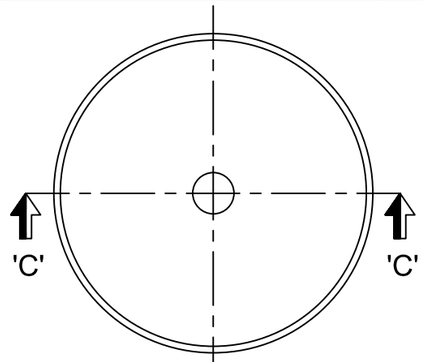
PLAN



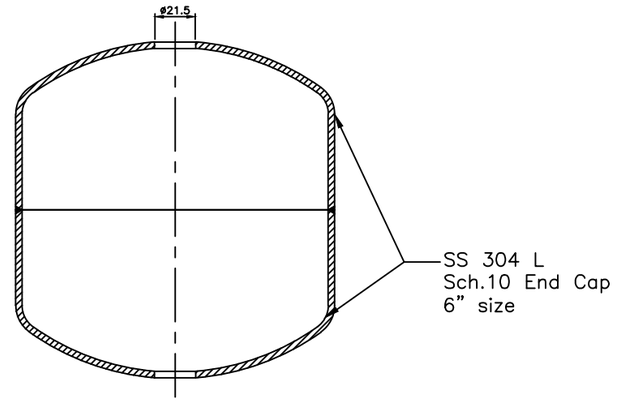
Section D - D
LIMIT SWITCH DISC



SECTION 'X-X'
SADDLE



PLAN



SECTION 'C-C'
FLOAT

NOTE:–

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.

PART NO.	DESCRIPTION	QTY	MTRL	SIZE	REMARK
4	FLOAT	1	SS 304 L	AS PER DRG.	
3	LIMIT SWITCH DISC	1	SS 304 L	AS PER DRG.	
2	SADDLE	1	SS 304 L	AS PER DRG.	
1	STEM	1	SS 304 L	15 NB SCH.40	

BILL OF MATERIAL

GENERAL TOLERANCE UNLESS OTHERWISE SPECIFIED

LINEAR DIMENSIONS		LENGTH OF SHORTER SIDE OF ANGLE	
UPTO – 6	± 0.1	1 – 6	± 1°
6 – 30	± 0.2	6 – 30	± 0.30'
30 – 120	± 0.3	30 – 120	± 0.20'
120 – 315	± 0.5	120 – 400	± 0.10'
315 – 1000	± 0.8		

SURFACE FINISH IN MICRONS 3.15 √ CHAMFER 1x45°

NOTE :– 1) IF IN DOUBT ASK.
2) ALL DIMENSIONS ARE IN MILLIMETERS.
3) REMOVE SHARP CORNERS AND BURRS.

NO.	LOCATION	DESCRIPTION	DRAWN	APP'D.

REVISIONS

TITLE:

PART - 3

DES'D.	DRN.	DATE: 01/05/2022	APP'D. DATE:
DES. CHK'D.	DRG. CHK'D.	DATE:	PROJECTION:

TENDER DRAWING

SCALE: –

FILE NAME: –

GOVERNMENT OF INDIA
BHABHA ATOMIC RESEARCH CENTRE

DRG. NO.

SHEET OF REV.

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