प्लाज्मा अनुसंधान संस्थान

(परमाणु ऊर्जा विभाग, भारत सरकार का एक सहायता प्राप्त संस्थान)
इंदीरा ब्रिज के पास, भाट, गांधीनगर – 382428, भारत
दूरभाष: 079-23962020/23962021, फैक्स: 079-23962277

निविदा सूचना दिनांक 24-10-2019
TENDER NOTICE DATED 24-10-2019

निम्नलिखित के लिए प्रतिष्ठित एवं योग्य पार्टियों से **दो भागों** में मोहरबंद निविदाएँ आमंत्रित की जाती हैं।
Sealed tenders are invited in **TWO PART** from reputed and eligible parties for the following.

क्र. सं.	निविदा सूचना सं.	मद	मात्रा	अंतिम तारीख और समय		निविदा शुल्क (रु.)	ईएमडी (रु.)
				निविदा जमा करने की तारीख	निविदा खोलने की तारीख		
1.	IPR/TN/ PUR/ TPT/19-20/34 **(TWO PART TENDER)**	- Fabrication, testing and supply of Basic Symmetric Chamber (BSC) as per the specifications given in the tender documents. Fabrication, testing and supply of Horizontal Access Module (HAM) as per the specifications given in the tender documents.	1 Set. 1 Set.	**11th December, 2019 by 1.00 p.m.**	**11th December, 2019 at 2.30 p.m.**	700.00	10,00,000.00

निविदा दस्तावेज आईपीआर की वेबसाइट पर उपलब्ध हैं: **:** http://www.ipr.res.in/ documents/tenders.html**.** निविदा दस्तावेजों में उल्लिखित पात्रता मानदंडों को पूरा करने वाले निविदाकार, उनके विकल्प पर, वेबसाइट से निविदा दस्तावेज डाउनलोड कर सकते हैं और निविदा दस्तावेजों में दिए गए विवरण के अनुसार निर्धारित निविदा शुल्क (अप्रतिदेय) और ईएमडी को किसी भी राष्ट्रीयकृत/अनुसूचित बैंक से डिमांड ड्राफ्ट के रूप में, जो प्लाज्मा अनुसंधान संस्थान के नाम में और अहमदाबाद में देय, के साथ अपना प्रस्ताव जमा कर सकते हैं। यह ध्यान दिया जाए कि निविदा की तारीखों, विनिर्देशों और नियमों और शर्तों के संबंध में कोई भी अद्यतन सूचना होने पर वह आईपीआर की वेबसाइट पर अधिसूचित और अपलोड की जाएगी और इस संबंध में अलग से कोई शुद्धिपत्र प्रकाशित नहीं किया जाएगा। अत: इच्छुक बोलीदाताओं को ऐसी अद्यतन सूचना जानने के लिए नियमित रूप से आईपीआर की वेबसाइट पर जाना होगा। यदि पार्टी डाक द्वारा निविदा दस्तावेज प्राप्त करना चाहती है, तो वे निर्धारित निविदा शुल्क के साथ क्रय अधिकारी से संपर्क कर सकते हैं। निविदा दस्तावेज **13-11-2019** तक जारी किए जाएंगे।

Tender documents are available on IPR Website **:** http://www.ipr.res.in/ documents/tenders.html**.** Tenderers meeting the eligibility criteria mentioned in the tender documents may, at their option, download the tender documents from the website and submit their offer along with prescribed **Tender Fee (non refundable) and EMD** in the form of Demand Draft from any nationalized/scheduled bank drawn in favour of ***Institute for Plasma Research*** and payable at ***Ahmedabad*** as per the details given in the tender documents. It is to be noted that all further updates or amendments if any regarding the tender dates, specifications and terms & conditions shall be notified and uploaded on the IPR website and no separate corrigendum would be published in this regard. Therefore, interested bidders need to visit the

website of IPR on a regular basis for such updates. In case party desires to collect the tender documents by post, they may contact the Purchase Officer along with prescribed tender fee. Tender documents will be issued upto **13-11-2019.**

निविदा खोलने में भाग लेने वाले प्रतिनिधि को निविदा खोलने में भाग लेने के लिए संगठन से प्राधिकरण पत्र लेना होगा, जिसके न होने पर उसे निविदा खोलने में शामिल होने की अनुमति नहीं दी जाएगी।

Representative who is going to attend the tender opening should carry an authorization letter from the organization for participation in the tender opening failing which he/she will not be allowed to attend the tender opening.

TENDER FORM

प्लाज्मा अनुसंधान संस्थान

(भारत सरकार के परमाणु ऊर्जा विभाग का सहायता प्राप्त संस्थान)
इंदीरा ब्रिज के पास, भाट, गांधीनगर – 382428, भारत
दूरभाष: 079-23962020/23962021, **फैक्स:** 079-23962277

निमंत्रण निविदा और निविदाकारों को निर्देश करने के लिए
Invitation to Tender and Instructions to Tenderers

The Purchase Officer, Institute for Plasma Research invites tenders in **TWO PART (INR QUOTE ONLY)** for supply of stores as detailed in the Purchaser's Tender documents. The conditions of contract and instructions to tenderers which will govern the contract pursuant to tender are given below. **The quote should be in INR only.**

If you are in a position to quote for the supply in accordance with the requirements stated in the attached Tender Form please submit your quotation as per the details given in the tender documents.

Kindly ensure that your quotation reaches us on or before the due date indicated in the tender notice.

Yours faithfully,

D.Ramesh
Purchase Officer-II

INSTITUTE FOR PLASMA RESEARCH
(An Aided Institute under
Department of Atomic Energy, Government of India)
Near Indira Bridge; Bhat; Gandhinagar-382428; India
Phone: 079-23962020/23962021, Fax: 079-23962277
Email: ramesh@ipr.res.in

INSTRUCTION SHEET

TENDER NOTICE No.IPR/TN/PUR/TPT/19-20/34 DATED 24-10-2019

(TWO PART)

For Fabrication, testing and supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specifications given in the tender documents – 1 Set each

1. Full details and specifications of the items and general instructions to be followed regarding submission of tenders are indicated in the tender documents.

2. **Proof for fulfillment of eligibility criteria mentioned hereunder should be submitted along with the tender. If the tender is submitted without valid documents, we shall not consider your offer. Tenders received without proof of eligibility criteria will be rejected.**

3. Tender documents can also be obtained by submitting a written request to the Purchase Officer together with prescribed tender fee, provided that the eligibility criteria is fulfilled. Last date for issue of Tender documents is **13-11-2019**.

4. While requesting for Tender Documents, such request shall indicate the **"REQUEST FOR TENDER DOCUMENTS AGAINST TENDER NOTICE NO. IPR/TN/PUR/TPT/19-20/34 DATED 24-10-2019".**

5. **Tender Fee:** The tender fee of Rs.700/- (non refundable) should be made in the form of DEMAND DRAFT issued by SBI/nationalized banks or any one of the scheduled banks mentioned in the bracket (Axis Bank, HDFC Bank, ICICI Bank and IDBI Bank) drawn in favour of *Institute for Plasma Research* and payable at *Ahmedabad*. Vendor's name and tender number shall be indicated on the reverse side of the Demand Draft.

5.1 Exemption from payment of Tender Fee: The firms registered with NSIC, DPS or Micro & Small Enterprises (MSEs) which are actual producers/manufacturers of tendered items are exempted from payment of Tender Fee provided valid registration certificate is submitted along with the offer.

6. **DD should not be prior dated to the date of advertisement. Separate request letter and separate Demand Draft shall be sent for each tender.**

7. **Those who use the downloaded tender documents from IPR Website may submit the prescribed Tender Fee keeping in a separate envelope along with the tender.**

8. **Tenders received without the prescribed tender fee will be rejected.**

9. No request for the extension of due date will be considered.

10. Late/Delayed offers will not be accepted.

11. **Tender in a sealed envelope (Technical Bid, Commercial terms and conditions and EMD [Part-I] in one envelope and Price Bid [Part-II] in another envelope) superscribing the envelope with the above tender no., date, due date and brief description of tendered item should be submitted to the *Purchase Officer* at the above address by 1.00 p.m. on 11th December, 2019. Part-I (Technical Bid along with Tender Fee of Rs.700/-, commercial terms and conditions and EMD for Rs. 10,00,000/-) received upto 1.00 p.m. on 11-10-2019 will be opened on the same day at 2.30 p.m. in the presence of attending tenderers.**

12. IPR will not be responsible for any delay/loss of documents in transit.

13. Tenders received without the details asked for including proof of eligibility for participating in the tender may not be considered.

14. Tenderers should furnish/enclose full technical details/literature, delivery period and confirm the terms and conditions attached with the tender.

15. Those who do not meet with the eligibility criteria need not submit Tender.

18. The Director, IPR reserves the right to accept or reject any offer in full or part thereof without assigning any reason thereof.

19. Quotations received without EMD will not be considered.

TENDER NOTICE No.IPR/TN/PUR/TPT/19-20/34 DATED 24-10-2019

ELIGIBILITY CRITERIA (ANNEXURE-A)

(**The bidder is required to submit all supporting documents as proof for the compliance of the following criteria**. The attachments must be serially labelled with the number as given in the table below. **Bids received without valid documents and/or incomplete and irrelevant documents are likely to be rejected summarily**)

Sr. No.	Essential Eligibility compliance	Evidence for submission	Attachment Sr. No. of proofs and evidence
1.	The Bidder must be a company registered in India for at least seven years from date of publication of this Tender	Bidder must provide copy of registration certificate issued by the Registrar of Companies (ROC)	
2.	The Bidder must have valid ISO 9001:2015 certification or quality management practice being followed	Bidder should submit copy of valid ISO 9001:2015 certificate or equivalent that shows quality management practices being followed	
3.	The Bidder must have experience during previous seven years (from the date of publication of this Tender) minimum in the field of design, manufacturing, vacuum testing and supply of at least 1.0 cu. m size chamber made up of stainless steel and operating in High Vacuum (HV) / Ultra-High-Vacuum (UHV)	Bidder should submit copy of executed Work Orders / contracts in previous seven years (from the date of publication of this Tender) consisting of design, manufacture, vacuum testing, installation and commissioning onsite to the satisfaction of customer, highlighting relevant technical details of the scope of work	
4.	Bidder must have access to use clean room area of class 100000 (ISO 8)	Bidder should submit the details of clean room area describing - A. Clean room dimensions B. Location (within works premise / outside work premise) details C. Attach photographs	
5.	Bidder to have in house Computer Aided Drafting (CAD) or have access to CAD through his subcontractor.	Bidder should submit copy of Purchase Orders covering CAD in its scope	
6.	Bidder should have in house or access to facilities for fabrication, large size machining, inspection, metrology and vacuum testing suitable for executing the job specified in this tender.	Bidder must submit details of A. Large size machining facilities available for fabrication B. Metrology, inspection & test facilities used for dimensional check, assembly accuracies C. vacuum leak test facility.	

		D. details of outsourced services, if any, with supporting documents for the same.	
7.	**1.** Bidder must be a profit making entity in last two out of three years and must have sound financial standing to undertake and successfully execute the scope of work of this tender within the completion schedule. **2.** The average annual turnover of the Bidder must be not less than Rs.20 (twenty) Crores in last three years (i.e. 2015-16 to 2017-18).	Bidder should submit Audited balance sheet and Profit & Loss Account for the past 3 financial years (i.e. 2015-16 to 2017-18) as a proof	
8.	The Bidder must have executed single order of value not less than Rs.1.0 (one) Crore consisting of manufacturing and supply of vacuum chamber in last 5 (five) years from date of publication of this Tender	Bidder should submit copy of Purchase order, and Satisfactory completion certificate	

Note: Original documents shall be produced for verifications, if required.

The response to tender without submission of proof of above points will summarily be rejected without further communication.

NOTE: Issue of tender documents does not mean that a vendor is qualified to submit tenders. IPR's decision to consider as to whether a vendor has met with the eligibility criteria is final.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Form No: IPR-LP-PT-02.V3

TWO-PART TENDER
SECTION – A

Invitation to Tender and Tendering Conditions

1.0 INVITATION TO TENDER

1.1 Institute for Plasma Research (IPR) invites sealed tenders in DUPLICATE for supply of Plant, Machinery, Equipment/Components to the specifications detailed in Section "C" to this tender document. The conditions of contract/purchase order which will govern the contract pursuant to the tender are as contained in Section "B" of this tender document. If you are in a position to quote for supply in accordance with the technical specifications indicated in Section "C" to this tender document and as per the conditions stipulated in this Section and Section B, please submit your offer in a manner and method specified below.

2.0 MANNER AND METHOD FOR SUBMISSION OF TENDERS

2.1 All tenderers in response to this invitation shall be submitted in Two Parts as under and in the different envelopes.

2.1.1 **Part-I (Techno-commercial):** This part of the tender shall include/contain documents related to eligibility criteria, all technical details, technical specifications, drawings and also the commercial terms and conditions of contract for the supplies to be made and the services to be rendered **EXCLUDING ANY PRICE DETAILS THEREOF.**

Proof for fulfillment of eligibility criteria mentioned in Annexure-A should be submitted along with the tender. If the tender is submitted without valid documents, we shall not consider your offer. Tenders received without proof of eligibility criteria will be rejected.

2.1.2 **Part-II (Price):** This part should contain only the prices of the stores offered for the services to be rendered. Part-II (Price) should be furnished in accordance with the format provided by the Purchaser at Section "D" of this tender document

2.1.3 If tenderer includes prices of any nature in Part-I (Techno-commercial) of the tender such offers are liable for rejection without any notice to the tenderers.

3.0 EARNEST MONEY DEPOSIT (EMD)

3.1 The Tenderer shall submit, as part of its bid, interest free Earnest Money Deposit (EMD) for an amount as specified in the Tender Notice. In the case of foreign bidders, the EMD shall be submitted either by the principal or by the Indian agent and in the case of indigenous bidders; the EMD shall be submitted by the manufacturer or their specifically authorized dealer/bidder. EMD shall be submitted by way of Demand Draft from **SBI/nationalized banks or any one of the scheduled banks mentioned in the bracket (Axis Bank, HDFC Bank, ICICI Bank and IDBI Bank)** issued in favour of ***"Institute for Plasma***

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Research" and payable at **Ahmedabad**. **Tender received without EMD will be rejected at the discretion of IPR.**

3.2 The EMD of unsuccessful Tenderer will be discharged/returned after finalizing award of the Contract/placement of Purchase order.

3.3 The successful Tenderers EMD shall be discharged upon the Bidder submitting the Security Deposit as specified in the contract/purchase order, without any interest.

3.4 **Exemption from payment of EMD:** The firms registered with NSIC, DPS or Micro & Small Enterprises (MSEs) which are actual producers/manufacturers of tendered items are exempted from payment of EMD provided valid registration certificate is submitted along with the offer. In the case of foreign bidders, payment of EMD is exempted if they submit their bid directly or through their Indian agent in **foreign currency** against the tender document bought by them, so that the order can be placed directly on their Principals.

3.5 **The EMD may be forfeited:**

3.5.1 If a Tenderer withdraws or amends or modifies or impairs or derogates its bid during the period of bid validity specified by the Bidder on the Bid Form; or

3.5.2 In case of a successful tenderer, if the tenderer fails to furnish order acceptance within 15 days of the order or fails to submit the Security Deposit within 21 days from the date of contract/order.

4.0 LATE/DELAYED TENDERS

4.1 If the envelope containing Part-I (Techno-commercial) and Part-II (Price) does not reach the Purchase Officer, IPR on or before the due date and time specified for its receipt, such tenders will be treated as Delayed/Late tenders and will neither be opened nor considered by the Purchaser and will be summarily rejected. The tenderers should therefore take care and ensure that both Part-I and Part-II of their tenders reach the Purchase Officer, IPR on or before the due date and time specified for their receipt to avoid the rejection of the tenders.

5.0 OPENING OF TENDERS

5.1 Unless otherwise pre-opened or postponed with advance intimation to the tenderers, tender will be opened in two stages on the date and time indicated in the tender notice.

5.2 Part-I (Techno-commercial) of the tender will be opened at the first stage on the due date and time indicated for opening in the tender notice of this tender document while the Part-II (Price) will be opened at the second stage after completion of the evaluation of the Techno-Commercial Part (Part-I) of the tender.

5.3 While all the tenderers who submit tenders within the due date and time specified for its receipt will be permitted to participate in the opening of Part-I (Techno-Commercial) of the tender on the due date and time indicated in the instruction sheet of this tender document, opening of the Part-II (Price) of the tender can be attended to only by such of those tenderers whose Part-I (Techno-commercial) of the tenders are found to be technical suitable/acceptable to the Purchaser and to whom intimation thereof is given by the Purchaser by Email/letter.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

5.4 The tenderers whose Techno-commercial part (Part-I) are found suitable/acceptable to the Purchaser, will be given seven days advance intimation by the Purchaser to enable such tenderers to depute their representative to participate in the opening of the Part-II (Price) of the tender. The technically unqualified tenderers will neither be given any intimation about the date and time of opening of Part-II (Price) of the tender nor will they be permitted to participate in the opening of the same. **Part-II (Price) of the technically disqualified tenderers will not be opened.**

6.0 AUTHORITY LETTER

6.1 The tenderers who wish to participate in the opening of the tenders may depute their representatives to IPR on the respective due date and time as indicated in the tender notice with an authority letter addressed to the Purchase Officer which should be produced to the officers who are opening the tenders, on demand to prove the bonafides of the representative who participates in the opening of the tender. In case the representative of the tenderer fails to produce such an authority letter on behalf of the tenderer, he will be debarred from participating in the opening of the tenders.

6.2 The tenderers representative, who reaches the venue of the tender opening late, i.e. after the starting time specified for opening of the tenders, may not be allowed to take part in the tender opening. It should be noted that only one representative of each tenderer will be permitted to participate in the tender opening.

7.0 EVALUATION OF TENDER

7.1 Evaluation of tender shall be based on all inclusive landed cost.

8.0 PURCHASER'S RIGHTS TO REJECT QUOTATION

8.1 The Purchaser reserves the right to reject any quotation without assigning any reason thereof.

9.0 TECHNICAL CLARIFICATIONS

9.1 After opening of Part-I (Techno-commercial) of the tender, if it becomes necessary for IPR to seek clarifications from the tenderers, the same will be sought for from the tenderers.

10.0 **DATE FOR OPENING OF PART-II (PRICE):**

After completion of technical evaluation, Part-II (Price) of only technically qualified tenderers shall be opened. The date and time of opening of Part-II (Price) shall be intimated only to the technically qualified tenderers. Whose Part-I offers have been found suitable will only be permitted to participate in the opening of the Part-II (Price) of the tender.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

11.0 HOLIDAYS

If the date (s) specified for receipt and opening of the tenders is/are declared as holidays abruptly by the competent authority due to any administrative reasons, then the date(s) for opening of tenders will get postponed automatically to the next working day. As for instance, if the due date for receipt of tender and its opening falls on 3rd of a particular month and if the 3rd day of the month is declared as a holiday, then the opening date of tender will stand automatically postponed to 4th day of the month at the same time. However, due date for submission of tender will remain same as mentioned in the tender notice.

12.0 **VALIDITY OF OFFERS**

Offers shall be kept valid for acceptance for a period of of 120 (One hundred twenty) days from the date of opening of Part-II (Price) of the tender. Offers with shorter validity period will be liable for rejection.

13.0 **CATALOGUES/TECHNICAL LITERATURE**

Vendor shall submit all necessary catalogues/drawings technical literature data as are considered essential for full and correct evaluation of the offers shall invariably accompany the Part-I (Techno-Commercial) of the tender. The quotations are liable to be ignored if this condition is not complied with.

14.0 **TERMS AND CONDITIONS OF THE CONTRACT**

It must be clearly understood that any contract concluded pursuant to this invitation to tender shall be governed by the General Conditions of the Contract as contained in Section “B" of this tender document. Tenderers must therefore, take special care to go through these general conditions of contract and in exceptional cases if any deviations are proposed, these must be clearly indicated in the Part-I of the tender as a separate annexure instead of merely enclosing their printed conditions of Sale. Tenders made subject to counter conditions or far too many deviations from the general conditions of contract, i.e. Section "B" of this tender document are liable to be ignored. It should also be realised that failure to bring out deviations from the General Conditions of Contract contained in Section "B" of this tender document will imply that the tenderer is willing to execute the contract as per the Purchaser's terms and conditions of contract.

15.0 TENDERING CONDITIONS FOR BIDS

15.1 The prices quoted must be FIRM and preference will be given to such tenders. In exceptional cases (e.g. items involving substantial use of raw materials susceptible to sharp fluctuations in prices) if prices quoted subject to variation it shall be on the basis of a standard 'Price Variation Formula'. The basis for calculation shall be very clearly stated. The responsibility for furnishing the documentary evidence for price variation lies with the vendor. Here again preference will be given to the tenders with a specific ceiling on escalation.

15.2 Prices quoted by the tenderer should include all charges involved for direct and safe-delivery of the stores to the consignee/place of delivery indicated in the tender document. If a tenderer so desires, separate lump sum charges for safe-delivery of the stores to the consignee/purchaser’s site, could be furnished. However, the purchaser reserves the right to call for break-up. The purchaser will neither undertake responsibility for transit insurance nor pay for it separately.

15.3 In respect of tenders on Ex-works basis, in case the tenderer has not mentioned in the offer packing, forwarding and transportation charges for safe delivery up to Purchaser's site, 2% of the price quoted towards packing (in respect of both local and outstation firms), 1% of the basic price quoted towards safe delivery

charges in respect of local tenderer and 3% of the basic price quoted towards safe delivery charges in respect of outstation firm will be added for comparison of offers on safe door delivery at Purchaser's site.

15.4 The stores shall neither be despatched under 'owner's risk' nor consigned to 'self', but only to the consignee's name and address indicated in the Purchase order. Non-adherence to this condition shall make the contractor liable to bear all consequential penalties/expenses such as demurrage, wharf age, etc. which the Purchaser may incur.

15.5 The consignee will, as soon as possible, but not later than 45 days from the date of arrival of stores at destination notify the contractor of any loss or damage to the stores that may have occurred during transit to enable the contractor to repair/rectify the defects/damages or replace the goods as is appropriate, free of all charges. In case it is desired by the contractor for returning of the material to them all expenses towards transportation etc. will be borne by the supplier and also will furnish bank guarantee towards the cost of material.

15.6 In case an Indian supplier/Agent furnishes an offer for supply of out-rightly imported stores, the price of such stores shall be quoted in Indian Rupees for delivery to the consignee's premises exclusive of import duties and on firm price basis.

15.7 **Conditional Discount:** In case the tenderer offers any conditional discount with regard to acceptance of their offer within a specific payment terms, delivery, quantity etc. the purchaser will not take into consideration such conditional discount while evaluating their offer.

16 **SPARES AND ACCESSORIES**

16.1 Tenders for plant/machinery/equipment/component shall also indicate prices for essential accessories, optional accessories and spares necessary for satisfactory operation of the plant/machinery/ equipment.

16.1.1 for a period of two years and

16.1.2 for a period of five years

16.2 Prices for accessories and spares shall be itemized. Tenders where only lumpsum prices are indicated are liable to be ignored. Particular care must be taken to list out each item of spare and quantity recommended and also the individual price for these items. These details should be included only in Part-II (Price) of the tender. However, a list of spares and accessories without Price should be included in Part-I (Techno-Commercial) of the tender.

17 **QUANTITY**

The purchaser reserves the right to accept tenders for any quantity of his choice and the tenderer shall be bound to accept a contract for any quantity. The Purchaser also reserves the right to accept or reject lowest or any tender in full or in part without assigning any reasons.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

18 **STATUTORY LEVIES SUCH AS CUSTOMS DUTY, GOODS AND SERVICE TAX**

18.1 **CUSTOMS DUTY**

18.1.1 The Purchaser is entitled for assessment of customs duty at the concessional rate as per Customs Notification No. 51/96-Custom dated 23.7.1996 issued by the Department of Revenue, Ministry of Finance, as amended from time to time, in respect of purchases made for the Research Institutions under the Department of Atomic Energy and the Purchaser will obtain the requisite certificate from the appropriate authority.

18.1.2 In case an Indian vendor/agent submits an offer for supply of outrightly imported stores in Indian Rupees, they should quote price for free and safe delivery of stores at destination.

18.1.3 Wherever, against a requirement, both indigenous as well as imported offers are received, the offers for imported stores will be evaluated on the basis of the total landed cost after loading the custom duty and other levies as may be applicable from time to time for taking purchase decision.

18.1.4 High Seas sale will not be considered.

18.2 **FLUCTUATION IN CUSTOMS DUTY**

18.2.1 Unless otherwise specifically agreed to in terms of the Contract, the purchaser shall not be liable for any claim on account of fresh imposition and /or increase in Customs Duty on raw materials and/or components used directly in the manufacture of the contracted stores, taking place during the pendency of the contract.

18.3 **Offers from Indian Agents on behalf of foreign suppliers:** In case the tender is submitted by an Indian supplier/Indian agent on behalf of their foreign supplier/ principals, following documents should be submitted with the tender, failing which, their offer is liable to be ignored.

18.3.1 Photocopy of the Agency Agreement between the Principals and the Indian Agent showing the percentage or the quantum of agency commission payable and a Letter of Authority from the Principals authorizing the Indian Agents to submit the tender on their behalf.

18.3.2 The type and nature of after sales services to be rendered by the Indian Agent.

18.3.3 Both Indian Agent and Principal/OEM cannot bid simultaneously for the same item/product in the same tender.

18.3.4 The Indian Agents are allowed to quote on behalf of only one foreign Principal/ Supplier against this tender.

18.4 **GOODS AND SERVICE TAX**

18.4.1 GOODS AND SERVICE TAX where legally leviable as per relevant HSN code will be admitted and reimbursed at the rate applicable during original delivery date.

18.4.2 GOODS AND SERVICE TAX intended to be claimed should be distinctly shown separately along with the price quoted. Where this is not done, no claim for GOODS AND SERVICE TAX will be admitted at any later stage and on any ground whatsoever.

18.4.3 The Purchaser is entitled for assessment of GST at the Concessional rate as per Notifications issued by the Government, as amended from time to time, in respect of purchases made for the Research and Development applications under the Department of Atomic Energy and other R&D units.

18.4.4 **GST for R&D Unit:** Goods and Service Tax (GST) wherever applicable will be paid extra at actual during the delivery period stipulated in the Purchase order. In terms of notifications issued by the Central Government and Statement Governments, R&D units of Department of Atomic Energy are

entitled for IGST @ 5% or CGST @ 2.5% and SGST @ 2.5% as applicable for stores covered under the Purchase Order.

18.4.5 **GST for Services:** As applicable. Specify the SAC codes wherever services are involved.

18.4.6 It would be the responsibility of the contractor to ensure that relevant certificate is obtained from the Purchaser before effecting the delivery of goods ordered failing which the excess tax paid by the contractor shall not be reimbursed by the Purchaser.

18.4.7 When GOODS AND SERVICE TAX is claimed as extra by the vendor in general and on packing charges in particular, the following certificates should be submitted by the vendor to the Paying Authority on the bills itself.

18.4.8 Certified that the goods and packing charges on which GOODS AND SERVICE TAX has been charged have not been exempted under the Central Sales Tax or the State Sales Tax Act or the rules made there-under and the amount charged on account of GST on these goods and packing charges are not more than what is payable under the provision of relevant Act or the rules there-under.

18.4.9 Certified further that we have actually paid GOODS AND SERVICE TAX and are being assessed to GST on packing charges and also that where there are statutory exemption under the Relevant Act/Law of the State Government concerned, we have availed ourselves of it and certified non-availability of such a provision for GST on packing charges wherever claimed.

18.4.10 Certified further in respect of amount claimed into the bill no claim is pending for refund/or admissible. Certified that in the event of our getting refund in whole or in part of the element of GOODS AND SERVICE TAX on packing charges claimed from Government, we shall pass on the benefit to the Purchaser by remitting to Government the amount equivalent to the amount of refund obtained by us.

18.4.11 Further certififed that we abide by the all the provisions of Acts of Governemnt and rules made thereunder especially regarding anti-profiteering provisions.

18.4.12 Certified further that we (our Branch or agent) _____ _____ (address) are registered as dealers in the State of _____ under Local Regn. No._____ and in the State of _____ under Central Regn. No. _____ for the purpose of State/Central Tax.

(Stamp & Signature of the Vendor)

18.4.13 The vendor shall solely be responsible for declaration of Goods and Service Tax made in his invoice and shall indemnify the purchaser from any claim or its liability from concerned authorities at any stage.

18.4.14 Certificate with each bill to the effect that no refund has been obtained in respect of the reimbursement of GST made to vendor during three months immediately preceding the date of the claim covered by the relevant bill.

18.4.15 AN UNDERTAKING to the effect that in case any refund of GST is granted to the vendor by concerned authorities in respect of stores supplied under the contract, they shall pass on the credit to the purchaser immediately alongwith a certificate from their Director/Manager/Proprietor/ Accountant to the effect that the credit so passed on relates to the GST originally paid for the stores supplied under the contract. In case of their failure to do so within 10 days of the issue of the refund orders to them by the Authorites, the purchaser would be empowered to deduct a sum equivalent to the amount refunded by the authorities without any further reference to the vendor, from any of their outstanding bills against this or any other pending Government Contracts and that no dispute on this account would be raised

by the vendor.

18.4.16 Statutory Deductions, as applicable shall be made from the supplier's bill.

18.5 **DEDUCTION OF TAX AT SOURCE (TDS)**

As per Government of India rules, it is mandatory that income tax shall be deducted at source at applicable rates as per relevant act, rules and notifications issued by the government from time to time.

18.5.1 **In case of Indigenous Vendors** (Indian Suppliers who provide indigenous products and services, Indian subsidiaries with permanent establishment in India who supply imported goods and services and paid in Indian currency only): Tax deducted at source will be applicable under Section 194-C for carrying out any work (including supply of labour for carrying out any work) in pursuance of contract as per Income Tax Act 1961. In case of technical or professional services, TDS will be applicable as per under Section 194-J of Income Tax Act 1961.

18.5.2 **In case of Foreign Vendors** (Foreign Suppliers who provide goods from abroad paid in foreign currency and providing technical services by Indian subsidiary paid in Indian currency): The TDS is applicable where services are rendered in India directly or through their Indian counter part against foreign Purchase order / Contract as per the provision of under Section 195 of Income Tax act of India. Wherever DTAA (Double Taxation Avoidance Agreement) agreement exists between India and the supplier country the provisions of the agreement shall be applicable. For getting benefit of DTAA (Double Taxation Avoidance Agreement), the following documents must be submitted, otherwise full TDS will be deducted.

a) No Permanent Establishment in India certificate
b) Tax Residency Certificate (TRC) issued by Tax authorities of their country
c) Form 10F if TRC does not contain required details
d) PAN (Permanent Account Number) details issued by Indian Income Tax Authority

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Important Note:

a) Where bifurcation is inappropriate and unacceptable for supply of material and providing services the purchase order / contract will be treated as ***Composite Contract*** and TDS will be deducted on whole contract / purchase order value as per applicable rate.

b) TDS or any other leviable taxes or duties, if applicable, shall be deducted recovered from the Supplier's bill and necessary certificate will be issued to the supplier.

c) Details on relevant sections of Income Tax Act and DTAA treaties can be obtained from https://www.incometaxindia.gov.in/ Pages/acts/ income-tax-act.aspx.

19 **FLUCTUATION IN STATUTORY LEVIES**

Unless otherwise specifically agreed to in terms of the Contract, the purchaser shall not be liable for any claim on account of fresh imposition and/or increase in statutory levies on raw materials and/or components used directly in the manufacture of the contracted stores, taking place during the pendency of the contract. However, any reduction in statutory levies on these raw materials and/or components must be passed on to the Purchaser.

20 **SAMPLES/PROTOTYPES**

If any called for shall be submitted free of all charges by the Tenderer and the Purchaser shall not be responsible for any loss or damage thereof for any reason whatsoever. In the event of non-acceptance of the tender, the tenderer will have to make arrangements to remove/collect the sample/prototypes at his own expenses.

21 **QUANTITIES**

Quantities indicated are approximate only and one or more of the items of the stores tendered, or a portion of any one or more of the items of such stores may be accepted and the tenderer notwithstanding that his Tender has not been accepted in whole shall be bound to supply contracted quantity to the Purchaser.

22 **SUBMISSION OF DRAWINGS**

The tenderer shall furnish all drawings pertaining to the plant/machinery/ equipment/component to the Purchaser along with the tender for correct understanding and appreciation of the tender in quadruplicate. Besides, tenderers should also furnish general arrangement, schematic and such other drawings prescribed by the Purchaser within 4 weeks from the date of receipt of LOI/Purchase Order for approval. Such drawings should be furnished along with Part-I (Techno-Commercial) of the tender. Tenderer's drawing will form part of the purchase order/contract only after these are approved by the Purchaser.

23 **INSTALLATION AND COMMISSIONING**

23.1 Wherever, the purchaser's invitation to tender calls for installation and commissioning or supervision of installation and commissioning of the instrument/equipment by the tenderer, the tenderer must clearly and separately quote the prices for the supply of the stores and the charges and the terms for installation and commissioning or supervision of installation and commissioning, as the case may be. The charges towards installation and commissioning should not be included in the price of the stores.

23.2 In respect of contracts involving installation and commissioning by vendors including overseas vendors where identifiable charges for the same has been

quoted by the vendor, he shall bear the Income-tax liability as per the rates prevailing at the time of undertaking the job in accordance with the Income-tax Act in force in India.

23.3 Wherever, the scope of the contract includes installation and commissioning, it shall be the sole responsibility of the contractor to undertake the installation and commissioning as and when called for, by the Purchaser.

24 **INSPECTION**

24.1 The Contractor shall be responsible for and perform all inspection and testing required in accordance with the contract/purchase order and specifications included therewith.

24.2 The Purchaser may at his option depute his representative for inspection of the stores to be supplied under the contract or authorize and nominate a Quality Surveillance Agency of his choice for the purpose hereinafter called, in either case, the inspection.

24.3 The supplier shall give notice of readiness for inspection to the Purchaser so that the Inspector can be present at the requisite time. In such an event delivery shall not be effected until an authorization or shipping release is obtained from the Purchaser.

24.4 The contractor shall allow reasonable facility and free access to his work/factory and records to the inspector for the purpose of inspection or for ascertaining the progress of delivery under the contract.

25 **FACTORY REGISTRATION/SHOP & ESTABLISHMENT CERTIFICATE**

The tenderers shall submit the copy of the Factory Registration/License or Shop & Establishment Certificate as applicable, along with the tender, failing which the tenders are liable for rejection.

26 **PRODUCTS WITH ISI MARK**

26.1 Products with ISI mark will be preferred.

26.2 In respect of following categories of item, Purchaser will consider offers for products with ISI mark only:

- Fire Extinguisher
- Building Material
- PVC Pipes & fittings
- Agricultural Implements & sprayers
- Medical instruments such as syringes, needles, BP apparatus etc.

27 **SHOP/FACTORY EVALUATION, QUALITY SURVEILLANCE /INSPECTION AND SUBMISSION OF PROGRESS REPORTS**

27.1 The Purchaser or his technical authorities may at his option and prior to evaluation of the tender depute his Inspector or any quality surveillance Agency of his choice to the factory/workshop of the tenderer to assess and establish the manufacturing capability etc. of the tenderer. Similarly, the Purchaser may also depute his inspector/Quality Surveillance agency of his choice for inspection of the plant/machinery/equipment/component during the various stages of manufacture in such an event the tenderer/contractor shall:-

27.1.1 Allow reasonable facility and free access to his factory/work/ records to the Inspector for the purpose of inspection or for ascertaining the progress of manufacture and delivery.

27.1.2 Provide the drawings, toolings, gauges, instruments etc. required for carrying out the inspection work.

27.1.3 Produce an inspection plan to the Purchaser's satisfaction notifying him when check points on the plan are imminent.

27.1.4 Not supply or deliver the plant/machinery/equipment/ component unless and until a Shipping Release or an authorisation for despatch is obtained in a format provided by the Purchaser. Failure to comply with this instruction will not only result in with holding of the payment to the contractor/supplier, but also hold the tenderer/contractor liable for payment of compensation to the Purchaser due to delay in clearance of the Equipment/plant/machinery/ component from the carriers.

28 **INSTRUCTION MANUAL**

In respect of plant/ machinery/ equipment/ instrument/ apparatus, where instruction/ operation manual is normally necessary to enable the user to put the plant/machinery/equipment/instrument/ apparatus to proper use, the Contractor shall furnish such an instruction/operation manual specific to the stores being supplied along with the plant/machinery/equipment/instrument/apparatus. The Contractor shall clearly specify in the offer about his readiness to supply instruction/operation manual

29 **PACKING**

29.1 Tenderers shall note that packing for shipment shall be in accordance with the instructions outlined in this tender document, each package shall be limited to the size and weights that are permissible under the existing Air and Sea limitations. Even when no packing specification is included in the invitation to tender, it will be Supplier's responsibility to provide appropriate packing depending upon the nature of the supply and the transportation and handling hazards.

29.2 The equipment shall be so packed and protected as not to suffer deterioration, damage or breakage during shipment and storage in a tropical climate.

29.3 Each package shall be properly labeled to indicate the type and quantity of material it contains, the purchase order number, its dimensions and weight and any other necessary data to identify the equipment and relate it to contract.

30 **DEVIATIONS TO PURCHASER'S SPECIFICATIONS AND CONDITIONS OF CONTRACT**

30.1 If any deviation or substitution from the technical specifications contained in Section "C" to this tender document is involved, such details should be clearly indicated in Part-I (Techno-Commercial) and should be added as an annexure to Part-I (Techno-commercial) of the tender as otherwise it shall be an admission on the part of the tenderer that he will supply the equipment as specified by the Purchaser. Similarly, deviations to the Purchaser's General Conditions of Contract/Special Conditions of Contract contained in Section "B" of this tender document shall be indicated by the tenderer in another annexure to Part-I (Techno-commercial) of the tenderer.

30.2 Part-II (Price) should be furnished in accordance with the format provided by the Purchaser at Section "D" of this tender document.

31 **DELIVERY**

Tenderer should note that no tender will be considered by the Purchaser unless the Tenderer can meet the delivery schedule specified by the Purchaser. All equipments/machinery/plant/ component covered by this tender document should be supplied on or before _____ or _____ month from the date of approval of drawings or ____ month from the date of receipt of free issue

materials. The prices quoted by the tenderer should include all charges involved for direct and safe delivery of the items by Road to the project site of the Purchaser. If a tenderer so desires/separate lumpsum charges for transportation and safe delivery to Purchaser's site could be furnished. Purchaser will neither undertake responsibility for transit insurance nor pay for it separately. No other, delivery term will be accepted by the Purchaser.

32 **ACCEPTANCE OF TENDERS**

32.1 The purchaser shall be under no obligation to accept the lowest or any other tender and shall be entitled to accept or reject any tender in part or full without assigning any reasons whatsoever.

32.2 Acceptance of tenders by the Purchaser will be sent by fax, E-mail, letter etc. within the validity date of the tender and such a fax, letter etc. would then be followed by a formal purchase order/contract. The tenderer whose offer is accepted will proceed with the execution of the contract on the basis of such advance acceptance of tenders without waiting for a formal purchase order/contract, and will be responsible to seek and obtain whatever clarifications that are necessary from the Purchaser to proceed with the manufacture without waiting for a formal purchase order/contract and delivery period will be reckoned from the date of the Letter of Intent.

33 **SETTLEMENT OF COMMERCIAL TERMS AND CONDITIONS OF CONTRACT**

In case the commercial terms and conditions of sale/contract stipulated in Part-I (Techno-commercial) of the tender submitted by the tenderer are at variance with the Purchaser's General Conditions of all Contracts/Special Conditions of Contract stipulated in Section "B" of this tender document, the Purchase Officer will settle the commercial terms and conditions of contract with the tenderers chosen for award of the contract by holding discussions with them OR by sending Fax/Letter/E-mail etc. In case the concerned tenderer to whom an intimation thereof is given does not respond/fail to respond to communication sent by the Purchaser within the date specified, his tender is liable for rejection at the discretion of Director, IPR and no complaints whatsoever will be entertained from the tenderer for rejection of this tender. The tenderers should not discuss with the technical authorities/user department any of the commercial terms and conditions of contract and any agreement/understanding reached between the tenderer and the technical authorities will not be valid and binding.

34 **COMPLIANCE WITH THE SECURITY REQUIREMENTS OF THE PURCHASER**

The Contractor shall strictly comply with the Security Rules and Regulations of the Purchaser in force and shall complete the required formalities including verification from Police and any other authority and obtain necessary prior permission for entry into the Purchasers premises, wherever authorized by the Purchaser.

35 **PAST PERFORMANCE**

In case the past performance of the tenderer is not found to be satisfactory with regard to quality, delivery, warranty obligation and non-fulfillment of terms and conditions of the contract, their offer is liable to be rejected by the purchaser.

36 **CAPACITY & FINANCIAL STANDING**

In case it is found that the tenderer does not possess the requisite infrastructure, capacity, capability and their financial standing is not satisfactory, such tender is liable to be rejected by the Purchaser.

37 **CONFIDENTIALITY**

Drawings, specifications, prototypes, samples or any other correspondence/details/information provided by the Purchaser relating to the tender or the contract shall be kept confidential by the contractor, and should not be disclosed or passed on to any other person/firm without the prior written consent of the purchaser. This clause shall apply to the sub-contractors, consultants, advisers or the employees engaged by the Contractor.

38 **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 the contractor, sub-contractor, consultant, adviser or the employees of the contractor will invite penal consequences under the aforesaid legislation.

39 **PROHIBITION AGAINST USE OF THE NAME OF ANY INSTITUTION OF DEPARTMENT OF ATOMIC ENERGY WITHOUT PERMISSION FOR PUBLICITY PURPOSES**

The Contractor or sub-contractor, consultant, adviser or the employees engaged by the contractor shall not use the name of any Institution of Department of Atomic Energy for any publicity purpose through any public media like Press, Radio, TV or Internet without the prior written approval of the Purchaser.

40 **FREE ISSUE MATERIAL** (*This clause shall apply only to contracts for supply of fabricated equipment with purchaser's Free Issue Materials (FIM).*

40.1 Wherever contracts envisage supply of Free Issue Material (FIM) by the Purchaser to the contractor, such Free Issue Material shall be safeguarded by an insurance policy to be provided by the Contractor at his own cost for the full value of such materials and the insurance policy shall cover, the following risks specifically and shall be valid for six months beyond the contractual delivery date.

- **Risk to be covered:** Any loss or damage to the Purchaser's material due to fire, theft, riot, burglary, strike, civil commotion, terrorist act, natural calamities etc. and any loss or damage arising out of any other causes such as other materials falling on purchaser's materials.
- **Insured by:** (Name of the Contractor)
- **Beneficiary:** Institute for Plasma Research, Near Indira Bridge, Bhat, Gandhinagar-382428.
- **Amount for which insurance policy to be furnished:** The amount will be indicated in the respective contract.

Free Issue Material (FIM) will be issued to the Contractor only after receipt of the Insurance Policy from the Contractor. The contractor shall arrange collection of the FIM from the Purchaser's premises and safe transportation of the same to his premises at his risk and cost.

Notwithstanding the insurance cover taken out by the Contractor as above, the contractor shall indemnify the purchaser and keep the Purchaser indemnified to the extent of the value of free issue materials to be issued till such time the entire contract is executed and proper account for the FIM is rendered and the left over/surplus and scrap items are returned to the Purchaser. The contractor shall not utilize the Purchaser's free issue materials for any job other than the one contracted out in this case and also not indulge in any act, commission or negligence which will cause/result in any loss/damage to the Purchaser and in which case, the Contractor shall be liable to the Purchaser to pay compensation to the full extent of damage/loss. The Contractor shall be responsible for the safety of the free issue materials after these are received by them and all through the period during which the materials remain in their possession/control/ custody. The free issue materials on receipt at the Contractor's works shall be inspected by them for ensuring safe and correct receipt of the material. The Contractor shall report the discrepancies, if any, to the Purchaser within 5 days from the date of receipt of the material. The Contractor shall take all necessary precautions against any loss, deterioration, damage or destruction of the FIM from whatever cause arising whilst the said materials remain in their possession/custody or control. The FIM shall be inspected periodically at regular intervals by the Purchaser for ensuring safe preservation and storage. The contractor shall also not mix up the FIM with any other goods and shall render true and proper account of the materials actually used and return balance remaining unused material on hand and scrap along with final product and if it is not possible within a period of one month from the date of delivery of the final product covered by this purchase order. The Contractor shall also indemnify the Purchaser to compensate the difference in cost between the actual cost of the FIM lost/damaged and the claim settled to the Purchaser by the insurance company. The decision of the Director, Institute for Plasma Research, as to whether the Contractor has caused any loss, destruction, damage or deterioration of the FIM while in his possession, custody or control from whatever cause arising and also on the quantum of damage suffered by the government, shall be final and binding upon the Contractor.

41 **EXPORT LICENCE/EXPORT PERMISSION**

41.1 It is entirely the responsibility of the vendors who are quoting for materials of foreign origin to ensure obtaining export permission/licence/authorisation as required from the respective Government before arranging shipment. This Department would not accept post supply inspection by any agency/authority of any foreign country. It is, therefore, necessary that the vendors offering materials from foreign countries shall have thorough knowledge of export contract regulations in vogue in those countries.

41.2 The vendors shall indemnify the purchaser against any consequences in respect of any end-use declaration they/their overseas Principals may furnish to the government/government agencies of the country of origin of the materials, while seeking export permission/licence. Post supply inspection, contrary to the terms and conditions of purchaser's contract shall be deemed to be null and void.

42 **END USE CERTIFICATE**

42.1 Whenever an End-use Certificate is desired by the vendor, the same shall be clearly mentioned in the quotation and the purchaser shall provide an Enduser Certificate as per the format given below. The Purchaser will not provide any other document/declaration in this regard.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

END USER STATEMENT:

"We hereby certify that the item/s i.e._____, being procured from M/s_____ against our Purchase Order No._____ dated _____ will be used for _____. We also certify that the item/s will not be used in designing, developing, fabricating or testing of any chemical, biological, nuclear, or weapons of mass destruction or activities related to it. It is further certified that we will not re-export the Item/s prior to obtaining permission from the concerned authorities as may be required".

43 **COUNTRY OF ORIGIN**

43.1 Wherever the tenders are for imported stores, the Country of Origin of the stores must be clearly specified in the quotation.

44 **LIABILITY**

44.1 Vendors shall be liable for any damage to the purchaser or any third party out of any patent or latent defect in the goods supplied by him or sub-standard services rendered by him.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

45 **RIGHT TO REJECT QUOTATION**

45.1 The Purchaser reserves the right to reject any quotation, which is not in conformity with the above instructions.

45.2 The Purchaser also reserve the right to reject any quotation without assigning any reason whatsoever.

46 **PRICE / PURCHASE PREFERENCE**

Purchase/Price preference to industries will be given as per the policy of the Government of India in force at the time of evaluation provided their offer is in compliance with the conditions of the policy.

47 **PERMANENT ACCOUNT NUMBER (PAN**

47.1 Vendors are required to submit a true copy of the PAN Card/Letter issued by the Income-tax Department, failing which the tenders are liable to be rejected.

48 MSE bidders should declare their UAM (Udyog Aadhar Memorandum) number on CPPP portal to avail benefits as per Public Procurement Policy for MSE's order 2012.

49 The bidder shall not be under a declaration of ineligibility for corrupt or fraudulent practices or blacklisted with any of the Government Agencies.

Any additional conditions attached to this Invitation to Tender shall also form part of the contract conditions.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

SECTION 'B'

GENERAL CONDITIONS OF CONTRACT

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

INSTITUTE FOR PLASMA RESESARCH
PURCHASE SECTION

GENERAL CONDITIONS OF ALL CONTRACT
&
SPECIAL CONDITIONS OF CONTRACT GOVERNING SUPPLIES OF PLANT AND MACNHINERY

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

GENERAL CONDITIONS OF CONTRACT

1. DEFINITIONS

1.1 The term 'PURCHASER" means the Institute for Plasma Research or its successors or assigns.

1.2 The term 'PARTICULARS' means the following:

1.2.1 Specification

1.2.2 Drawing

1.2.3 Sealed pattern denoting a pattern sealed and signed by the Inspector

1.2.4 Proprietary make denoting the produce of an individual firm

1.2.5 Any other details governing the construction manufacture and/or supply as existing for the contract.

1.3 The term 'CONTRACTOR' or 'SUPPLIER' means, firm or company with whom or with which the order for the supply of stores is placed and shall be deemed to include the Contractors/Successors (approved by the Purchaser), representatives, heirs, executors and administrators unless excluded by the contract.

1.4 The term 'CONTRACT' or 'PURCHASE ORDER' means and comprises of a Letter or Email or ink signed or digitally signed document conveying acceptance of Contractor's offer and invitation to tender, tender containing offer, advance acceptance of offer, general and special conditions of contract specified in the acceptance of offer and any subsequent amendments/alterations thereto made on the basis of mutual agreement.

1.5 The term 'STORES' or 'MATERIAL' means, the goods specified in the contract/purchase order which the contractor has agreed to supply under the contract.

1.6 The term 'SUB-CONTRACTOR' or 'SUB-SUPPLIER' means any contractor or supplier engaged by the contractor or the supplier with the prior approval of the Purchaser in relation to the contract/purchase order.

1.7 The term 'INSPECTOR' or 'QUALITY SURVEYOR' means any person nominated and deputed by the purchaser or their appointed Consultants or Quality Surveillance Agency or any other person from time to time authorized by the Purchaser to act as his representative for the purpose of inspection of stores under the contract/purchase order.

2. AUTHORITY OF PERSON SIGNING THE CONTRACT ON BEHALF OF THE CONTRACTOR

The person signing the contract or the purchase order or any other document in respect of the contract or purchase order on behalf of the contractor shall deemed to warrant that he has the authority to bind the contractor.

3. SUBLETTING OF CONTRACT OR BILLS OR ANY BENEFIT ACCRUING THEREFROM

3.1 The Contractor shall not sublet, transfer or assign the Contract or any part thereof or bills or any other benefits, accruing therefrom or under

the contract without the prior written consent of the Purchaser (All Sub-contractors are required to be appraised and approved by the Purchaser before placement of orders by the Contractor/Supplier). However, such consent shall not be unreasonably withheld by the Purchaser, if such stores are not normally manufactured by the Contractor, such assignment or subletting shall not relieve the Contractor from any contractual obligation or responsibility under the Contract.

3.2 Any breach of this condition shall entitle the Purchaser to cancel the Contract or any part thereof and to purchase from other sources at the risk and cost of the Contractor and shall recover from the Contractor damages arising from such cancellations.

3.3 In case the Contractor sublets, transfers or assigns any part of the Contract with the prior written consent of the Purchaser, all payments to the Sub-Contractor shall be the responsibility of the Contractor and any requests from such sub-Contractor shall not be entertained by the Purchaser.

4. SECURITY DEPOSIT

4.1 On acceptance of tender, the Contractor shall at the option of the Purchaser and within the period specified by him, submit a Bank Guarantee from SBI or any one of the nationalized banks or reputed private banks, viz. AXIS Bank, ICICI Bank, IDBI Bank and HDFC Bank towards Security Deposit not exceeding 10% (ten percent) of the tendered value of the contract/purchase order valid till at least 2 months beyond the acceptance date of the material, as the Purchaser shall specify.

4.2 If the Contractor is called upon by the Purchaser to submit Security Deposit and the contractor fails to provide the same within the period specified such failure shall constitute a breach of the Contract and the Purchaser shall be entitled to make other arrangements for the repurchase of the stores contracted for at the risk and expenses of the Contractor in terms of clause 9.2.4 hereof and/or recover from the Contractor damages arising from such cancellation. No claim shall lie against the purchaser either in respect of interest if any due on Security Deposit or depreciation in value.

4.3 Offers wherein contractors declined to submit Security Deposit are liable to be rejected.

5. DRAWINGS & SPECIFICATIONS

5.1 The drawings and specifications are intended to be complementary and to provide for an comprise everything necessary for the completion of supply. Any material shown on the drawing even if not particularly described in specifications or vice versa is to be supplied by the Contractor as if it were both shown and specified.

5.2 Should any discrepancy be noted in the drawings and/or specifications and should any interpretation of the same be required, the matter shall be referred to the Purchaser for clarification which shall be binding upon the contractor. Otherwise, the contractor shall assume responsibility for the interpretation of the drawings and specifications including interpretation by his sib-contractors.

5.3 Should any difference or dispute arise with regard to the true intent and meaning of drawings or specification or should any portion of the same be obscure or capable of more than one interpretation, the same shall be decided by the Purchaser whose decision shall be final.

5.4 All lettering on the drawings is t be considered as part of the specification and contract. In all cases figured dimensions are to be followed rather than those indicated by scale. Large scale drawings will take precedence over small scale drawings.

5.5 The contractors drawings shall, when approved by the Purchaser, be deemed to be included in the list of drawings which form part of the contract. The Contractor shall not proceed with fabrication until all drawings associated therewith have been duly approved by the Purchaser.

5.6 The Contractor shall be responsible for and shall pay for any alterations of the stores and shall indemnify the Purchaser for any consequential expenditure incurred by the Purchaser due to any discrepancies, errors, omissions in the drawings or other particulars supplied by him whether such drawings or specifications have been approved by the Purchaser or not, provided that such discrepancies, errors or omissions be not due to inaccurate information or specifications furnished to the contractor on behalf of the Purchaser.

5.7 **General Warranty**

5.7.1 The stores supplied by the contractor under the contract shall be of best quality and workmanship. The contractor shall supply the stores in accordance with the contract specifications unless any deviation has been expressly specified in the contract and any amendments agreed thereto.

5.7.2 The contractor's offer to supply stores in accordance with the tender specifications shall be deemed to be in admission on his part that he has fully acquainted himself with the details thereof and no claim shall lie against the Purchaser on the ground that the contractor did not examine or acquaint himself fully with the tender specifications.

5.8 **Contractor's Liability for Defective Stores**

5.8.1 For a period of twelve months after the stores have been accepted by Purchaser the Contractor shall be responsible for any defects that may be discovered therein notwithstanding that such defects could have been discovered at the time of inspection or any defects therein are found to have developed under proper use, arising from faulty materials, design or workmanship and the Contractor shall remedy all such defects as aforesaid at his own cost provided he is called upon within a period of 14 months from the date of acceptance thereof to do so, by the Purchaser who shall state in writing in what respect the goods are faulty and further if in the opinion of the Purchaser the defects are of such a nature that it is necessary to replace or renew any defective stores, such replacement or renewal shall be made by the Contractor without any extra costs to the Purchaser, provided notice informing the Contractor of the defect is given by the Purchaser within the said period of 14 months. The decision of the Purchaser notwithstanding any prior approval or acceptance of the Inspector as to whether or not the stores delivered are defective or any defect has developed

within the said period of twelve months or as to whether the nature of defects renewal or replacement shall be final conclusive and binding on the Contractor.

6. ALTERATIONS

6.1 The Purchaser may, from time to time, make changes in the drawings specifications and issue additional instructions without altering the purchase order in any manner provided that no changes shall have been ordered which materially alter the character and scope of the supply under the contract.

6.2 It shall be lawful for the parties to the contract to alter by mutual consent at any time and from time to time the drawings and specifications and as from the dates specified by him stores to be supplied shall be in accordance with such altered drawings and specifications provided that if any such alterations involve increase or decrease in the cost of or in the period required for production, a revision of the contract price and/or the period prescribed for delivery shall be made by mutual agreement in respect of the stores to which the alteration applies. In all other respects, the contract shall remain unaltered.

7. SAMPLES

7.1 Samples submitted for any reason shall be supplied without charge and freight paid without any obligation of the Purchaser as regards safe custody or safe-return thereof. All samples submitted must be clearly labelled with the Contractor's name and address and tender number. If the Contractor submits the sample with his tender the same shall not govern the standard of supply except when it has been specifically stated in the Purchase Order that it is accepted instead of any sealed pattern. Should certified samples be lent to the Contractor by the Purchaser, the Contractor is responsible for the return in perfect order of all certified samples with the labels intact.

8. PACKING

8.1 The contractor shall be held responsible for the stores being sufficiently and properly packed for transport by rail, road, sea or air so as to ensure their being free from any loss or damages on arrival at their destination. The packing and marking of packages shall be done by and at the expenses of the Contractor. Each package shall contain a Packing Note quoting Purchase Order number and date and showing its contents in detail.

8.2 Unless otherwise provided in the contract all containers (including packing cases, boxes, tins, drums and wrappings) in which the stores are supplied by the contractor shall be considered as property of the Purchaser and their cost as having been included in the contract price.

9. DELIVERY:

9.1 **TIME FOR AND DATE OF DELIVERY, THE ESSENCE OF THE CONTRACT:**
The time for and the date of delivery of the stores stipulated in the purchase order/contract shall be deemed to be of the essence of the contract and delivery must be completed not later than the date/dates stipulated.

9.2 **EXTENSION OF DELIVERY SCHEDULE**

9.2.1 If any delay in delivery shall have arisen from any cause such as strike, Lock-outs, fire, accidents, riot or the like which the purchaser may admit as reasonable ground for grant of extension of delivery schedule, the purchaser will

allow such additional period for the purpose as he may consider necessary taking the circumstances into consideration.

9.2.2 If the contractor fails to deliver the stores or any instalment or part thereof within the period fixed for such delivery or such additional period allowed by the purchaser in accordance with foregoing paragraphs or any time before the expiry of such period repudiates the contract, the Purchaser may without prejudice to the rights of the purchaser.

9.2.3 Recover from the contractor as Liquidated Damages and not by way of penalty as detailed under clause No.22 given herein below for any stores which the contractor has failed to deliver within the period fixed for delivery in the contract or such additional period as mentioned in paragraph 9.2.1. during which the delivery of such stores, may be in arrears where delivery thereof is accepted after expiry of the aforesaid period. (For the purpose of computing the damages for delayed supplies under the clause, the cost of the entire plant/machinery/equipment/instrument will be taken into consideration if the plant/machinery/equipment/instrument cannot be put to the intended use for want of delayed portion of supply).

9.2.4 Purchase or authorise the purchase elsewhere without notice to the contractor, on account and at the risk of the contractor of the stores not so delivered or others of a similar description (where stores exactly complying with the contract specification are not in the opinion of the Purchaser, which opinion shall be final, readily procurable) without cancelling the contract in respect of the portion instrument not yet due of delivery, OR

9.2.5 Cancel the contract or portion thereof and if so desired purchase or authorise purchase of the stores not so delivered or others of a similar description (where stores exactly complying with the contract specification are not in the opinion of the Purchaser, which opinion shall be final, readily procurable) at the risk and cost of the contractor, if the contractor had defaulted in the performance of the original contract, the purchaser shall have the right to ignore his offer in response to risk purchase enquiry even though the lowest.

9.2.6 Where action is taken under sub-clause 9.2.4 or sub-clause 9.2.5 above the contractor shall be liable for any loss which the purchaser may sustain on that account provided that the repurchase, or if there is an agreement to repurchase then such agreement, is made within a reasonable period from the date of such failure, depending upon the nature / merit of the purchase and in case of repudiation of the contract before the expiry of the aforesaid period of delivery, shall not be entitled to any gain on such purchase and the manner and method of such purchase shall be in the entire discretion of the Purchaser. It shall not be necessary for the purchaser to serve a notice of such purchase on the contractor.

10. INSPECTION

10.1 The contractor shall be responsible for and perform all inspection and testing required in accordance with the contract/purchase order and specifications included herewith.

10.2 The Purchaser may at his option depute his representative for Inspection of the stores to be supplied under the contract or authorize and nominate a Quality Surveillance Agency of his choice for the purpose hereinafter called, in either case, the inspection.

10.3 The contractor shall give notice of readiness for inspection to the Inspector (deputed under clause 10.2 above) so that the Inspector can be present at the requisite time. In such an event delivery shall not be effected until an authorization or shipping release is obtained from the Purchaser's Inspector.

10.4 The contractor hall allow reasonable facility and free access to his work/factory and records to the inspector for the purpose of inspection or for ascertaining the progress of delivery under the contract.

11. RECTIFICATION AND REPLACEMENT OF DEFECTIVE STORES

11.1 If the inspector find that the contractor has executed any unsound or imperfect work, the inspector shall notify such defects to the contractor and the contractor on receiving the details of such defects or deficiency, shall at his own expenses, within seven days or otherwise within such time as may be mutually agreed upon as reasonably necessary, proceed to alter, reconstruct or remanufacture the stores to the requisite standard and specifications as called for by the tender specification.

12. INSPECTION AND REJECTION

12.1 **Inspection and Rejection**: The stores shall be tendered by the Contractor for inspection at such places as may be specified by the Inspector, at the Contractor's own risk, expenses and costs and shall lie at such places of inspection at the risk of the Contractor and the stores will be subject to inspection and test as may be considered necessary by the inspector and his decision as regards rejection of goods shall be final and binding on the Contractor. If any goods are rejected as aforesaid, then without prejudice to the foregoing provision, the Purchaser shall be at liberty to

12.1.1 Allow the Contractor to re submit without prejudice to the Purchaser's right to claim and recover Liquidated damages as provided in clause 9.2.3 hereof, stores in replacement of those rejected within a time specified by the Purchaser (which time shall be essence of the contract), the contractor bearing the cost of freight for such replacement without being entitled to any extra payment, or

12.1.2 Buy the quantity of stores rejected or others of a similar nature elsewhere at the risk and cost of the Contractor in accordance with the provisions contained in second paragraph of clause 9.2.4 thereof without effecting the Contractor's liability as regards the supply of any further consignments due under the Contract, or

12.1.3 Terminate the Contract and recover from the Contractor the loss Purchaser thereby incurred

12.2 **Removal of rejection**: Any stores submitted for inspection and rejected by the Inspector must be removed by the Contractor within fourteen days from the date of receipt of intimation of rejection, provided that in the case of dangerous infected or perishable stores, the Inspector (whose decision shall be final) shall notify the Contractor to remove such stores within 48 hours of receipt of intimation of rejection and it shall be the duty of the Contractor to remove them accordingly. Such rejected stores shall lie at the Contractor's risk from the time of such rejection and if not removed within the aforementioned time, the Purchaser shall have the right either to return the rejected stores to the Contractor at the Contractor's risk by such mode of transport as Purchaser may select or to dispose off or segregate such stores as he thinks fit at the Contractor's risk and on his accounts and to appropriate such portion of the proceeds as may be necessary to cover any loss or expenses incurred by the Purchaser in connection with the said sale. Freight to destination of stores rejected after examination at destination shall be recoverable from the Contractor at the Tariff Rate.

12.3 **Test Certificate and Guarantees:** Test Certificate Guarantees, if required by the Inspector shall be obtained and furnished by the Contractor free of costs.

13. RECOVERY OF SUMS DUE

13.1 Whenever any claim for payment of, whether liquidated or not, moneys arises out of or under this contract against the Contractor the Purchaser shall be entitled to recover sum by appropriating, in part or whole, by encashing the Bank Guarantee submitted towards Security deposit by the Contractor, if a Security Deposit is taken against the Contract. In the event of the security being insufficient or no Security Deposit has been taken from the Contractor then the balance or the total sum or which at any time hereafter may become due to the Contractor under this or any other contract with the Purchaser, should this sum be not sufficient to cover the full amount recoverable, the Contractor shall pay to the Purchaser on demand the remaining balance due. Similarly, if the Purchaser has or makes any claim, 'whether liquidated or not against the Contractor under any other contract with the Purchaser the payment of all moneys payable under the contract to the contractor including the security deposit shall be withheld till such claims of the Purchaser are finally adjudicated upon and paid by the Contractor.

13.2 All demurrage, wharfage and allied expenses incurred by the Purchaser, if any, due to delayed clearance of Stores in view of non receipt, incomplete or delayed receipt of documents by the Purchaser, shall be recovered from the payment due to the Contractor.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

14. BAR/PERT CHART

14.1 The contractor at the discretion of the Purchaser shall submit the BAR/PERT chart indicating various activities from the date of purchase order to handing over of the stores.

15. PERFORMANCE BANK GUARANTEE

15.1 In the event of acceptance of the offer in respect of plant, machinery, equipment, instrument, etc. the tenderer will be required to submit a performance bank guarantee for 10% of the total value of the stores inclusive of all statutory levies and other charges admitted in the contract, from SBI/any nationalized bank or private sector banks, namely, ICICI Bank, IDBI Bank, HDFC Bank and AXIS Bank, on a non-judicial stamp paper of appropriate value valid till 2 months beyond the expiry date of warranty period as per the Purchaser's format towards satisfactory performance of the plant, machinery, equipment, instrument, etc. during the warranty period. In case of bids in currency other than INR performance bank guarantee shall be furnished from any bank of international repute.

15.2 In case of non-submission of performance bank guarantee by the Contractor, an amount equivalent to 10% of the total value of the stores and other charges admitted in the contract will be retained by the purchaser till the expiry of the warranty period of the stores.

15.3 Offers of the tenders who are not agreeable to furnish performance bank guarantee or retaining of an equivalent amount by the purchaser as per clause No.15.1 and 15.2 above, are likely to be rejected.

16. PERMIT AND LICENCES

16.1 The contractor shall secure and pay all licenses and permit at his end which he may be required to comply with all laws ordinances and regulations of the public authorities in connection with the performance of his obligations under the contract. The contractor shall be responsible for all damages and shall indemnity and save the purchaser harmless from against all claims for damages and liability which may arise out of the failure of the contractors to secure and pay for any such licenses and permits or to comply fully which any and all applicable laws ordinances and regulations.

17. PATENTS & PATENT RIGHTS INDEMNIFICATION

17.1 The Contractor shall indemnify and keep indemnified the Purchaser from and against any and all claims, actions, costs, charges and expenses arising from or for infringement of patent rights, copy right or other protected rights, of any design plans, diagrams, drawings in respect of the stores supplied by the contractors or any of the manufacturing methods or process adopted by contractor for the stores supplied under the contract.

17.2 In the event of any claim being made or action being taken against the purchaser in respect of the matter referred to clause 17.1 above, the contractor shall promptly be notified thereof and he shall at his own expense, conduct all negotiations for the settlement of the same and any litigation that may arise therefrom.

17.3 In the event of any designs, drawing, plans or diagrams or any manufacturing methods or process furnished by the contractor constituting infringement of patent or any other protected rights and use thereof is restrained, the contractor shall procure for Purchaser, at no cost to the latter, the rights to continue using the same or to the extend it is possible to replace the same so as to avoid such infringement and subject to approval by the Purchaser or modify them so that

they become non-infringing, but such modifications shall otherwise be to the entire satisfaction of the Purchaser.

17.4 The provision of the clause remains effective and binding upon the Contractor even after the completion, expiration or termination of the contract.

18. LAW GOVERNING THE CONTRACT

18.1 This Contract shall be governed by the laws of India for the time being in force. The marking of all stores supplied must comply with the requirements of India Acts relating to Merchandise Marks and all the rules made under such Acts.

19. JURISDICTION

19.1 The Courts within the local limits (i.e. Gandhinagar) of whose jurisdiction the place from which the purchase order is issued is situation only shall, subject to Arbitration Clause, have jurisdiction to deal with and decide any matter out of this Purchase Order/Contract.

20. SETTLEMENT OF DISPUTES

20.1 The Purchaser and the Contractor shall make every effort to resolve amicably by direct informal negotiation any disagreement or dispute arising between them under or in connection with the Contract.

20.2 If the parties have failed to resolve their dispute or difference by such mutual consultation, then either the Purchaser or the Supplier may give notice to the other party of its intention to commence arbitration, as hereinafter provided, as to the matter in dispute, and no arbitration in respect of this matter may be commenced unless such notice is given. Any dispute or difference in respect of which a notice of intention to commence arbitration has been given in accordance with this Clause shall be finally settled by arbitration. Arbitration may be commenced prior to or after delivery of the Goods under the Contract.

21. ARBITRATION

21.1.1 In the event of any dispute or difference arising out or of in connection with any of the terms and conditions of the Purchase Order/Contract, the matter shall be referred to the Director, IPR for settlement. In case the parties to the Purchase Order are not in a position to settle the dispute mutually, the matter shall be referred to a Sole Arbitrator to be appointed in accordance with the Arbitration & Reconciliation Act, 1996 & Arbitration and Conciliation (Amendment) Act, 2015 as amended time to time.

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22. LIQUIDATED DAMAGES

22.1 As per Standard Terms & conditions, the Purchaser reserves the right to levy the Liquidated Damages, for delay in supply beyond the contractual delivery date at the rate of half percent (0.5 percent) of the total Contract price (Basic price) for each calendar week of delay. The total liquidated damages shall not exceed five percent (5%) of the contract price (Basic price). Stores/Goods will be deemed to have been delivered only when all its component parts are also delivered. If certain components are not delivered in time, the Stores/Goods will be considered as delayed until such time as the missing parts are delivered.

22.2 Where the Contract entered into is a composite one with supply cum erection and installation/commissioning activities and the completion of erection and installation/commissioning is delayed irrespective of the fact that whether supply of material has been made within the original delivery period, the contract is to be considered as a whole and Liquidated Damages will be recovered on the total contract value.

23. EXERCISING THE RIGHTS AND POWERS OF THE PURCHASER

23.1 All the rights, discretions and powers of the Purchase under the contract shall be exercisable by and all notices on behalf of the Purchaser shall be given by the Purchase Officer and any reference to the opinion of the Purchaser in the terms and conditions contained in these General Conditions of all Contracts shall mean and be construed as reference to the opinion of any of the persons mentioned in this clause.

24. TRAINING

24.1 The successful tenderer shall, if required by the Purchaser, provide facilities for the practical training of Purchaser's engineering or technical personnel for their active association on the manufacturing process throughout the manufacturing period of the Contract/stores, number of such personnel to be mutually agreed upon. If demanded by the Purchaser, such training shall be conducted at Purchaser's site by the Contractor free of charge. The duration of training shall be mutually decided upon by the Purchaser and the Contractor.

25. RISK PURCHASE

25.1 In the event supplier fails to fulfill the contractual obligations as per the terms and conditions of the Contract, the Purchaser has an option of completing the Contract at the risk and expenses of the Contractor. While initiating risk purchase at the risk and expenses of the supplier, the Purchaser must satisfy himself that the supplier has failed to deliver and he has been given all the opportunities as per the Contract to execute the Contract and also adequate and proper notice. Wherever risk purchase is resorted to, the supplier is liable to pay the additional amount spent by the government, if any as compared to contracted amount. All the factors including the method of recovering such amount should also be considered while taking a decision to invoke the risk purchase.

26. LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS

26.1 Any sum of money due and payable to the Contractor under any contract may be withheld or retained by way of lien by the purchaser or any other person or persons contracting through the Director, IPR against any claim of the Purchaser or such other person or persons in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Purchaser or with other such person or persons.

26.2 It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Purchaser will be kept withheld or retained as such by purchaser till this claim arising out of in the same contract or any other contract is either mutually settled or determined by the arbitrator, and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

SPECIAL CONDITIONS OF CONTRACT GOVERNING SUPPLIES OF PLANT AND MACHINERY

In addition to the General Conditions of Contract hereinbefore set out the following special conditions shall apply to contracts for the supply of Plant and Machinery and manufactured equipment. These Special Conditions where they differ from the General Conditions shall over-ride the later.

27. DEFINITION OF PLANT

27.1 The word “”PLANT” wherever, appears in these "Special Conditions of Contract governing supplies of Plants and Machinery" shall mean all machinery, plants, equipment or parts thereof or what the Contractor agrees to supply under contract as specified in the Purchase Order.

28. MISTAKES IN DRAWING

28.1 The Contractor shall be responsible for and shall pay for an alterations of the works due to any discrepancies, errors or omissions in the drawings or other particulars supplied by him whether such drawings or particulars have been approved by the Purchaser or not.

29. RESPONSIBILITY FOR COMPLETENESS

29.1 All fittings or accessories which may not be specifically mentioned in the specification but for which are usual or necessary, are to be provided by the Contractor without extra charge and the plant must be complete in all respects.

30. REJECTION OF DEFECTIVE PLANT

30.1 If the completed plant or any portion thereof before it is finally accepted is found to be defective or fails to fulfill the requirements of the contract, the Purchaser shall give the Contractor notice setting forth with the details of such defects or failure and the contractor shall forthwith rectify the defective plant or alter the same to make comply with the requirement of the contract. Should the contractors fail to do so within a reasonable time the Purchaser may reject and replace at the cost of the Contractor, the whole or any portion of the Plant as the case may be, which is defective or fails to fulfill the requirement of the contract. Such replacement shall be carried out by the Purchaser within a reasonable time and at reasonable price and where reasonably possible to the same specifications and under competitive conditions. The Contractor shall be liable to pay to the Purchaser the extra cost, if any, of such replacement delivered and or erected as provided for in the contract such extra cost being the difference between the price paid by the Purchaser under the provisions above mentioned for such replacement and the contract price for them. Contractor shall refund to

Purchaser any sum paid by the Purchaser to the Contractor in respect of such defective plant.

31. INSPECTION AND FINAL TESTS

31.1 All tests necessary to ensure that the plant complies with the particulars and guarantees shall be carried out at such place or places as may be determined by the inspector. Should, however, it be necessary for the final tests as to performance or guarantees to be held over until the Plant is erected at site they shall be carried out within one month of completion of erection.

32. TRANSPORT AND RESPONSIBILITY FOR BREAKAGES EN-ROUTE

32.1 Unless otherwise specified the Purchaser will take delivery of the plant from the place named in the purchase order but the contractor will be responsible for any damage which may be caused to the Plant during transit to the site of erection thereof.

33. ERECTION AND COMMISISONING

33.1 In all cases where contracts provide for supervision of erection and commissioning or for test at the Purchaser's premises the Purchaser except where otherwise specified, shall provide free of charge, such labour, materials, fuels, stores, apparatus and instruments as may be required from time to time and as may reasonably by demanded by the contractor to carryout efficiently such supervision of erection and commissioning and for the requisite test. In case of contracts requiring electricity for the completion of erection, commissioning and testing at site, such electricity shall be supplied free to the contractor.

33.2 Action by the Purchaser under the clause shall not relieve the contractor of his warranty obligations under the contract.

34. WARRANTY

34.1 The contractor warrants that stores to be supplied under the contract shall be free from all defects and faults in materials, workmanship and manufacture and shall be of the highest grade and consistent with the established and generally accepted standards for stores of the types under the contract in full conformity with the specifications, drawings or samples, if any and shall if operable, operate properly. This warranty shall expire (except in respect of complaints notified to the contractor prior to such date) twelve months from the date of acceptance of material.

34.2 For a period of twelve calendar months after the plant/ machinery/equipment/instruments has been put into operation (or a suitable mutually agreed longer period to be reckoned from the date of last major shipment depending upon the nature of the plant/machinery/equipment/instrument) the Contractor shall be responsible for any defects that may develop under conditions provided for the contract and under proper use, arising from the faulty materials, design or workmanship in the plant or from faulty erection of the plant by the Contractor, but otherwise and shall rectify such defects at his own cost when called upon to do so by the Purchaser who shall state in writing such defects.

34.3 If it becomes necessary for the Contractor to replace or renew any defective portions of the plant for purpose of rectification under this clause, the provisions of this clause shall apply to the portions of the plant so replaced or renewed

under the expiration of six months from the date of such replacement or renewal or until the end of the above mentioned period of twelve months whichever may be the later. If any defects not rectified within reasonable time, the purchaser may proceed to get the work done at contractor's risk and expenses but without prejudice to any other rights which the Purchaser may have against the Contractor in respect of such defects as provided in clause 9.2.4 or 9.2.5.

34.4 All inspections adjustments, replacements or renewals carried out Contractor during the warranty period shall be subject to the same conditions as in the contract.

34.5 Contractor shall, spare parts of equipment before going out of production, give adequate advance notice to the purchaser so that the latter may order requirement of spares in one lot if so desires.

34.6 The contractor shall further guarantee that if spare parts go out of production, will make available blue prints, drawings of spare parts and specifications of material at no cost to the Purchaser, if and when required in connection with the equipment to enable Purchaser to fabricate or procure spare parts from other sources.

34.7 The provision of this clause shall remain effective and binding upon the Contractor even after the completion or expiration of the contract and till the plant/machinery/equipment supplied under the contract is in use by the Purchaser.

35. MODE OF PAYMENT

35.1 Unless otherwise agreed to in writing between the Purchaser and the Contractor, payment for the delivery of the material will be made as follows.
Within 30 days from the date of final acceptance and on receipt of Performance Bank guarantee for 10% of the contract value amount from SBI/nationalized banks or any one of the scheduled banks mentioned in the bracket (Axis Bank, HDFC Bank, ICICI Bank and IDBI Bank) valid through out the guarantee period mentioned in the contract/purchase order.

35.1.1 In case any of the vendors seek advance or progressive payment prior to delivery of the material, such requests can be considered only in exceptional cases of large value items, in which case the vendor will be required to furnish a bank guarantee for an equivalent amount of the advance/progressive payment sought for, valid till the execution of the contract. The bank guarantee shall be got executed as per the Purchaser's format from the State Bank of India (SBI)/nationalized banks or any one of the scheduled banks mentioned in the bracket (Axis Bank, HDFC Bank, ICICI Bank and IDBI Bank).

35.1.2 Besides, the offers of the vendors seeking advance/progressive payment will be evaluated by loading 12% interest charges per annum on the amount of advance desired up to the delivery period quoted.

35.1.3 In case any of the vendors seek pro-rata payment for the stores to be supplied they should clearly mention in their offer the maximum number of installments of supply. However, such installment delivery and pro-rata payment will be considered only in respect of contract involving large value and sizeable quantity of the item and the maximum number of installments shall be normally restricted to four. Acceptance or otherwise of this condition is reserved by the purchaser.

35.1.4 **Bank Charges:** All bank charges to be borne by the Contractor/Supplier.

35.1.5 No correspondence will be entertained within 30 days from the date of receipt of material and bills, whichever is later.

35.1.6 **Interest for delay in supply beyond the contractual delivery date:** Wherever advance payments are sought for by the contractor and admitted in the contract, against Bank Guarantee for equivalent amount, in the event of any delay in supply beyond the contractual delivery date for reasons attributable to the contractor, interest charges @ 12% shall be levied for the period beyond the contractual delivery date, on the amount of balance advance payment to be adjusted.

36. DELAY IN ERECTION

36.1 Wherever erection of a plant or machinery is the responsibility of the Contractor as a term of the contract and in case the Contractor fails to carry out the erection as and when called upon as to do within the period specified by the Purchaser, the Purchaser shall have right to get the erection done through any source of his choice. In such an event, the contractor shall be liable to bear any additional expenditure that the Purchaser may incur towards erection. The Contractor shall, however, not be entitled to any gain due to such an action by the Purchaser.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

SECTION 'C'

TECHNICAL SPECIFICATIONS OF STORES AND DRAWINGS

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Please refer tender document

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

SECTION 'D'

FORMAT FOR SUBMISSION OF PART-II (PRICE)

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Please refer tender document

TENDER FORM

INSTITUTE FOR PLASMA RESEARCH

(An Aided Institute of
Department of Atomic Energy, Government of India)
Near Indira Bridge;
Bhat; Gandhinagar-382428
India

Following terms are replaced in our Form No. IPR-LP-PT-02.V3 for Tender no. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019.

1) Sr.No.3.1 (Section-A) under heading "Earnest Money Deposit (EMD)" of Form No. IPR-LP-PT-02.V3 (Terms and Conditions) is replaced with the following:

The Tenderer shall submit, as part of its bid, interest free Earnest Money Deposit (EMD) for an amount as specified in the Tender Notice. EMD shall be submitted by way of Demand Draft from **SBI/nationalized banks or any one of the scheduled banks mentioned in the bracket (Axis Bank, HDFC Bank, ICICI Bank and IDBI Bank)** issued in favour of ***"Institute for Plasma Research***" and payable at **Ahmedabad**. **Tender received without EMD will be rejected at the discretion of IPR.**

2) Sr.No.3.4 (Section-A) under heading "Earnest Money Deposit (EMD)" of Form No. IPR-LP-PT-02.V3 (Terms and Conditions) is replaced with the following:
Exemption from payment of EMD: The firms registered with DGS&D, NSIC, DPS or Micro & Small Enterprises (MSEs) which are actual producers/manufacturers of tendered items are exempted from payment of EMD provided valid registration certificate is attached with the offer.

3) Sr.No.7 (Section-A) under heading "Evaluation of Tender" of Form No. IPR-LP-PT-02.V3 (Terms and Conditions) is replaced with the following:
Evaluation of tender shall be based on Ex-Works quoted cost.

4) Sr.No.15.2 (Section-A) under heading "Tendering Conditions for Bids" of Form No. IPR-LP-PT-02.V3 (Terms and Conditions) is replaced with the following:

Prices quoted by the tenderer should include charges for Manufacturing, testing, packing, loading for delivery at factory and unloading at delivery site mentioned in contract. All other charges involved for direct and safe-delivery of the stores to the consignee/place of delivery indicated in the tender document which include insurance, forwarding and transport shall be paid at actual on production of proof/receipt for payment of the same. If a tenderer so desires, separate lump sum charges for safe-delivery of the stores to the consignee/purchaser's site, could be furnished. However, the purchaser reserves the right to call for break-up. The purchaser will neither undertake responsibility for transit insurance nor pay for it separately.

5) Sr.No.15.3 (Section-A) under heading "Tendering Conditions for Bids" of Form No. IPR-LP-PT-02.V3 (Terms and Conditions) is deleted. Accordingly, Sr.No.15.4, 15.5, 15.6 and 15.7 is replaced with Sr.No.15.3, 15.4, 15.5 and 15.6 respectively.

6) Sr.No.18 (Section-A) under heading "Statutory Levies such as Customs Duty, Goods and Service Tax" of Form No. IPR-LP-PT-02.V3 (Terms and Conditions) is replaced with the following:
Clause Nos.18.1, 18.2, 18.3, 18.5.2 and its sub-clauses deleted from Form No: IPR-LP-PT-02.V3.

7) Sr.No.31 (Section-A) under heading "Delivery" of Form No. IPR-LP-PT-02.V3 (Terms and Conditions) is replaced with the following:

Delivery: All equipments/machinery/plant/component covered by this tender document should be delivered as per the delivery schedule given under clause No.11 of Section-C. The prices quoted by the tenderer should include packing, loading and unloading at delivery site. If a tenderer so desires/separate lumpsum charges for transportation and safe delivery to Purchaser's site could be furnished. Purchaser will neither undertake responsibility for transit insurance nor pay for it separately. No other, delivery term will be accepted by the Purchaser

8) Sr. No. 35 (Section-B) under heading Mode of Payment of "General Conditions of Contract" of Form No. IPR-LP-PT-02.V3 (Terms and Conditions) is replaced with the following:

Payment: Unless otherwise agreed to in writing between the Purchaser and the Contractor, payment for the delivery of the tendered items, will be made as follows.

(a) 10% of contract value will be paid against approval of manufacturing drawings and on submission of Bank Guarantee for an equivalent amount from SBI/nationalized banks or any one of the scheduled banks mentioned in the bracket (Axis Bank, HDFC Bank, ICICI Bank and IDBI Bank) valid till delivery of the entire material and on receipt of proforma invoice triplicate.

(b) 10% of contract value will be paid against procurement of bulk raw materials and on submission of material test certificate report (MTCR) and invoices of raw material procured for this project and on submission of Bank Guarantee for an equivalent amount from SBI/nationalized banks or any one of the scheduled banks mentioned in the bracket (Axis Bank, HDFC Bank, ICICI Bank and IDBI Bank) valid till delivery of the entire material.

(c) 60% of basic cost + 100% of all other charges will be paid after carrying out Factory Acceptance Tests (FAT), delivery of materials at RRCAT, Indore Site, its verification by IPR/RRCAT representative and on receipt of Delivery challan duly signed & stamped by RRCAT, Indore and Invoice in triplicate.

(d) 20% will be paid within 30 days from the date of acceptance and on receipt of Performance Bank Guarantee for 10% of the order value from SBI/nationalized banks or any one of the scheduled banks mentioned in the bracket (Axis Bank, HDFC Bank, ICICI Bank and IDBI Bank) valid throughout the warranty period and on receipt of final invoice.

Following terms is **added to** our Form No. IPR-LP-PT-02.V3 for Tender No. No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019.

a) **TDS as per CGST Act**: As per the provisions mentioned under Section No. 51 of the CGST Act 2017, TDS @ 2% (IGST 2% or CGST 1% and SGST 1%) will be deducted while making payment to the suppliers where total value of the purchase order/contracts/work orders exceeds Rs.2.5 Lakhs. Necessary TDS Certificate will be issued to the supplier after TDS deduction.

IMPORTANT NOTE:

[1] QUOTATIONS ARE INVITED IN INDIAN CURRENCY ONLY
[2] QUOTATIONS RECEIVED OTHER THAN "INR" QUOTE SHALL SUMMARILY BE REJECTED.

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Technical Specification Document for Procurement of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) Chamber

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Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Manufacturing /Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) Chamber

Technical Specification Covering Scope of Work

INSTITUTE FOR PLASMA RESEARCH

BHAT, GANDHINAGAR-382828

GUJARAT, INDIA

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1. Introduction

Laser Interferometer Gravitational-Wave Observatory (LIGO), INDIA is a large-scale physics experiment for the detection of gravitational waves. LIGO detector is a modified Michelson Interferometer having in each perpendicular arms of 4-km length a pair of Fabry-Perot cavity to detect ripples in space with sensitivity less than or equal to 10^{-24} per square root Hz.

LIGO-India is a collaborative project between LIGO USA and Department of Atomic Energy (DAE) & Department of Science and Technology, Govt. of India, for establishing an Advanced LIGO detector in India. India's major institutes (IPR-Gandhinagar, RRCAT-Indore, DCSEM, Mumbai and IUCAA-Pune) are contributing in installation, commissioning and operation of the Gravitational Wave detector in India.

Institute for Plasma Research (IPR) is primarily responsible for development and procurement of vacuum system for the LIGO-India project. Vacuum system is an integrated system of many vacuum components which comprises of, BSC chamber (6 nos.), HAM chamber (5 nos.) Beam Tube (about 8 km long), Septum plates, Mode cleaner tubes, Spools, Adapters, Baffles, Cryo pump, gate valves, vacuum pumps and associated gauges with controls and instrumentation to control and monitor integrated vacuum system.

Purpose of BSC and HAM

Basic Symmetric Chamber's (BSC) are used to support core optical components while Horizontal Access Module's (HAM) are used to house auxiliary optics. All major optical components are housed in these two chambers. Both BSC and HAM chambers are provided with demountable cover flanges so that the servicing of the optical components could be carried out whenever needed. These chambers contain seismic isolators and alignment mechanism which support the optical elements and have internal attachment brackets. These brackets will be used to support lightweight optical components. The seals on these cover flanges are designed as double O-rings with a pumped annulus to reduce the gas load due to the permeability of O-rings. A clean air vent and purge system is incorporated to break vacuum and maintain cleanliness of the optical components whenever a chamber is open.

This tender notice is for procurement of prototype one set each of BSC and HAM chamber assembly.

1.1 Basic Symmetric Chamber (BSC) -

'Basic Symmetric Chamber' (referred as 'BSC' hereafter) is a cylindrical metallic enclosure performing the following functions:

- Provide Ultra High Vacuum environment
- Sustain self-weight, weight of end covers, nozzles & their flanges and operational loads. (Refer Annexure 8)

- Provide the openings for feed-through that are necessary for the attachment of vacuum pump, pressure gauge, Residual Gas Analyzer (RGA), other control instruments installation requirement

- To allow access to inside of the chamber for installation / maintenance and provision for removal of end & upper covers

- **The 'BSC Chamber Assembly' under the scope of this contract includes following:**

    - Basic Symmetric Chamber assembly is made up of upper and lower cylindrical shells, end covers, annulus tubing assembly and its support structure (Refer Drawing VB01-001-R1)

    - BSC support structure (Refer Drawing VB01-002-R1)

    - Lower cylindrical chamber with torispherical dished head (with suitable openings for maintenance access, connection of vacuum pump, and mounting of pressure gauge, RGA, etc.) (Refer Drawing VB01-003-R1)

    - Floor assembly. (Refer Drawing VB01-004-R1)

    - End covers (with suitable openings), detachable from side for mounting as well as for removal of internal components during installation and maintenance phases. (Refer Drawing VB01-005-R1 & VB01-006-R1)

    - Upper cylindrical chamber / cover with torispherical dished head (with suitable openings for mounting pressure gauge and other instrumentations) detachable from top for mounting as well as removal of internal components during installation and maintenance phases. (Refer Drawing VB01-007-R1)

    - Double O-ring flange annulus pumping system (Refer Drawing VB01-008-R1)

    - All the fasteners and required vacuum seals (along with spares mentioned).

    - Spares as specified (Annexure-9)

1.2 Horizontal Access Module (HAM) chamber -

'Horizontal Access Module' (referred as 'HAM' hereafter) chamber is a cylindrical metallic enclosure performing the following functions:

- Provide Ultra High Vacuum environment

- Sustain self-weight, weight of end covers, nozzles & their flanges and operational loads. (Refer Annexure 8)

- Provide the openings for feed-through that are necessary for the attachment of vacuum pump, pressure gauge, Residual Gas Analyzer (RGA), other control instruments installation requirement

- To allow access to inside of the chamber for installation / maintenance and provision for removal of access & end covers

- **The 'HAM Chamber assembly' under scope of this contract includes following:**

    - Horizontal Access Module (HAM) is made up of cylindrical vessel with specified openings for maintenance access, vacuum pumping, mounting pressure gauge, RGA and optical requirement. (Refer Drawing VH01-001-R1)
    - HAM support structure (Refer Drawing VH01-002-R1)
    - Cylindrical Part (acting as a main chamber) with suitable openings for maintenance access, connection of vacuum pump, and mounting of pressure gauge, RGA, etc. (Refer Drawing VH01-003-R1)
    - End cover big and small (with suitable openings for optical requirements), detachable from side for mounting as well as removal of internal components during installation and maintenance phases. (Refer Drawing VH01-004 and VH01-006-R1)
    - Cylindrical Part (acting as a beam tube connecting port) with suitable openings for connection of vacuum pump, and mounting of pressure gauge, RGA, etc.) (Refer Drawing VH01-005-R1)
    - Double O-ring flange annulus pumping system (Refer Drawing VH01-007-R1)
    - All the fasteners and required vacuum seals.
    - Spares as specified (Annexure-9)
    - Provision for lifting lugs on all parts as necessary to handle and lift them

2. Overall Dimensions of the BSC and HAM

2.1. Overall Dimensions of Basic Symmetric Chamber (BSC) -

Length: 4820 mm, OD of the chamber: 2680 mm

Overall height of chamber from ground to top in vertical assembled condition: 5210 mm

2.2. Overall Dimensions of Horizontal Access Module (HAM) -

Length: 3032 mm, OD of the chamber: 2165 mm

Overall height of chamber from ground to top in vertical assembled condition: 2918 mm

3. The Scope of work

3.1 Study of the drawings of "BSC" & "HAM" provided with contract document, in the form of technical specifications and drawings to meet functional requirements (with respect to dimensions, surface finish, weld joints, lifting lugs & its locations) listed in

table-1 of section-4 and achieve manufacturing feasibility, and propose necessary changes for purchaser's approval.

Vendor shall propose necessary changes from findings of their drawings study to purchaser with supporting rationale, for review & necessary approval and subsequently incorporate changes agreed & approved by purchaser and ensure fulfilment of the functional requirements. Documents incorporating final approved and agreed changes shall be transmitted to purchaser at appropriate stage.

Vendor shall be responsible to accomplish functional requirements of BSC / HAM, as defined in subsequent section #4 (which relate to surface finish, dimension and geometrical tolerances, welding, leak rates within acceptable limits, cleanliness) and demonstrate realization of ultimate vacuum in BSC and HAM assembly.

3.2 Preparation and qualification (where necessary) of manufacturing drawings, documents related to quality viz. Manufacturing & Inspection Plan (MIP), Quality Assurance Plan (QAP), Manufacturing Process Sheets (MIS), Manufacturing Procedures, Welding procedures, Assembly procedures, Inspection & Testing Procedures (ITP), Cleaning procedure, packing & transportation procedures including handling and lifting details.

3.3 Procurement of all raw material required for the BSC / HAM manufacturing (including material required for pre-qualifications), set of manufacturing tools, jigs & fixtures (covering all manufacturing activities, handling, assembly), inspection (functional & dimensional), testing (at factory), packing and loading on transportation, unloading and acceptance inspection at delivery site.

3.4 Scope of work includes packing, loading on transportation at factory, unloading and inspection at delivery site. Forwarding and freight shall be addition scope of work and to be paid at actual basis.

3.5 Establish necessary cleaning setup for cleaning (including procurement of the required equipment(s)) of manufactured / fabricated parts of BSC / HAM chamber.

3.6 Manufacture, fabricate and assemble the BSC / HAM Chamber as per approved manufacturing & assembly drawings, MIP and QAP.

3.7 Design and manufacturing of necessary tools, jigs & fixtures required during handling and lifting for entire scope of work is in the scope of vendor. All these custom tools

with related documents) used during scope of work, shall be supplied to purchaser at IPR, Gandhinagar, Gujarat.

3.8 Design, manufacturing, testing and supply of special transportation structure / fixture and necessary tools for handling of the chambers (BSC & HAM) delivered to purchaser's site at RRCAT, Indore.

3.8.1 The design of packing / transportation structure shall be such that it provides access to delivery supplies for lifting by crane at delivery site to equipment.

3.8.2 Vendor shall guarantee the performance of supplied support structure / fixture.

3.9 Make necessary arrangement for the provision of equipment's (vacuum pumps, gauges, vacuum leak detector etc.) during vacuum leak testing and for demonstration of ultimate vacuum for BSC and HAM. (Refer annexure – 6 & 7)

3.10 Manufacture/ procure and supply of blank off - ConFlat (CF) flanges used in vacuum testing whenever it is performed and seal off the chamber at the time of delivery.

3.11 Make provision of flanged connections to mount gauges, pumps and other control instruments during leak testing and vacuum testing of chambers.

3.12 Supply of temporary support structure (which can be dismantled) to store upper and lower parts of BSC, main cylindrical part and covers of HAM, in stable configuration when chamber is opened for inside access during its functioning at delivery site. These structures may be of carbon steel (with isolation at support locations between SS chamber and CS support structure to avoid direct contact).

3.13 Inspection and testing at identified stages before / during / after manufacturing as agreed in approved QAP / MIP included in relevant sections and annexures and drawings.

3.14 Loading, transportation, safe delivery to RRCAT, handling and unloading shall be done in LIGO Lab at RRCAT, Indore. The chamber shall be handled safely to prevent any distortion. The parts of BSC / HAM shall not be subjected to other additional loads / stresses not mentioned in this specification.

3.15 Supply specific photographs (@ 25 numbers preferably in 250 x 200 mm size); edited video film (approx. of min. 1 hr. duration) covering complete scope of manufacture, inspection & testing of BSC/HAM with commentary to keep the records.

Each stage, from material procurement till final delivery covering scope of work, shall be recorded additionally in digital form of photograph and video. The digital records shall be provided to purchaser on suitable storage media at the end of scope of supply.

3.16 Complete all checks as a part of factory acceptance tests and prepare reports to accomplish the scope of work of this procurement and arrange for delivery: (as detailed in annexure referred against them)

3.16.1 Raw Material testing and certification (Annexure – 1)

3.16.2 Visual and Dimensional inspection (Annexure – 5)

3.16.3 Helium leak test of all sealing joints / location and welds. (Annexure 6)

3.16.4 Demonstration of specified ultimate vacuum (Annexure-7). Vendor shall provide the procedure to be followed for the purpose of this demonstration, for review and approval of purchaser before taking up demonstration

3.16.5 Cleaning inspection *(As per Annexure 4 of this specification)*

3.16.6 Packing Inspection *(As per section 9 of this document)*

3.16.7 Obtain "Shipping Release" from purchaser (or his authorized representative)

3.17 Complete following checks as a part of onsite acceptance after delivery of supplies:

3.17.1 Check for any physical damage to supplied deliveries during transportation

3.17.2 Visual and dimensional inspection to confirm that distortion and dimensions are within acceptable limits

3.17.3 Checking and verification of reading of gauges / impact sensors mounted on the vacuum sealed equipment(s), packing and merchandises delivered

4. Design and functional requirements of BSC / HAM

Functional requirements of chambers (BSC & HAM) are mentioned in Table-1. Vendor after studying drawings details provided to them with the tender document shall come out with their suggested changes, which will fulfil functional requirements. During evaluation of the tender bids, vendor should present outcome of their study to convey purchaser on how they will ensure compliance of manufactured items with each of the specified functional requirement.

Requirement	Value
Design internal pressure	0.12 MPa (1.2 bar)
External pressure	Atmosphere
Demonstration of vacuum level at factory site	1.0×10^{-7} mbar Base vacuum inside chamber within 10 days starting from atmospheric pressure
Vacuum level at Interspace/Annulus (between two O-rings)	10^{-5} mbar (to be pumped by Ion/dry-TMP pump)
Design Temperature	25^0 C during operation 200^0C during baking
Load condition	Refer: Annexure 8
Number of pressurisation / evacuation cycles (during systems operation life	1000 cycles

Table 1: Design and functional requirement

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

5. Material Procurement

5.1 The material specification requirements for BSC shall be followed as identified in Table-2 and for HAM as identified in Table-3:

Sr. No.	Part name	Material grade
1.	**Upper part**	
	Shell, F&D head	ASME, SA240, Dual certification for conforming to both SS304 and304L
	Port	SS304L
	Stiffener & lifting lugs	ASME, SA479, SS304
	Standard ConFlat (CF) Flange	ASME, SA240, SS316L
	Large custom flange	ASME, SA182, Grade F,SS 304L
2.	**Lower part**	
	Shell, F&D head, port (Dia. 1.5 m)	ASME, SA240, Dual certification for conforming to both SS304 and304L
	Internal attachment bracket	ASME, SA240, SS304L
	Port	SS304L
	Stiffener, lifting lugs	ASME, SA479, SS304
	Standard ConFlat (CF) Flange	ASME, SA240, SS316L
	Large custom flange	ASME, SA182, Grade F,SS 304L
3.	Annulus tubing & support	SS304L
4.	Support Structure	ASME, A36 or A500 Gr B Equivalent Indian standard IS 2062
5.	Floor Assembly	ALU SB-308, 6061-T6 & T6511
6.	Fastener	SS 316 Grade A4-70/A4-80 silver plated
7.	O-ring	Perfluoroelastomer
8.	Copper Gasket	Oxygen-Free Electronic (OFE) grade copper (UNS C10100)
9.	**Welding Consumable for** Stainless steel to Stainless steel Stainless steel to Carbon steel Aluminum 6061	**Filler Material grade** Stainless steel –AWS ER 308L Stainless steel – AWS ER 309L Aluminum Alloy 4043 or 5356

Table 2: Material requirement for BSC

Sr. No.	Part name	Material grade
1.	Cylindrical part (main shell)	ASME, SA240, Dual certification for conforming to both SS304 and304L
	Port	ASME, SA240, Dual certification for conforming to both SS304 and304L
	Stiffener & lifting lug	ASME, SA479, SS304
	Internal attachment bracket	SS304L
	Standard ConFlat (CF) Flange	ASME, SA240, SS316L

Sr. No.	Part name	Material grade
	Large custom flange	ASME, SA182, Grade F,SS 304L
	Bellow & tie rod	SS304L
2.	End Access (Big & small)	
	F&D head	ASME, SA240, SS304L
	Port	SS304L
	Lifting lugs	SS304L
	Standard ConFlat (CF) Flange	ASME, SA240, SS316L
	Large custom flange	ASME, SA182, Grade F,SS 304L
3.	Annulus tubing & support	SS304L
4.	Support Structure	ASME, A36 or A500 Gr B Equivalent Indian standard IS 2062
5.	Fastener	SS 316 Grade A4-70/A4-80 silver plated
6.	O-ring	Perfluoroelastomer
7.	Copper Gasket	Oxygen-Free Electronic (OFE) grade copper (UNS C10100)
8.	**Welding Consumable for** Stainless steel to Stainless steel Stainless steel to Carbon steel Aluminum 6061	**Material grade** Stainless steel –AWS ER 308L Stainless steel – AWS ER 309L Aluminum Alloy 4043 or 5356

Table 3: Material requirement for HAM

5.2 All material, welding consumable, proprietary items and brought out items including materials for trials, qualifications and test coupons etc., as required for manufacture of BSC / HAM shall be procured and tested in accordance with the specification in Annexure-1. The vendor shall procure all the materials as per relevant specifications from reputed manufacturers and avoid procurement from agents. The source of material procurement should be approved by purchaser as part of quality audit.

All the material used in manufacture shall be marked and traced throughout the procurement to delivery to site time-cycle.

5.3 The vendor shall submit the schedule for the procurement of raw materials and welding consumable by including it in the work schedule.

5.4 MIP, QAP, testing procedure, Non Destructive Examination (NDE) procedure etc. submitted by the procurement source of raw materials, welding consumables and other proprietary & brought out items shall be communicated to the purchaser for approval before effecting delivery material. Approved MIP and QAP shall be strictly adhered thereafter during procurement.

5.5 Material / standard bought out items will be procured under inspection by purchaser (or purchaser's authorized agency). The inspection and testing (as covered in relevant Annexures) of materials will be carried out by the vendor at his cost in a laboratory approved by the purchaser. This testing may be witnessed by Purchaser (as covered in

QAP/MIP). Purchaser may ask for the specimen coupons from the procured material for independent testing at his end.

5.6 The vendor shall procure the material in sufficient quantities and appropriate size in single lot taking into account all the necessary allowances required for manufacture, qualification and testing coupons.

5.7 Upon receipt of procured material from raw material source, product analysis shall be carried out by vendor as mentioned in Annexure 1 to ensure the quality and quantity.

6. Welding

6.1 All welding consumables shall meet the applicable specifications stated in Annexure 3. Welding qualification shall be as per clause no.5 and 6 of Annexure 3. The average heat input shall be concluded and reported based on qualified welding procedure.

6.2 The vendor shall give details of storage details, system for issuance and traceability of welding consumables whenever asked for it by purchaser.

6.3 The vendor shall submit Shop Weld Plan (SWP) consisting of weld joints indicating seam nos. for respective weld joints, applicable Welding Procedure Specification (WPS), Weld Procedure Qualification Record (PQR) and NDE to be carried out, with corresponding drawing number, for review and approval to the purchaser.

6.4 The weld seam shall be staggered wherever required as per the joint design requirements.

6.5 To approve welder and weld samples Vendor shall submit a Procedure Qualification Record (PQR) on welder and weld samples, prior to starting production welding

7. Inspection and Testing

7.1 The vendor shall inspect all the machined parts, sub-assemblies, final assemblies etc., in full compliances with Annexure 5 and approved drawings as per agreed procedures.

7.2 All the tolerance dimensions / features of individual parts, sub-assemblies and the assembled chamber shall be inspected by applicable procedures. All the threaded fasteners shall be checked by the thread gauges and ensure fasteners shall be interchangeable.

7.3 All the dimensions given in the drawing are at 25^0 C. Measurement carried out at other temperature shall be compensated and corrected to 25^0 C before comparing with dimensions in the drawing. Value of co-efficient of thermal expansion at various temperatures shall be obtained from material producer.

7.4 The inspection and testing shall be done as per specifications and in a manner acceptable to purchaser. If deemed necessary purchaser will have right to specify additional inspection / testing other than specified here in this specification and cost of such test / inspection will be borne by the purchaser. The records of all the tests and inspection shall be maintained by the vendor and the same will be submitted to the purchaser.

7.5 Quality surveillance as well as quality audit by the purchaser or his authorized representative shall not relieve the vendor from the responsibility of meeting the specification or the inspection duties.

7.6 The inspection shall be in compliance with MIP prepared by the vendor and approved by the purchaser. However depending on the manufacturing procedure, quality assurance system of the company and manufacturing and inspection facilities available with the vendor, some additional checks may also be necessary on and above approved MIP. Such checks shall be incorporated and implemented by the vendor without any extra financial implications to the purchaser.

7.7 Change request: If vendor requires raising any change deviation to specification provided and approved for acceptance to purchaser, it has to get it approved before implementing if change is necessary. Change request procedure shall be mutually decided and agreed upon between vendor and purchaser.

8. Cleanliness, storage and workmanship

8.1 Surface treatment procedure shall be prepared in line with the Annexure-4 of this document and submitted to purchaser for approval.

8.2 Clean condition and good workmanship shall be maintained at all the stages of storing, handling, fabrication, inspection and packing as acceptable to purchaser.

8.3 Care should be taken to avoid contact of stainless steel with carbon steel at any time.

8.4 SS fabrication area shall be shielded from neighboring areas by metallic screens to prevent contamination from the machining area, weld spatter and fumes, grinding dust etc.

8.5 The raw material, subassemblies and finished components shall be sufficiently covered with polythene sheets to avoid contamination during storage.

8.6 Separate storage facility for S.S. material away from C.S material shall be used and identification of all material and their cut offs (like heat no, plate no., rolling direction etc.) shall be maintained by transferring the same to other location before cutting.

9. Handling, Packing and Delivery

9.1 The vendor shall provide details of floor space layout, handling facilities available at the place of manufacture, testing and assembly of BSC / HAM parts at the time of bidding. Vendor shall obtain detail of cleanliness class (class 100000 which is ISO 8 equivalent) for the area where final clean components are stored, assembled and are prepared for packing before dispatch.

9.2 The vendor shall ensure that all the chamber parts / assemblies are protected against any corrosion or surface damage during all stages of manufacture, inspection, handling, storage and transport. The packing shall be suitable and rigid enough to ensure safety of chamber during all stages of shipping to delivery site, loading, stacking and storage. Adequate number of silica gel packets shall be kept inside carte along with a copy of shipping release document.

9.3 All the openings shall be protected to prevent entrance of dirt and moisture during shipment, storage and assembly.

9.4 The package shall be stenciled in bold character with indelible paint, protected with shellac to indicate shipping mark, package numbers, dimensions and gross weight in

kilos, the purchase order number and any other necessary data to identify the equipment and relate it to the contract.

9.5 Packing list shall be clearly visible and include package number, package contents, dimensions and net, legal and gross weight of each package and handling instructions if any. If more number of items are placed in a package, the net weight for each item shall be specified apart from gross package weight.

9.6 The shipment of equipment shall not be effected until and unless written "Shipping Release" is obtained from purchaser. The same will be issued by the purchaser or his authorized representative after satisfactory completion of "Factory acceptance test" before release for delivery. The vendor shall dispatch the entire lot of supplies to purchaser's site after receipt of shipping release certificate.

9.7 Transshipment in transit shall be avoided and vendor shall arrange specially hired transport for direct delivery to purchaser specified delivery site.

9.8 The vendor shall do the road survey of route through which shipment is to be transported up to the unloading / installation location. Purchaser may join vendor in this activity. Moving supplies up to installation location is responsibility of vendor when specified.

9.9 When necessary, to obtain required clearance from statuary bodies for transportation of supplies responsibility lies within the scope of the vendor. The purchaser has no obligation in this regards. Wherever possible purchaser will put efforts to try to sort out issue but that doesn't relieve vendor from responsibility.

10. Technical documentation and progress reports

10.1 Drawings

The following drawings are provided to vendor with tender document of BSC / HAM chamber which shall be used as reference basis.

SL. No.	DRAWING Name	DRG No.	No. of Sheets
1.	BSC ASSEMBLY	VB01-001-R1	03
2.	BSC SUPPORT ASSEMBLY	VB01-002-R1	02
3.	BSC LOWER PART	VB01-003-R1	09
4.	FLOOR ASSEMBLY	VB01-004-R1	04
5.	BSC END COVER TYPE 1	VB01-005-R1	03
6.	BSC END COVER TYPE A11	VB01-006-R1	01
7.	BSC UPPER PART	VB01-007-R1	03
8.	BSC ANNLUS TUBING ASSEMBLY	VB01-008-R1	02
9.	STANDARD FLANGES	VO01-001-R0	05

Table 4: Drawing reference for BSC

SL No.	DRAWING Name	DRG No.	No. of Sheets
1.	HAM ASSEMBLY	VH01-001-R1	03
2.	HAM VESSEL SUPPORT	VH01-002-R1	02
3.	HAM CYLINDRICAL PART (DIA 84.25" ID)	VH01-003-R1	06
4.	HAM END COVER (BIG)	VH01-004-R1	04
5.	PORT CYLINDRICAL PART (DIA 60.5" ID)	VH01-005-R1	08
6.	HAM END COVER (SMALL)	VH01-006-R1	03
7.	HAM ANNLUS TUBING ASSEMBLY	VH01-007-R1	04
8.	STANDARD FLANGES	VO01-001-R0	05

Table 5: Drawing reference for HAM

10.2 Preparation of manufacturing drawings and as built drawings & 3D Model -

The 3D CATIA Model in .stp; format and 2D drawings derived from them covering the chamber assembly and its support structure will be supplied by the purchaser. The vendor shall prepare manufacturing drawings from them respecting design code compliance, manufacturability, fabrication, handling, access / effectiveness of inspection & testing and functional requirements.

The vendor shall incorporate changes if any in the 3D model as per the final manufacturing drawings approved by purchaser. The new 3D model / 2D Drawings shall be submitted to purchaser in '.stp' format compatible to CATIA V5 / SOLIDWORKS (preferably SOLIDWORKS) for review and approval.

At the end of manufacturing the vendor shall prepare 'as built' 3D model / 2 D Drawings of equipment in CATIA or equivalent and supply it to purchaser in the format compatible to CATIA V5 / SOLIDWORKS for record as a part of delivery of supplies.

If vendor wants to make suggestion to use CAD software other than SOLIDWORKS, he shall seek approval before its use. Approval to use other CAD software lies with purchaser and do not relieve vendor of his responsibility.

10.3 Preparation of manufacturing drawing

Preparation of manufacturing drawings (based on drawings / models supplied with tender document) and seek purchaser's review and approval is in the scope of vendor. This step is prior to beginning of the manufacturing stage.

The vendor shall ensure necessary care in preparation of manufacturing drawings in specifying all the dimensions with tolerances for each of the individual components, sub-assemblies and final assemblies. Progressive tolerances shall be implemented at intermediate stages from manufacturing to assembly in order to achieve the final requirements specified in the purchaser's assembly drawings. Drawings for jigs, fixtures

and tooling required to cover the scope of work, shall be prepared by the vendor and submitted to the purchaser for information & record.

The shop drawings shall include all details covering surface finish, weld details, method of inspection / examination, surface finish, bill of materials, allowances for cutting, machining including final finish besides other relevant information and details.

Vendor shall prepare all drawings in approved CAD software and provide in appropriate CAD and pdf format along with one hard copy for review.

If appropriate, the purchaser may ask the vendor for comments on new drawing versions. If new versions are viewed by purchaser or the vendor as significantly affecting interfaces, functionality or costs, a mutually agreed procedure between purchaser and the vendor will be followed.

The purchaser reserves the right to make minor dimensional changes during the period of contract, such changes shall be considered within the scope of the specified work and shall not be considered extra; the necessary agreement for the quantum of such changes shall be mutually agreed upon.

The vendor shall prepare the 'as built' drawing after completion of scope of work and submit them to the purchaser for records as a part of deliverable compatible with SOLIDWORKS.

10.4 Applicable code and standards covering scope of work of procurement of BSC / HAM

- ASME Boiler and Pressure vessel code Section II Part A
- ASME Boiler and Pressure vessel code Section II Part C
- ASME Boiler and Pressure vessel code Section II Part D
- ASME Boiler and Pressure vessel code Section V
- ASME Boiler and Pressure vessel code Section VIII Div. 1
- ASME Boiler and Pressure vessel code Section VIII Div. 2
- ASME Boiler and Pressure vessel code Section IX
- ASTM E498-Standard Test Methods for Leaks Using the Mass Spectrometer leak Detector
- Standard of Expansion Joint and Manufacturer's Association (EJMA)
- ISO Standard 2861-Flange standard
- ISO Standard 14644-1 for cleanroom

Latest edition of above codes shall be used.

10.5 Applicable Specification –

Detailed specifications applicable to scope of work are included in the number of annexures listed below and form the part of tender specifications applicable to BSC / HAM Chambers:

Sr. No.	Description	Annexure No.
1.	Specification for Material	Annexure 1
2.	Specification for rolling, machining and manufacturing	Annexure 2
3.	Specification for welding and welding qualification of the austenitic stainless steel	Annexure 3
4.	Specification for cleaning and cleanliness	Annexure 4
5.	Specification for inspection and testing	Annexure 5
6.	Specification for vacuum leak tightness and leak testing	Annexure 6
7.	Specification for Vacuum requirement	Annexure 7
8.	Various parts details & Load specification for BSC / HAM	Annexure 8
9.	List of deliverables	Annexure 9

Table 6: Applicable Annexure / Specification

10.6 In case of conflict between this specification and other specification mentioned elsewhere at other document /places, the vendor shall contact purchaser for guidance and the purchaser's decision shall be considered as final.

10.7 Details of documents to be prepared and provided for approval of purchaser at all stages of manufacturing, fabrication, inspection and testing of BSC / HAM Chamber :

Document to be provided by vendor	Provider	Milestone*
2D manufacturing drawing, BoM	Vendor	Within 30 days from the KOM
Follow-up documents (Quality Assurance Plan and Manufacturing & Inspection Plan) identifying Purchaser hold points	Vendor	
Material / welding consumables / Equipment tracing - identification and marking procedure	Vendor	
Deviation Request (If Applicable)	Vendor	BS
Material documentation (incl. Procurement specification, material certificates, test and examination results)	Vendor	BS

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Document to be provided by vendor	Provider	Milestone*
List of contractor's sub-suppliers/sub-contractor	Vendor	BS
Welding Data Package (WPS, PQR, WPQ and Shop Weld Plan), welder qualification	Vendor	BS
NDE procedures along with the credentials of qualified NDE personnel	Vendor	BS
Cleanroom specification for the areas of storage, manufacturing, assembly, testing and packing	Vendor	BS
Assembly and fabrication procedures	Vendor	BS
Leak Testing Procedures along with the credentials of qualified testing personnel	Vendor	BS
PWHT – Dimension Stability Procedures (wherever applicable)	Vendor	BS
Cleaning procedures along with details of cleaning agents	Vendor	BS
Packing and Transportation procedures	Vendor	BS
Forming procedure (if applicable)	Vendor	BS
Non Conformance Report (If applicable)	Vendor	BS Throughout period of scope of work
Documents to be supplied before final acceptance of BSC / HAM in the factory		
Inspection reports (dimensional check, visual inspection, vacuum leak tests outcome (covering magnitude and location of leak recorded), NDE results (Annexure 3, 4 & 5)	Vendor	AC
Vacuum performance (demonstration of ultimate vacuum as per specification) (Annexure-6 & 7)	Vendor	AC
End of manufacturing report (Release Note) including as-built drawings for BSC / HAM chamber assembly and its parts. The end of manufacturing report file is progressively built up during manufacture of the component(s) assembly & testing.	Vendor	EF

Table 7: Document submission list throughout scope of work

*** AC: After completing of activity

EF: End of the factory acceptance

*BS –Before start (of Manufacturing or procedure)

10.8 The vendor shall record all deviations incorporated after due approval, which necessitated throughout the manufacturing, inspection and testing stages. Standard forms shall be used by the vendor for raising Deviation Requests (DRs) supplied by purchaser.

10.9 The vendor shall prepare detailed monthly progress reports on the works performed and submit soft and hard copy for each month to the purchaser by mutually agreed dates/week of succeeding month.

10.10 As this work is a prototype in nature (Manufacture and assembly of BSC / HAM), Vendor shall prepare and submit a comprehensive note on the manufacturing experience, covering all the activities highlighting the salient features. Specific difficulties / problems faced, if any, and the methods by which they were resolved shall be included with necessary details. All deviation requests approved shall be part of this note.

11. Delivery

Supply of scope of work specified under this contract shall be completed within 9 (nine) months from the date of approval of manufacturing drawings.

Delivery of supplies shall be made at RRCAT, P. O. CAT, Indore - 452013, Madhya Pradesh, India. Contact details at RRCAT, Indore shall be provided in contract documents

Goods shall be unloaded inside LIGO lab, RRCAT. The Project Coordinator, LIGO Activities, RRCAT shall be the contact person in RRCAT. In case situation arise, the unloading location may be changed due to unavoidable circumstances but it shall remain within the premises of RRCAT, Indore.

12. Guideline to vendors on Notification and Hold points for Purchaser

Activity	Purchaser	Comment
Approval of Procurement related documentation (includes QAP, MIP, Manufacturing drawings with BOM, Manufacturing procedure and Inspection stages & Test results etc.)	H	
List of Contractor's sub-suppliers	H	Approval of sub-contractor shall be subjected to clearance of quality audit by purchaser
Kick off Meetings between Contractor and Purchaser	H	
Material procurement, Procurement of Welding consumables.	N	

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Activity	Purchaser	Comment
Raw Material receipt inspection Material identification marking	H	Product analysis, Check test, Material Test Certificate and Identification
Design of Jigs, fixture, Tooling and manufacturing	N	Contractor to provide details of Jigs, Fixture and tooling to be used.
Marking And Cutting of Material	N	
Machining and Drilling of parts (as applicable)	N	
Dimensional inspection of Parts before taking up for fabrication	H	
Welding Qualification (Procedure & Welders)	H	
Commencement of fabrication	H	
Special Fixture for fabrication (as applicable)	N	
Visual & Dimensional inspection of chamber	H	
Non Destructive Examination of welds	H	
Cleaning of chamber	H	
Leak testing of chamber	H	
Ultimate Vacuum test	H	
Factory Acceptance Test	H	
Preparation of End of Manufacturing report	N	
Packing & Transportation	H	
Shipment release clearance by purchaser (or purchaser's representative)	H	

Table 8: Guideline on Notification and Hold points for Purchaser

H: Hold Point

N: Notification Point

This table is guideline to contractor for preparing detail MIP.

The notification / hold points may be added or deleted by purchaser before / during / after manufacturing as per the need and criticality of the activity.

ANNEXURE – 1

SPECIFICATION FOR MATERIAL:

A. Specification for Austenitic Stainless steel SS304/304 L plates:

1. Scope

This Annexure describes the requirements for the manufacture, procurement, inspection, testing, packing and supply of austenitic stainless steel plates type 304L and dual certification type 304 & 304L.

Any other requirements indicated in ASME Sec II Part A, SA 240 and SA 480 which are not included in the text of this Annexure shall also be applicable.

From the point of use of material in UHV application, there is need to comply with requirements for composition as specified in point no. 6. Supplier should source the material which has undergone secondary refining processes (Argon Oxygen Decarburization (AOD) or Vacuum Oxygen Decarburization (VOD) or Vacuum Arc Refining (VAR)).

2. General

All the material used in manufacture shall be firsthand. The vendor shall procure all the materials from reputed manufacturers with original Certified Material Test Reports (CMTRs) and avoid procuring from agents. Purchaser shall recommend source of procurement if there is need for use of pre-qualified material.

The dimensions mentioned in the drawings are finishing dimensions, accordingly vendor shall procure the material in sufficient quantities of appropriate size accounting for the necessary allowances required for cutting, machining during manufacture, qualification and testing.

3. Delivery condition

The stainless steel plates procured shall be of Hot Rolled, Solution Annealed and pickled (HRAP) condition. The parameters of the heat treatment cycle shall be obtained from the source of material supply and shall be made available to the purchaser whenever they are demanded.

After final cleaning and pickling, no grinding with abrasive wheels, cloth or stones is permitted. No iron, carbon steel or other contaminants (such as grease, chloride compounds, oil hydrocarbons) to come in contact with the finished material.

4. Cleanliness

This material is intended for use in Ultra High Vacuum (UHV) application. Potential hydrocarbon contamination shall be eliminated. Entire lot of clean material shall be wrapped and covered at all times during storage and handling of the material when it is not being processed to minimize exposure to contaminants.

5. Testing Details

Clause no. 8.0 to 13.0 of this specification are to be followed as guidelines for testing of plate.

6. Chemical composition

The chemical analysis shall be performed for each lot of material from same heat. Analysis may be performed on metal discards taken from mechanical test specimens.

A lot shall be defined as plates produced from same heat, subjected to same hot working and heat treatment to arrive at the same thickness.

Chemical Analysis shall be performed in accordance to ASME Sec II Part A, SA 751.

The results shall be in confirmation with the requirements as per ASME Sec II Part A, SA 240

Chemical composition of SS304L plates as per ASTM A240

Sr. No.	Element	Weight percentage
1	Carbon	0.030 (Max)
2	Manganese	2.00 (Max)
3	Phosphorus	0.045 (Max)
4	Sulfur	0.030 (Max)
5	Silicon	0.75 (Max)
6	Chromium	18.0–20.0
7	Nickel	8.0–12.0
8	Nitrogen	0.10 (Max)

Table 9: Chemical composition of SS304L as per ASTM A240

Chemical composition of SS304 plates as per ASTM A240

Sr. No.	Element	Weight percentage
1	Carbon	0.08 (Max)
2	Manganese	2.00 (Max)
3	Phosphorus	0.045 (Max)
4	Sulfur	0.030 (Max)
5	Silicon	0.75 (Max)
6	Chromium	18.0–20.0
7	Nickel	8.0–10.5
8	Nitrogen	0.10 (Max)

Table 10: Chemical composition of SS304 as per ASTM A240

Sr. No.	Element	Weight percentage
1	Carbon	0.03 (Max)
2	Manganese	2.00 (Max)
3	Phosphorus	0.045 (Max)
4	Sulfur	0.030 (Max)
5	Silicon	0.75 (Max)
6	Chromium	18.0–20.0
7	Nickel	8.0–12.0
8	Nitrogen	0.10 (Max)

Table 11.Chemical composition of dual certified SS304 & SS304L

7. Mechanical Properties Requirements

Testing procedure as per ASME Sec II Part A, SA 370

Tensile test requirements at room temperature as per ASME Sec II Part A, SA 240

Mechanical property of SS304L plates Specification as per ASTM A240M

Sr. No.	Property		Value
1.	Tensile Strength		485 MPa (Min)
2.	Yield Strength		170 MPa (Min)
3.	Elongation in 50 mm		40% (Min)
4.	Hardness	Brinell (HB) max.	201
		Rockwell B (HRB) max.	92

Table 12.Mechanical property of SS304L plates Specification as per ASTM A240M

Mechanical property of SS304 and dual certified SS304 & SS304L plates Specification as per ASTM A240M

Sr. No.	Property		Value
1.	Tensile Strength		515 MPa (Min)
2.	Yield Strength		205 MPa (Min)
3.	Elongation in 50 mm		40% (Min)
4.	Hardness	Brinell (HB) max.	201

		Rockwell B (HRB) max.	92

Table 13. Mechanical property of SS304 and dual certified SS304 & SS304L plates Specification as per ASTM A240M

Additionally % reduction of area shall be recorded for information.

Hardness test requirements as per ASME Sec II Part A, SA 240

8. Failure of mechanical test and retests

Case-1:

If test specimen has a physical defect (which does not affect the usefulness of the product) or if unsatisfactory test results are due to incorrect mounting of the specimen or testing machine malfunction, the test shall be repeated using another specimen. If the results of the second test are satisfactory, the rolled plate shall be accepted; if not, case 2 shall apply.

Case-2:

Where unsatisfactory results cannot be attributed to causes mentioned in Case-1, two re-test may be performed for each unsatisfactory result obtained. The second set of test specimens shall be taken close to those which were defective. If the results of the each retest are satisfactory, the plate shall be accepted, if not, it shall be rejected.

9. Non-Destructive Examination

9.1 Surface Examination

The plates shall be visually examined in accordance with ASME Sec V, Article 9. The products shall show clean surfaces without any undulation. They shall be free from scratches, blowholes, scales, cracks, hairline flaws.

9.2 Ultrasonic Examination

All the plates (where applicable) shall be 100% ultrasonically examined with each pass overlapping at least 10% of the previous pass to ensure complete coverage.

Examination shall be carried out with reference to ASME Sec V, Article V and ASME Sec II Part A, SA 578.

Acceptance criteria shall be as per ASME Sec II Part A, SA 578; Acceptance Standard-Level B

10. Finish of plate

Finish of final products (i.e. plates) shall be as per Cl. 13.1.2 of ASME Sec II Part A, SA 480.

The Surface roughness shall not exceed 6.3 microns (RMS value).

11. Repairs

Repair by welding is prohibited. Surface grinding (using permissible tools) can be carried out to eliminate surface defects provided the remaining thickness satisfies the tolerance requirements. The resulting depression shall be merged smoothly with the rest of surface.

12. Material Test Reports

Each of the following details shall be indicated in Material test report (mill test report).

- Specimen wise Material identification (batch number, heat number etc.)
- Purchase order No.
- Identification of Manufacturer
- Melting process
- Heat treatment record (Heat number)
- Chemical Analysis
- Mechanical properties
- Dimensional report
- Non-Destructive Examination report

13. Marking

Each plate shall be marked as per details given in ASME Sec II, Part A, SA240. In addition, the following shall also be marked:

- Order Number of item
- Manufacturer name or symbol
- Plate number or unique identification number for traceability of quality history
- Grade of material
- Heat number
- Direction of Final Rolling

14. Packing and Transportation

The packing of the delivered material (plates) shall be suitable for repeated handling. Suitable packing material shall be provided in between plates and each plate to prevent damage, contamination etc. All covered plates shall be packed in wooden crates. Material inside crates shall be protected from dirt and moisture during shipment and storage at site. Each carte shall bear details stenciled in bold letter with indelible paint to indicate shipping details, packing number, dimensions, gross and net weight. Handling locations of the crates shall be identified and clearly visible.

15. Access for inspector

The vendor shall allow the access for purchaser and/ or authorized representative at all reasonable facilities necessary to satisfy him that the material is being furnished in accordance with this specification.

B. Specification for Austenitic Stainless Steel 304L Forgings

1. Scope

This section of Annexure prescribes the requirements for the manufacture, inspection, testing, packing and supply of austenitic stainless steel 304L forgings.

Any other requirements indicated in ASME Sec II Part A, SA 182 or SA 961 or SA 336 or SA 965 or SA 788 which is not covered in this specification shall also be applicable.

2. General

All the material used in manufacture shall be firsthand. The vendor shall procure all the materials as per relevant applicable specification from reputed manufacturers with original Certified Material Test Reports (CMTRs) and avoid procuring from agents.

The dimensions mentioned in the drawings are final dimensions and the vendor shall procure the material in appropriate size taking into account all the necessary allowances required for cutting, machining during manufacture, qualification and testing.

3. Melting Process

The steel shall be made using an electric furnace or by any other technically equivalent process.

4. Manufacture

Sufficient discard shall be taken from the ingot to ensure that only sound metal enters the complete forging. Forging shall be as close as practicable to finished shape and size.

No grinding with abrasive wheels, cloths or stones is permitted. No iron carbon steel or other contaminants (such as grease, oil or hydrocarbons) to come in contact with the forging after the cleaning process. Machining fluids shall be water soluble and free of oil, sulfur, and chlorides

5. Delivery condition

Forged parts shall be delivered in the solution heat treated condition and machined to the as delivered dimension and profile.

Solution heat treatment shall consist of holding at a temperature between 1050^{o}C to 1150 ^{o}C followed by rapid water quenching. Vendor shall propose the details of the treatment whenever it is necessary with details of atmosphere inside oven, temperature, duration of soaking and quench method based on the dimensions of the part and submit to the purchaser for approval before performing the process.

The material shall be supplied per the requirements of ASME Sec II Part A, SA 182 or SA 961 or SA 336 or SA 965 as applicable.

6. Chemical composition

Chemical analysis shall be performed in accordance with ASME Sec II Part A, SA 751.

Chemical composition of SS304L forged material as per ASTM A182

Sr. No.	Element	Weight percentage
1.	Carbon	0.030 (Max)
2.	Manganese	2.00 (Max)
3.	Phosphorus	0.045 (Max)
4.	Sulfur	0.030 (Max)
5.	Silicon	1.00 (Max)
6.	Chromium	18.0–20.0
7.	Nickel	8.0–13.0
8.	Nitrogen	0.10 (Max)

Table 14: Chemical composition of SS304L as per ASTM A182

Requirement mentioned in ASME Sec II Part A, SA 182 or SA 961 or SA 336 or SA 965 or SA 788 for chemical analysis shall meet.

7. Mechanical Properties Requirements

Specimens shall be tested at ambient temperatures for each lot of material with the same heat.

Testing procedure as per ASME Sec II Part A, SA 370

Tensile test requirements at room temperature as per ASME Sec II Part A, SA 182 or SA 961 or SA 336 or SA 965 or SA 788 as applicable.

Mechanical property of SS304L as per ASTM A182

Sr. No.	Property	Value
1.	Tensile Strength	485 MPa (Min)
2.	Yield Strength	170 MPa (Min)
3.	Elongation in 50 mm or 4D	30% (Min)
4.	Reduction of Area	50% (Min)

Table 15.Mechanical property of SS304L as per ASTM A182

Additionally % reduction of area shall be recorded for information.

Hardness test requirements at room temperature shall be as per ASME Sec II Part A, SA 182 or SA 336 or SA 961 or SA 965.

8. Rejection, Rework and Repeated Tests

Conditions mentioned in ASME Sec II A, SA 788 or SA 961.

9. Non-Destructive Examination

9.1 Surface Examination-Visual Examination

Each forged part shall be visually examined through entire production to machining phase to check the soundness of the metal. The part shall be sound and free from defects like strings, tears, and nicks.

Finish and appearance of the forged component shall meet the requirements of ASME Sec II Part A, SA 961. The maximum Surface roughness shall not exceed 6.3 microns.

9.2 Ultrasonic Examination

Examination shall be carried out with reference to ASME Sec V, ASME Sec II Part A, SA 388.

10. Permissible Variation in dimensions

The dimensions shall be checked in accordance with the requirements of the Approved procurement drawing.

The main dimensions shall be recorded. The values shall be within the tolerances given on the drawing.

11. Repairs

Repair by welding is prohibited. Surface grinding can be carried out to eliminate surface defects provided the remaining thickness satisfies the tolerance requirements. The resulting depression shall be merged smoothly with the rest of surface.

12. Test Reports (See part A of this Annexure)

13. Marking

Marking on the product shall be as per the requirements mentioned in ASME Sec II Part A, SA 182 or SA 336 or SA 961 or SA 788.

14. Cleanliness

The forgings are intended for use in a high vacuum application. Potential hydrocarbon contamination shall be eliminated.

15. Packing and Transportation

16. Access for inspector

The vendor shall allow the inspector authorised by purchaser at all reasonable facilities necessary to satisfy him that the material is being furnished in accordance with this specification.

C. Specification for Aluminum material for Floor assembly

1. This section of annexure prescribes the requirements for the manufacture, inspection, testing, packing and supply of Aluminium 6061 extruded standard structural profiles.
2. All requirements indicated in ASME Sec II Part B, SB-308 / ASTM B308M in addition to UHV requirement mentioned in this document shall be applicable.

Sr. No.	Element	Weight percentage
1.	Silicon	0.40–0.8
2.	Iron	0.7 (Max)
3.	Copper	0.15–0.40
4.	Manganese	0.15 (Max)
5.	Magnesium	0.8–1.2
6.	Chromium	0.04–0.35
7.	Zinc	0.25 (Max)
8.	Titanium	0.15 (Max)

Table 16. Chemical composition of Aluminium 6061

D. Specification for Copper gasket

1. This section of annexure prescribes the requirements for the manufacture, inspection, testing, packing and supply of Copper gasket. Following are the requirements for copper gasket used for Conflat flange joint:
    - OFE grade (UNS NO.:C10100) Copper confirming to ASTM: B 152M
    - Temper: 1/4 Hard.
    - Silver plated and shall be free from any surface defects like peeling off or swelling
    - Bake-out temperature ~ 300 °C
    - All the gaskets should be properly cleaned as per standard UHV practices.
    - The gaskets should be free of visible defects, debris, scratches, oil marks and finger-prints.

ANNEXURE – 2

SPECIFICATION FOR ROLLING, MACHINING AND MANUFACTURING

1. Scope

This specification covers the minimum requirements for Stainless Steel machining and rolling of shells for the vacuum components.

The specified chamber is intended for use as part of the Ultra High vacuum.

The vendor shall be responsible for coordination of their sub-contractor activities and assume surety of mechanical compatibility of material.

2. General requirements

It shall be the responsibility of the vendor to call attention to any apparent conflicts between specifications, the Purchase Order, or purchaser's drawings and request an interpretation from the purchaser. The vendor shall not assume which instruction shall prevail. In case vendor find any of purchaser's drawings or calculations are in conflict with applicable code requirements, he should seek clarification before proceeding with further processing.

The components covered in procurement specification are to be used in ultra-high vacuum service and require stringent controls overs cleanliness and contamination throughout the material handling, fabrication and shipping process.

All storage for these components shall be done in the clean and controlled area to prevent contamination from heat, smoke, dust and oily vapors from other manufacturing areas. Material contact with other carbon steel shall be avoided to prevent carbon steel contamination of the stainless steel components. Same precaution applies to handling of plates so as not to contaminate the SS plate/components with carbon steel, steel forks, hooks of lifting mechanisms.

No grinding with abrasive wheels, cloth or stones is allowed on the internal vacuum surface unless specified in this specification.

Potential hydrocarbon contamination shall be prevented. The material shall be wrapped and covered at all times when it is not being processed to minimize possible exposure to contaminants.

Material identification shall be maintained during all manufacturing operations to keep and material identity and incorporate its traceability.

Finished flange surfaces and rolled shells must be covered and protected during all fabrication steps and during shipment to the fabrication shop.

Surface defects shall be removed by grinding with carbide burr cutters only. Abrasive-type wheels and stones are not allowed on vacuum facing metal surfaces.

3. Dimensional Stability

Supplier shall ensure dimensional stability by adopting suitable cutting process (preferably Water jet cutting), balanced welding, suitable welding technique and machining process which shall not introduce residual stresses. The purpose is to minimize distortion and provide dimensional stability to stainless steel vacuum system components with critical tolerances.

4. Machining of Parts

4.1 O-Ring Groove and Sealing Surfaces Requirements 0.8 µm

All flange O-ring and sealing surfaces shall meet the following requirements:

Basic finish required: 0.8 µm, concentric lay (finish tolerance +/- 0.2 µm)

The following processes are not allowed at any phase: grinding, honing, lapping, polishing, buffing, sanding, sand blasting, or any other process that disturbs the concentric machining lay, imbeds material into the surface, or smears the surface.

In addition to out of tolerance dimensions, the following machining problems lead to machined component rejection: ridges, chatter, waviness, scratches or marks along or across the concentric lay, tool marks, dents, gouges, burrs, sharp edges.

4.2 Machining Fluids

No iron, carbon steel or other contaminants (such as grease, oil or hydrocarbons) shall come in contact with Machined Parts during material handling and fabrication. Machining, cleaning fluids or any other materials or fluids contacting the raw material or finish component shall be water soluble, and meet the limits as mentioned in below Table

Maximum concentration limits for machining fluids:

Contaminant	**Limit**
Water Leachable Chlorides	100 ppm
Total Halogens (including Water Leachable Chlorides)	1000 ppm
Total Sulfur	1000 ppm
Hydrocarbons	None Allowed

Table 17: Maximum concentration limits for Machining fluid

5. Tolerance

Tolerances for machining and assembly shall be followed as per indication in the respective drawings sheets. Any deviation from the specification shall be prior communicated to supplier and must be approved by supplier.

6. Identification

Marking the materials with marking fluids, die stamps, crayons, paints and/or electro-etching is not permitted. Laser technique or a vibratory tool with a minimum tip radius of 0.1 mm is acceptable for marking the outside only of the rolled or finished shell. All

other marking methods must be approved by the purchaser prior to use. All parts shall be marked only on outside (of vacuum) surface only.

Marking on interior of vacuum boundary surfaces is not allowed in any form.

ANNEXURE – 3

SPECIFICATION FOR WELDING AND WELDING QUALIFICATIONS FOR AUSTENITIC STAINLESS STEEL

1. Scope

Weld quality significantly govern the performance of UHV chambers. All welding shall be carried out in class 100000 (ISO 8) clean areas which is separated from other areas in machine workshop

Vendor has to control, specify and qualify following before taking up welding production -

1.1 General requirements for welding of the vacuum system components

1.2 Requirements for the preparation of Welding Procedure Specification (WPS) and qualification of welding procedure and welders by Gas Tungsten Arc Welding (GTAW), Plasma Arc welding (PAW), Shielded Metal Arc Welding (SMAW), etc. process for austenitic stainless steel material used for manufacture of BSC / HAM shall be in the scope of the vendor. The purchaser or his authorized representative shall approve the specification, procedure and qualification record to use the qualified welders and specific welding procedures in fabrication of BSC / HAM. SMAW shall not be used for vacuum welding.

1.3 Requirements for usage and qualification of welding consumable

2. Applicable Specification

Latest active edition of the following code / specification shall be applicable for the scope of work

ASME Sec IX	: Welding and Brazing Qualification
ASME Sec V	: Non-destructive Examination (NDE)
ASME Sec II Part A, SA 370	: Test methods and definitions for mechanical testing of steel products
ASME Sec II Part C	: Specifications for Welding Rods, Electrodes and Filler metals

Table 18: Code / specification applicable for welding

3. Vendor's responsibility

3.1 Clause QW-201 and QW 301 of ASME Sec IX shall be applicable. The qualification tests shall be performed in the same workshop where the production weld is planned to be carried out.

Welding Procedure Specification (WPS), Procedure Qualification Record (PQR), Welder Performance Qualification (WPQ) and Welding Operator Performance Qualification

(WOPQ) shall include weld joint details along with Weld Data Sheet (WDS) and shall get approved by the purchaser or his authorized inspector.

The recommended format shall be:

Clause QW 482 for WPS of ASME Sec IX

Clause QW 483 for PQR of ASME Sec IX

Clause QW 484A for WPQ of ASME Sec IX

Clause QW 484B for WOPQ of ASME Sec IX

4. Welding General Requirements

Production welding shall be accomplished, strictly following the qualified and approved welding procedures using approved welding consumables and qualified welders (welding operators). A list of qualified welders identified for production work assignment shall be submitted for approval to purchaser along with copy of their supporting credentials (qualification, experience, certification etc.)

Welds should be regular, continuous, non-porous and every attempt shall be made to reduce the width of the transition region along each side of the weld. Before commencing welding of parts they shall undergo thorough cleaning procedure.

Sequencing of welds to avoid buildup of residual stress and distortion shall be proposed and submitted for approval before it is used during welding. The vendor shall prepare written procedure for distortion control for each typical joint giving the sequence of welding; heat input to weld etc. and shall submit the same to purchaser before taking up work. Approved weld procedure shall be displayed in vendor's weld shop area during work. The weld fit-up tolerance shall be as indicated in manufacturing drawing. Clearance shall be obtained from the purchaser's inspector for fit-up before welding.

The shrinkage and distortion of the welded joints shall be measured and recorded. The average heat input as per qualified PQR shall be maintained by suitably controlling voltage, current and welding speed during welding to meet the mechanical and metallurgical properties.

All vacuum boundaries shall be checked to ensure that they can be examined volumetrically during testing.

All weld consumables and weld preparation areas shall be clean areas as prescribed to UHV requirement prior to welding. Weld consumables shall be handled only with clean gloves during welding after cleaning.

All penetration (port openings) in the chamber shall be welded continuously from inside and stich welded from outside in accordance with ultra-high vacuum practice. In unavoidable circumstance full penetration welding from atmospheric side shall be used with adequate purging of argon gas inside the vacuum chamber.

Seam welds of shell shall be from vacuum side with adequate argon purging from outside.

Where ever it is possible single pass welds should be used. Welds to be smooth but not flush and not ground.

Use of dye penetrant is strictly prohibited on vacuum exposed surface. (prior approval is necessary for use in unavoidable circumstances)

All welds at vacuum boundaries to be vacuum leak tight with a helium leak rate less than 1×10^{-9} mbar-lit/sec.

5. Welding Procedure Qualification (WPQ)

5.1. All the procedure qualification test coupon shall be welded in presence of the purchaser/ his authorized inspector

5.2. All the welding procedure shall be developed and qualified as per latest edition of ASME Sec IX

5.3. Weld procedures are in place for both ASME and Ultra high vacuum requirements

5.4. Additional requirements

5.4.1. Non-destructive Examination -

The qualification test coupon must undergo all the non-destructive examinations applied in fabrication to the joints which it qualifies and must satisfy the highest acceptance level requirements applicable to these joints.

5.4.2. Metallographic Examination -

These are to be carried out on a complete transverse section of the weld. There shall not be any micro cracks.

The examination shall provide means of characterizing each zone of the weld in thickness, deposited metal, heat affected zone with those of the base metal.

6. Qualification for Welders / Welding Operators

6.1 General -

6.1.1 This qualification shall be done before any fabrication work is commenced so as to ensure that the welders are certified and competent to execute satisfactory welds using the qualified welding procedure.

6.2 Technical competence of welder / welding operator -

It is strongly recommended considering the dimensional control requirement, welding shall be carried out using automatic welding as much as possible. Only when automation is not viable manual welding shall be permitted.

6.2.1 When a test assembly is made by a welder / welding operator, the inspector shall check with care which has been taken in complying with the points specified below and this shall be one of the criteria applied in reaching the assessment.

i. Ability to judge the quality of the groove preparation
ii. Ability to judge the state of cleanliness of the work piece and filler materials
iii. Ability to comply with grades and dimensions of the filler materials to be used
iv. Ability to comply with the drying of filler material where necessary
v. Ability to comply with the welding parameters such as the current, voltage, rate of gas flow, inter-pass temperature, backfilling purge gas flow etc.

6.2.2 Condition for qualification

i. The documents in which the qualification requirements are set out shall be given to the welder
ii. All the qualification test coupon shall be executed in presence of the certified welding inspector
iii. The inspector is entitled to stop the test at any time if it appears obvious that the welder lacks technical competence and operating skill necessary to achieve satisfactory results.
iv. Every test coupon shall be stamped with identifying marks of the inspector and of the welder
v. The welding equipment used shall be similar to that used in production
vi. Any welder / welding operator who has to remove an obviously excess amount of deposited metal by grinding, gouging or other method to avoid leaving defects shall be rejected
vii. The welder who has qualified the welding procedure shall be automatically qualified.

6.3 Welder / welding operator shall be properly trained and have undergone enough practice before he is considered for qualification

6.4 Welder / welding operator shall be qualified as per latest edition of ASME Sec IX with addition of other requirements of this specification

7. Welding Consumable

7.1 All the welding consumables shall be selected as per the welding method & procedure selected and Ultra high vacuum requirement.

7.2 All the welding consumable shall be manufactured, inspected, tested, packed, supplied and stored as per the requirements of ASME Sec II Part C.

7.3 Each batch of welding consumable are required to be qualified at vendor's shop as per the requirements of ASME Sec II Part C along with the additional requirements of this section before using in production.

7.4 Argon gas of ultra-high purity (99.999% min) with low moisture content [due point of (-24^0 C) or lower] shall be used for the shielding as well as purging the hot root from the rear side.

7.5 Ferrite content permissible range in weld consumable shall be 5 FN to 8 FN.

8. Welding repair procedure

8.1 For Repairs Not Requiring Welding

i. Weld defects shall be removed by grinding with Carbide burr cutters only. Abrasive-type wheels and stones are not allowed on the interior or the exterior of vacuum welds.
ii. Visually inspect the area prepared for welding to ensure that the defect has been removed or the indication reduced to an acceptable limit.
iii. The reduced material thickness shall be checked by a suitable gauge.

8.2 For Repair Requiring Welding

i. Any defect in welding on vacuum exposed side shall be removed before re welding to minimize the trapped volume and become source for outgassing
ii. Remove the defect by grinding (with Carbide burr cutters only) or by chipping and grinding to an acceptable level.
iii. Visually inspect the area prepared for repair welding.
iv. Weld as per approved welding procedure
v. The repaired area can be left in the as-welded condition or can be blended by grinding. Grinding is restricted to the use of with Carbide burr cutters only. The repaired area shall blend uniformly into the surrounding surface and shall be visually inspected after welding.

8.3 For Fillet Weld Repairs Requiring Welding

i. Remove the unacceptable weld metal by grinding with Carbide burr cutters only.
ii. If the full fillet weld is not completely removed, visually inspect the area prepared for welding.
iii. Weld as per approved welding procedure
iv. Repairs welds shall be visually inspected after welding.

ANNEXURE – 4

SPECIFICATION FOR CLEANING AND CLEANLINESS

1. Scope

This specification specifies typical cleaning procedures and processes to be used for vacuum chamber and its components compatible for operation in ultra-high vacuum.

It is intended that the vendors manufacturing such chambers shall follow the specification to achieve and demonstrate required cleanliness specifications.

The vendor is at liberty to utilize other substitute techniques not described here in this specification (in consultation with the purchaser) provided that the supplies delivered to purchaser at the end of scope of work of this procurement arrangement comply with the cleanliness requirements of contract document.

Scope includes setting up necessary cleaning facility including cleaning equipment, tools, consumable, personnel safety gear and source of supply of dry clean compressed air, steam and DM water as necessary for accomplishing the cleaning activity.

2. General requirements

The vendor shall have clean fabrication facilities (as described in this document elsewhere) required for this job. Prior experience on fabrication of large high / ultra-high vacuum components in clean room is highly desirable.

All items (including procured raw material) shall be wrapped or sealed after cleaning to maintain cleanliness throughout storage manufacturing testing, handling, transportation and. Care shall be taken to minimize exposure to corrosive environment (e.g. such as those containing chloride compounds).

No visible contaminant (viewed with naked eye under both natural and ultraviolet light) of any form shall be left within the vacuum enclosure of equipment's.

No grinding with abrasive wheels, cloth or stones is allowed on the internal vacuum surface unless specified in this specification. These supplies are intended for use in Ultra High Vacuum (UHV) application. Potential hydrocarbon contamination shall be prevented. The supplies shall be wrapped and covered at all times they are not being processed to minimize possible exposure to contaminants.

No iron, carbon steel or other contaminants (such as grease, oil or hydrocarbons) shall come in contact with the chamber interior surfaces during handling and assembly. Machining fluids shall be water soluble and free of oil and sulfur (refer table - 17).

3. Cleaning

3.1. Cleaning of components fabricated at shop –

3.1.1. Mechanical Cleaning

The components/assemblies shall be mechanically cleaned for removal of all weld tacks, sharp edges & projections, dust and particles generated during grinding.

3.1.2. Surface Cleaning

a. This shall be done after mechanical operations like cutting, bending, grinding etc. have been completed. The surfaces and ends shall be cleaned of all burrs. Only new SS wire brush cleaning shall be used. For internal cleaning of SS Pipes / Tubes, the brushes shall be slightly oversized than the internal diameter of the pipes. Brushing shall be alternated with compressed air in the first instance and with jet of DM water afterwards so that the loose scales are removed. Large diameter pipes shall be cleaned with hand brushes.
b. Remove gross contamination from all interior and exterior surfaces (including flange faces) by steam cleaning. Remove material markings etc. with acetone.
c. Preliminary cleaning solution wash shall follow with UHV compatible cleaning agents (Phosphate free alkaline detergent) and rinsing with DM water.
d. Handle each piece and component with care by wearing UHV compatible clean gloves during and post cleaning.

3.1.3. Precautions in handling the materials

As a general precautionary measure, all SS items before surface treatment, shall be stored in clean racks, shelves / platforms and covered appropriately to prevent the ingress of grease, oil, dust and extraneous matter. Particularly, items meant for identified critical component (e.g. seals) shall always be handled with care so as to avoid scratch, rust stains etc. Clean gloves (replaced with new at regular interval) shall be worn while handling of materials in order to avert sweat and finger marks coming in to contact with the surface. The areas where surface treatments are carried out shall be free from dust.

Personnel shall wear as a minimum; cleanroom booties or clean boots when walking on/working in the interior surfaces of chambers, opening in assembly.

3.2. Area used during surface cleaning treatment

The vendor shall have an exclusive clean area for carrying out the surface cleaning treatment. He shall ensure to take necessary precaution for handling, exhaust of acid fumes etc. The necessary arrangements for disposal of the all the waste generated after cleaning procedures shall be the responsibility of the vendor. This shall be clearly included in his requirements in space utilization meant for the purpose.

3.3. The cleaned chamber surface shall qualify for ultrahigh vacuum requirement after FTIR analysis report where it is specified as necessary test at the end of cleaning process.

4. Drying

Drying will be accomplished by blowing clean dry air over the component.

Inspect and cover the component (or the chamber) as soon after drying as possible and store in clean area. Avoid contamination from unfiltered shop air.

5. Inspection

Inspection shall be done (before removing the piece from the cleaning area) using a procedure which shall be established by vendor in consultation with purchaser and approved by purchaser.

The presence of any hydrocarbon or fingerprints on any interior surface or flange face shall be cause for rejection of supplies.

A visual inspection shall be made of exterior surfaces. Visible particulates or actual contamination shall be removed.

Immediately after inspection, cover the components with double wrap of clean, oil-free polyethylene and seal them.

ANNEXURE – 5

SPECIFICATION FOR INSPECTION AND TESTING

1. Scope

This Annexure prescribes the requirements of various inspections and tests to be conducted in the shop during the course of manufacture and before final acceptance and despatch of specified goods. These inspection and tests are primarily intended to ensure applicable execution of scope of work in conditions enacted by the governing manufacturing specification of component for ultra-high vacuum application.

2. Quality assurance, Inspection and surveillance

2.1. Quality Assurance Program (QAP) -

Quality assurance program aims to achieve quality through examination of the tasks to be performed, identification of skills required, the selection and training of appropriate personnel, the use of appropriate equipment, tool & instruments, the creation of appropriate environment in which activity can be performed and recognition of responsibility of the individual who is to perform the task. Briefly stated, then a quality assurance program shall provide a disciplined approach to all activities affecting quality, including where appropriate, verification that each task has been satisfactorily performed and that necessary corrective action have been implemented. QAP should also provide for production of documentary evidence to demonstrate that the required quality has been achieved.

2.2. Calibration of Equipment -

Vendor need to ensure following,

Measures shall be established to ensure that tools, gauges, instruments and other inspection, measuring & testing equipment & devices used in determining conformance to acceptance criterion are of proper range, type, accuracy & precision. Testing & measuring devices used in activities affecting quality shall be controlled, calibrated and adjusted at specified intervals and surrounding environment on or before use to maintain accuracy within limits. Necessary documents in support of the valid calibration shall be accompanying with each of the equipment and made available for inspection when asked by purchaser.

2.3. Qualification & Certification of NDE personnel –

Vendor need to ensure following

2.3.1. For the NDE inspection ISNT or ASNT level II qualified inspectors in the respective technique shall be employed.

2.3.2. The NDE personal shall also be qualified for any special technique or procedures to be followed as per the need mentioned in examination specification or drawing.

2.3.3. Responsibility of necessary Training and certification is with vendor and certification validity shall be as per applicable ISNT / ASNT standards.

2.3.4. All the air, liquids and other materials to be used at various stages of manufacture, inspection, testing, packing etc. shall be identified, checked to be free from halogen & sulfur contents as limited by the specification for stainless steel components and vendor shall get it approved at the beginning of the start of scope of work.

3. Documents to be prepared

The following are some of the important documents to be prepared by vendor and approved by the purchaser and followed to ensure appropriate execution of the work and to have records of all gathered data. The vendor can have any additional documents required by him and the purchaser can suggest for any additional documentation if felt necessary at any stage of scope work execution. All these documents shall be identified by proper numbering system for easy identification and reference.

- Drawings for various developments for formed parts, cutting plans for raw materials, shop drawings for various parts use in manufactures' shops, tooling drawings required at various stages of manufacture, inspection, assembly, testing, corrections, packing, transportation etc., and any other drawing required for execution on the job.
- Manufacturing and Inspection Plan (MIP) indicating the stages of inspection and agencies to inspect and endorse reports.
- Internal inspection reports for any inspection carried out (to be retained by vendor and produced when required).
- Non-destructive examination reports for visual inspection, radiography, Ultrasonic, vacuum leak testing etc. in the format accepted by respective specification or suggested by purchaser.
- List of welding qualification required for welding procedure and welders / welding operators considering all the manufacturing welds and welding positions.
- Weld test results for all destructive and non-destructive tests done on various test coupons, welders qualifications, procedure qualification shall be documented as prescribed in respective standards and this specification.
- Shop Weld Plan (SWP) with weld joint mapping identifying all the welds by proper numbering system, applicable WPS, process used, type of joint with sketch, NDT requirements & welds requiring test coupons.
- Weld data sheets, detailing all the details like joint detail, welding process, welding parameters, inspection & testing prior to, during and after welding etc.
- Final inspection reports for all individual parts as well as assembly.

- Report on non-conformances (to be got approved by design concession request)
- As built drawings
- Photographs / Videography of various important operations performed through manufacture and test.

4. Inspection of Welds

4.1. Weld Data Sheet (WDS)

The vendor shall identify all the welds in a component by serial numbers indicating on a weld reference sketch. In the Weld Data Sheet welding parameters shall be filled for each of these welds by vendor and shall be signed by the purchaser's as well as vendor's inspectors. The format of WDS shall be proposed by vendor and approved by purchaser.

4.2. Weld Surface –Finish

The welds shall have a regular surface. In general, all weld surfaces shall be ground smooth and merged smoothly into the adjacent base metal. The weld surface finish shall be as per requirements of drawings.

4.3. Visual Examination

Visual Examination shall be carried out as per ASME Sec V, by ASNT or ISNT level II operator.

Weld spatter, surface cracks, surface porosity and such other defects shall not be permitted.

4.4. Radiographic Examination

This examination shall be performed for all seal welds where they are applicable and accessible for test.

The radiographic examination shall be carried out as per ASME Sec V.

Acceptance criteria for radiographic examination shall be as per ASME Sec VIII Div. 1.

4.5. Ultrasonic Examination

This examination shall be performed for all applicable seal welds where radiography cannot be performed.

The ultrasonic examination shall be carried out as per ASME Sec V, Reference block with appropriate reference defects shall be make available by supplier.

Acceptance criteria for ultrasonic examination shall be as per ASME Sec VIII Div. 1

4.6. Repairs

Any repair welding involving grinding or grinding followed by welding shall be re-examined by all the non-destructive tests applicable to that joint. The repair shall be carried out with prior approval of purchaser or his authorized inspector and in presence of either of them. Die penetration test is not allowed for welds or repair on welds on vacuum side.

The procedure and acceptance criteria for repaired weld remain unchanged.

5. Factory Acceptance Test

5.1. Visual and Dimensional inspection

Vendor shall be required to demonstrate the dimensional and distortion control of the component during welding. If necessary vendor should undertake welding trials using mock up pieces or scaled down model how this could be achieved. Alternately, vendor can simulate the distortion using a combination of experiments and modelling and then come up with a procedure that would not only meet the qualification requirement as per properties or weld quality but also with respect to distortion control.

The vendor shall respect the tolerances mentioned on the drawing. He shall establish the procedure for dimensional and geometrical shape verification by identifying and defining the measuring instruments, inspection methods and accuracies of the measurement, no. of readings to be taken etc. Such procedures whenever established shall be submitted for approval of the purchaser.

The dimensional verification of parts before assembly, eventual heat treatment, or machining shall be done by the vendor. The purchaser's representative may participate in this verification. The final dimensional check shall be conducted by the vendor, in the presence of purchaser or his authorized inspector at vendor's premises and at purchaser's site.

The purchaser will take decision regarding the acceptance of parts, which are outside the tolerance limits.

All dimensions indicated on the drawings are in millimetre and at 25^0 C. The vendor shall submit to the purchaser a report on dimensional check performed. This can be in form of "as-built drawing" describing all the dimensions in its actual value. Measurement made at different temperatures of all components to be matched at site should be corrected to 25^0 C.

5.3 Helium Leak test of all seals and welds (As per Annexure 6 of this specification)

5.4 Cleaning inspection *(As per Annexure 4 of this specification)*

5.5 Ultimate vacuum test *(As per Annexure 7 of this specification)*

ANNEXURE – 6

SPECIFICATION FOR VACUUM LEAK TESTING AND ACCEPTANCE

1. Scope

This Annexure defines the criteria for the leak testing of BSC / HAM supplied to IPR. It gives test procedure, acceptance criteria and general instruction and guidelines to vendor and inspector.

The procedure includes methods for leak checking of welded joints and the double O-ring /pumped annulus flange joints.

2. General

The leak testing methods shall use a dry (oil free) Helium Mass Spectrometer Leak Detector.

All roughing vacuum pumps and turbo pump shall be OIL-FREE.

Gases used to back-fill evacuated parts shall be ultra-clean (5N purity N_2).

Leak test shall be carried by trained person and witnessed and approved by purchaser.

Chamber shall be cleaned according to Annexure 4 of this specification prior to Leak testing.

100% welds and all the demountable joints shall be tested for Leak testing.

All required examination like Non Destructive Examination (if required) shall be done prior to Final Vacuum Leak Testing.

In no circumstance any vacuum components of BSC / HAM chamber shall be accepted without an accepted Leak testing.

3. Reference Documents

- Leak testing standard- ASTM E498-Standard Test Methods for Leaks Using the Mass Spectrometer leak Detector
- ASME Sec. V Article 10 – Non Destructive Examination - Leak Testing

4. Equipment Calibration

All equipment used in testing shall have valid calibration certificates which shall be submitted before their use.

5. Vendor's responsibilities for hardware for leak testing

- The vendor is responsible for providing all tools, probes, gas, seals, blank off flanges and vacuum equipment's to perform the leak detection test and subsequent leak measurements across all vacuum boundaries (weld joint, sealed flanged joints "O" ring joints annulus space)

- The Vendor is responsible for the supply of tooling and methodologies for the subsequent removal of tools, seals, and temporary closure plates etc. fitted to chamber to facilitate the leak testing.

6. Documentation Requirements

- Vendor shall submit the Leak testing procedure which describes how the leak test will be performed and include configuration diagrams and technical specification of equipment to be used etc. to purchaser for approval.
- Vendor shall prepare leak test report and submit it for approval to the purchaser.

7. Leak Testing Methods

This Annexure describes recommended procedures for carrying out the most widely used methods of helium leak testing. Other methods may be used, but only with the prior approval of the purchaser.

7.1 Overpressure Methods

Over pressure methods enable thin walled vacuum chambers to be leak tested which might otherwise collapse under vacuum.

7.1.1 Mass spectrometer sniffing probe

Chamber subjected to leak testing is pressurized by Helium and a sampling probe "sniffs" used for detecting leaks.

Helium passing through the leak is sampled from the surrounding atmosphere through a long narrow flexible tube which is connected to a mechanical pump to give a drop in pressure from atmosphere to about 10^{-4} mbar at the ion source of a mass spectrometer detector. Traces of helium in the environment can also be detected, which may lead to errors in the measured leak rate.

The Sampling tube should be as short as possible to reduce the response time of the gas flow of the air-helium mixture from the entrance of the tube to the detector.

7.1.2 Probe leak testing

This method can be used for leak testing of welds or parts having incomplete enclosures.

A Partial enclosure which can be evacuated by a leak detector is tightly pressed against the wall of the component being tested. The enclosure is evacuated and helium tracer gas applied to the opposite surface of the wall by a spray gun or other means. Helium leaking through the wall can pass to the detector via the vacuum box. The sensitivity is usually limited by diffusion of helium through the seal between the evacuated enclosure and compound wall.

7.2 Vacuum Leak Detection Method

7.2.1 Helium Leak Detector

These are based on a mass spectrometer, usually a small magnetic sector device. Leak detection can begin only when high vacuum conditions are obtained in the mass spectrometer. The inlet pressure at the entrance to the leak detector depends on the design of the unit, but can range from atmosphere down to at least 10^{-6} mbar.

Helium is used as a tracer gas in this technique. To increase the helium detection sensitivity and improve detector stability, the mass analyzer in helium leak detection system is often de tuned to give lower mass resolution.

For large component leak testing at high sensitivity, it may be necessary to reduce the partial pressure of hydrogen at the analyzer by selectively pumping it with a getter in series with the leak detector input. It may also be necessary to selectively pump condensable gasses at the leak detector inlet. This can be achieved by the addition of a cold (i.e. liquid nitrogen) trap in series with the inlet.

8. Leak Testing Procedure

It is recommended that vendor follow the procedure as specified in "ASTM E498-Standard Test Methods for Leaks Using the Mass Spectrometer leak Detector". However vendor may propose any other procedure which shall be subjected to approval of purchaser.

The MSLD shall have MDLR less than or equal to $1x10^{-10}$ mbar.lit/sec

Leak checking procedure for various type of joints

Joint Categories:

Category I

Welded joint located away from the double O-ring flange assembly.

Category II

Welded joint located near the double O-ring flange assembly.

Category III

CF flange joint.

Category IV

Atmospheric O-ring (O-ring between atmosphere and annulus channel)

Category V

UHV O-ring. (O-ring between annulus channel and UHV chamber)

(a) Leak Checking of Welded Joints

All weld Joints shall be tested and shall have leak rates less than 1.0×10^{-9} mbar-l/s.

Category I

Welded joint located away from the double O-ring flange assembly.

These leaks can be detected using standard MSLD leak detection procedures with He as the tracer gas. The leak detector is sensing the vacuum chamber and He is sprayed external to the chamber.

Category II

Weld joint located near a double O-ring flange assembly.

Helium leak detection procedures are still preferred. The proposed method is to bag the O-ring flanged joint and introduce a pure nitrogen purge into the bag. This will keep the concentration of helium in the bag low in order to minimize permeation or leakage of Helium through the atmospheric O-ring seal. Maintaining a vacuum in the O-ring annulus is required to prevent helium from permeating thru the UHV O-ring and entering the vacuum chamber.

(b) Leak Checking of Conflate flange joints

All Conflates shall be tested and shall have leak rates less than 1.0×10^{-9} mbar-l/s.

Category III

Conflate flanges.

The conflate flanges can be leak checked using standard Helium MSLD procedures. As in Category II leak detection, nearby O-ring flange assemblies may need covering (enclosing) and nitrogen purging.

(c) Leak Checking O-ring sealed joints

All Annulus passages shall be capable of being pumped to less than or equal to 1×10^{-5} mbar.

Category IV

Atmospheric O-ring (O-ring between atmosphere and annulus channel)

Leak checking method

A cold cathode/hot cathode gauge will be used to sense the vacuum pressure in the pumped annulus volume between the atmospheric O-ring seal (Cat. IV) and the UHV O-ring (Cat. V). Air that leaks across or diffuses through the O-ring seals will be pumped by the test annulus pumping system. If the annulus vacuum pressure, as measured by the Ion gauge is less than or equal to 1×10^{-5} mbar, the annulus seals pass the test.

Category V

UHV O-ring (O-ring between UHV space and annulus channel)

Leak checking method

Same as Category IV O-ring leak checking method described above.

9. Acceptance Criteria

Acceptance of leak testing of component is subject to successfully completion of all stages and following conditions have been met.

- The leak detector has been correctly calibrated and its calibration value is within ±5% of the standard leak rate value as corrected for the ambient temperature.
- The leak rate value as measured by the leak detector has not increased in value above the measured background to a value greater than the specified leak rate during the entire duration of the global leak test.
- The location and magnitude of all identified leaks shall be recorded. All practicable efforts shall be made, after agreement with purchaser to bring down any leak quantified during the manufacturing phase to a level lower than the limit of detection of the leak testing methods used.

9.1 Acceptable Leak Rate

All Weld Joints and Conflate flanged joint shall be tested and shall have leakage rates less than 1.0×10^{-9} mbar-l/s.

Global leak rate shall be less than 5×10^{-7} mbar-l/s by using pressure hood method.

10. Test Report

The Leak test report shall contain the following minimum information.

- Identification of the Manufacturer, the purchase order and equipment
- Identification of the part ,weld or the area subjected to examination
- Time/duration of Examination
- Test Equipment
- Reference to approved procedures
- Surface condition and cleanliness
- Examination condition and in particular ,calibration conditions
- Interpretation of test results
- Name and qualification/certification details of the inspector
- Identification of the subcontractor conducting the examination (if applicable)
- Date of examination and inspector’s signature.

ANNEXURE – 7

SPECIFICATION FOR VACUUM REQUIREMENT

1. Vacuum pressure requirement -
   1.1 Provide Ultra high vacuum requirement during normal operation in BSC / HAM chamber.
   1.2 Surface treatment / preservation
   - 304/304L type stainless steel shall be handled without direct contact with carbon steel or other contaminants at all time
   - Storage, Welding. Fitting and Assembly shall be performed in clean space (class 100,000 – ISO 8 equivalent)
   - Welding exhaust fumes shall be collected and extracted outside
   - Welding wire and joints shall be cleaned with CO_2 spray before welding
   - No grinding with abrasive tools unless specified in the document, grinding allowed at weld prep area using rotary carbide tools
   - Potential contact with hydrocarbon material (like human hair, oil, grease etc.) to be prevented at all stages.
   - Fabricated component to be covered at all times when not in use
   - Machining fluids to be water soluble and free of oil and sulphur.
   - Personnel to wear clean boots when walking in the interior surface of the chamber as well as inside the clean work areas
   - Smoking not allowed at the manufacturing or fabrication area
   - Clean components shall be handled by wearing clean vacuum compatible gloves
2. Acceptance of vacuum -
   BSC chamber shall achieve a vacuum of $1x10^{-7}$ mbar

   HAM chamber shall achieve a vacuum of $1x10^{-7}$ mbar

3. Pumping system & associated gauges (scope of supply) -
   The vacuum pumps, vacuum monitoring gauges, leak detectors, residual gas analyzer (wherever needed) will be made available by vendor during leak testing and vacuum pumping.

4. Monitoring and control system -
   Monitoring and control of the evacuation process of BSC / HAM will be manual in nature. In case of emergency shut down due to power failure, the gate valve shall isolate the chamber with vacuum pump to prevent backflow or contamination of the chamber from the vacuum pump side.

5. Vacuum baking & insulation -
   Baking of chamber at 150^0 C ($+10^0$ C) at factory site to reduce hydrogen and water vapor content from vacuum facing surface during vacuum pumping is carried out using heating elements covered with insulation. For demonstration of ultimate vacuum performance of

BSC / HAM chamber, equipment and instruments necessary to bake the chambers, shall be arranged by the vendor.

All the heating element/pads used for baking of chamber along with controller shall be supplied by vendor to purchaser.

6. O-ring requirement -
   - Clean O-ring using standard degreasing (Liquinox or equivalent) solution for 10 minutes in an ultrasonic cleaner before their use for sealing flanges.
   - Bake for 12 hours at170^0 C in air bake oven.
7. Annulus pumping requirement -
   Annulus space between two "O" rings is to be pumped down to less than $1x10^{-5}$ mbar pressure using ion/dry-TMP.

8. Surface (vacuum facing) treatment of vacuum component –

   For any of the components of UHV chambers (BSC/HAM) no further surface treatment shall be done other than that mentioned in this annexure. Surface finish of as received HRAP material shall be retained. Vendor shall obtain prior approval for any changes envisaged to the finish to the vacuum facing surface.

ANNEXURE – 8

A. VARIOUS PARTS DETAILS & LOAD SPECIFICATION FOR BSC CHAMBER

1. Scope:

The aim of this section is to put together all information for constituent part details and the loads applicable to Basic Symmetric Chamber (BSC) assembly.

2. System Description:

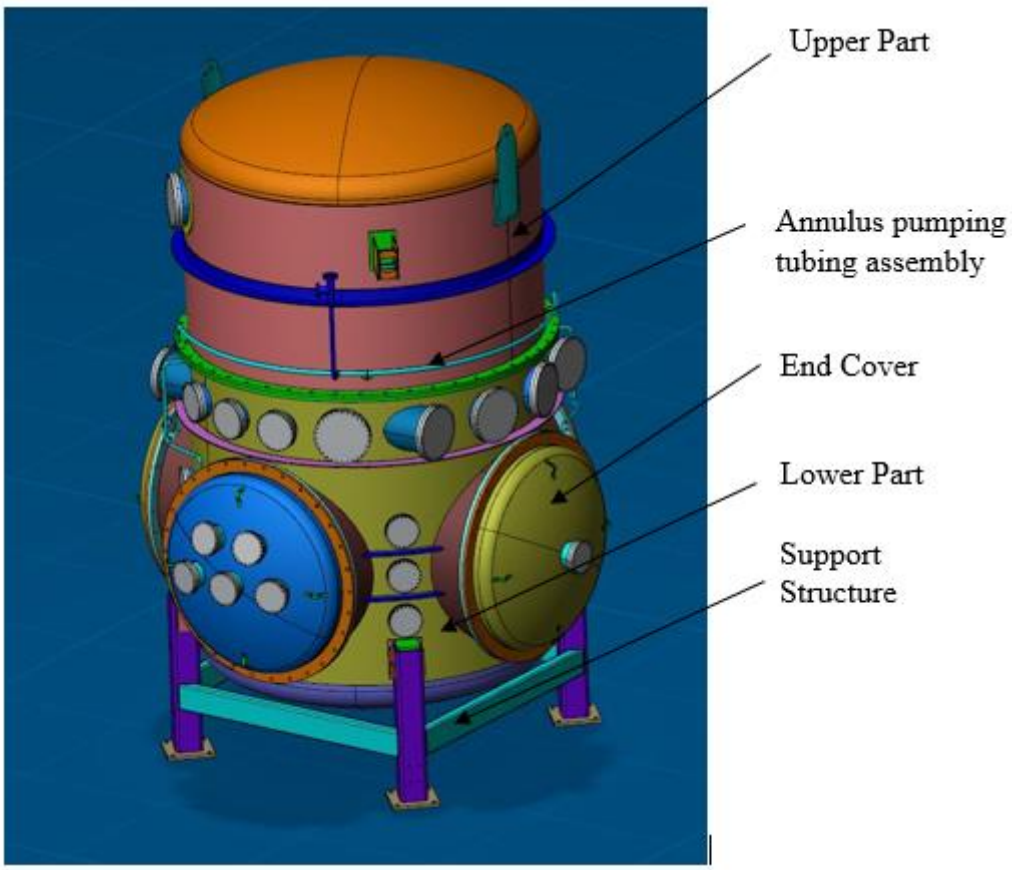


Figure 1: BSC chamber description

3. Type of Loads:

The following types of loads are applied on chamber:

- Self-weight
- Pressure load: due to difference of pressure between atmosphere pressure and inner chambers pressure
- Seismic Load
- Thermal load (baking to 150^0 C temperature before vacuum pumping)

4. Weight:

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Sr. no.	Component	Value (kg)	Quantity	Application Point	Figure No.
1.	Upper part	2000	1	Top flange of lower part	2
2.	Lower part	4000	2	Ground (through Leg support)	3
3.	End covers	1800	2 + 2	Side flange of lower part	4

Table 19: Weight of Major Parts of BSC

FIGURE OF PARTS of BSC Chamber:

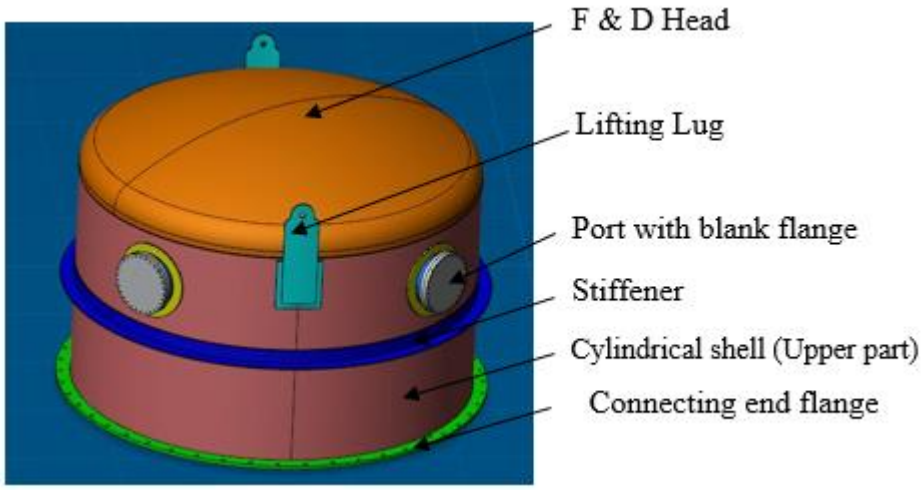


Figure 2: Upper part supported on top flange of lower part

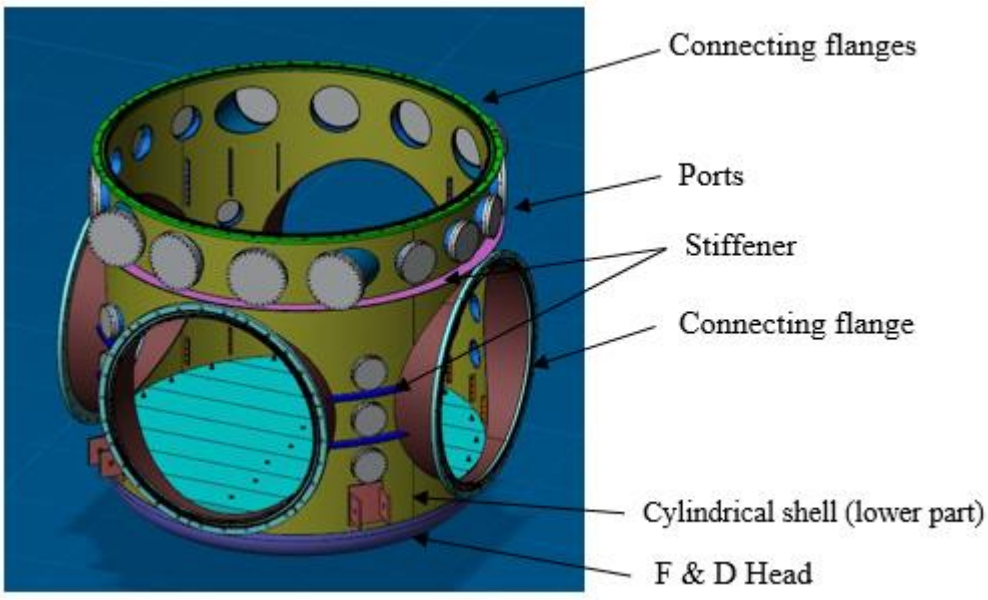


Figure 3: Lower part supported on leg support

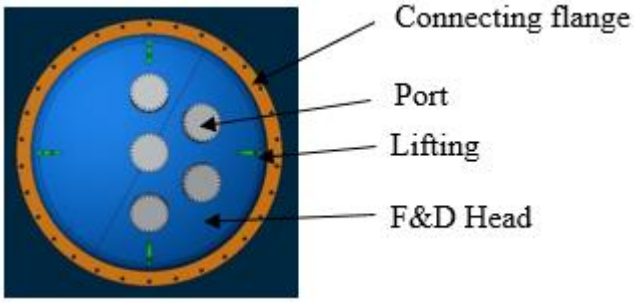


Figure 4: End cover supported on side flange of lower part

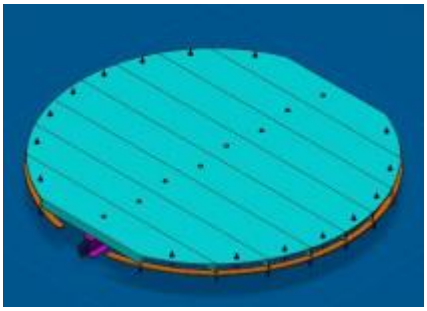


Figure 5: Floor Assembly

B. VARIOUS PARTS DETAILS & LOAD SPECIFICATION FOR HAM CHAMBER

1. Scope:

   The aim of this section is to put together all information for constituent part details and the loads applicable to Horizontal Access Module (HAM) chamber assembly.

2. System Description:

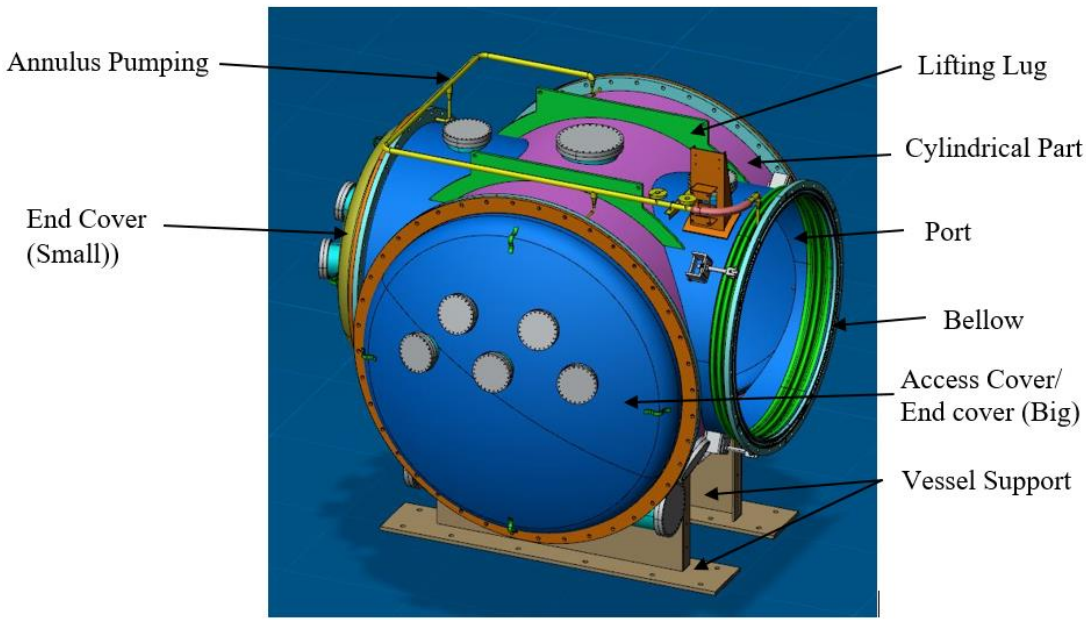


Figure 6: HAM chamber description

3. Type of Loads:

The following types of loads are applied on chamber:

- Self-weight
- Pressure load: due to difference of pressure between atmosphere pressure and inner chambers pressure
- Seismic Load
- Thermal load (baking to 150^0 C temperature before vacuum pumping)

4. Weight:

Sr. no.	Component	Value (kg)	Quantity	Application Point	Figure No.
1.	Cylindrical part	1650	01	Saddle of vessel support	7
2.	Port	800	01	Cylindrical part	8
3.	End covers (big)	600	02	Side flange of cylindrical part	9
4.	End covers (small)	350	02	End flange of cylindrical part	10

Table 20: Weight of Major Parts of HAM

FIGURE OF PARTS HAM Chamber:

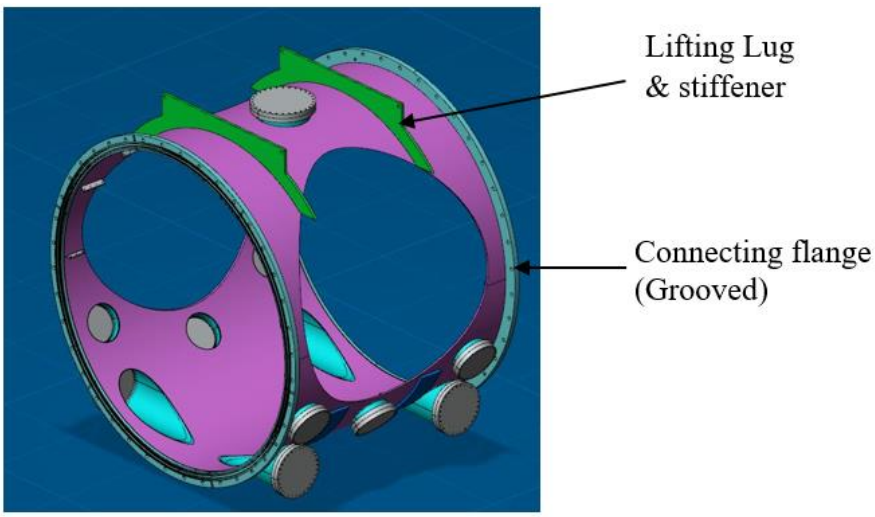


Figure 7: Cylindrical part supported on support structure

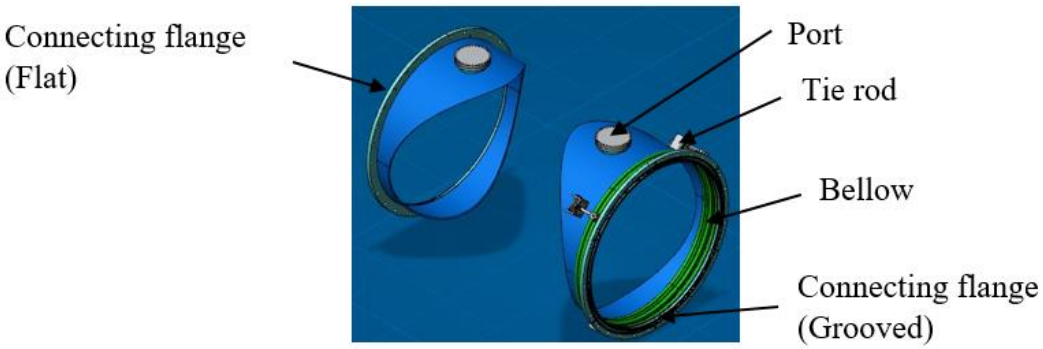


Figure 8: Port of ID 1654mm

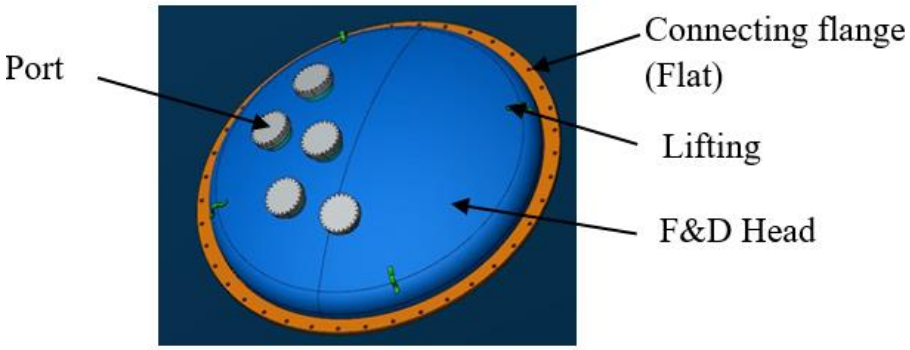


Figure 9: End covers (big)

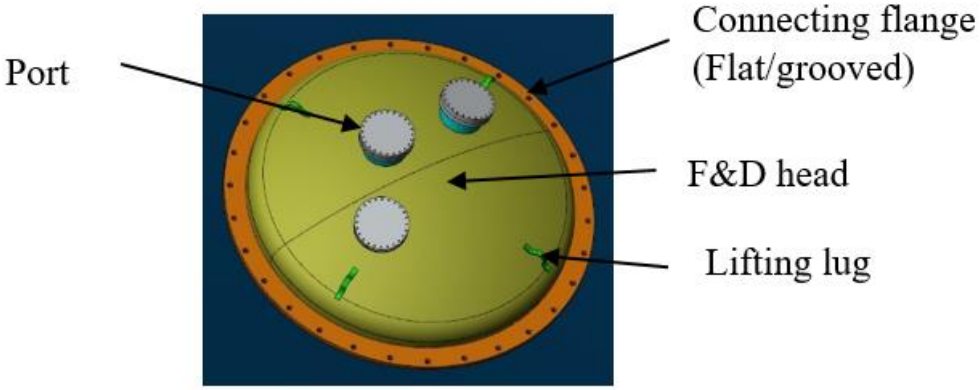


Figure 10: End covers (small)

ANNEXURE – 9

LIST OF DELEVERABLES

Section 3 of this document covers the scope of work for successful vendor of this procurement tender and defines the deliverable. These annexure sum-ups the list of deliverables under scope of work specified in section 3 of this document. The deliverables shall be transmitted to purchaser, in the form of soft copy and one hard copy in case of items in digital form (Table-21), in the form of physical item in case of manufactured / standard bought out items (Table-22 & 23) as listed below in details.

Vendor shall give undertaking while bidding for the tender that he agree to this list and shall comply with supply of deliverables included herein at the end of completion of scope of work under the contract.

A. Items in the digital form –

Below table list all the items which shall be transmitted to purchaser in soft copy and one hard copy of each listed item

Sr. No	Item (Applicable to both BSC and HAM)	Form of submission Unit / Quantity	Confirm Status
1.	Drawings appraisal report with identified proposed changes and their approval status	Report (Set)	
2.	Manufacturing drawings – Approved for manufacturing	A. Soft copy (Set) B. Hard copy (Set)	
3.	As Built Drawings (Part of end of manufacturing report)	Complete set of drawings A. Soft copy B. One set in hard copy	
4.	Material Testing – Certificates (for procured raw material and standard bought out items)	Original certified Material test reports	
5.	Material Testing – Report (for procured raw material and standard bought out items)	Complete set A. Chemical composition B. Mechanical Properties	

Sr. No	Item (Applicable to both BSC and HAM)	Form of submission Unit / Quantity	Confirm Status
6.	List of activity for which the special tool / fixture designed and manufactured for - - Machining - Fabrication - Welding - Handling / Lifting - Cleaning - Testing - Transportation - Temporary support structure to store parts of BSC in stable configuration - Temporary support structure to store parts of HAM in stable configuration	Set of tool / fixture specifically designed and manufactured to use activity covered in the scope of procurement of BSC / HAM - A. Design report (Set) B. Tool Specification including standard bought out items used in tool assembly if any C. Manufacturing Drawings D. Dimension check report E. Tool use procedure	
7.	Procedure / Qualification established – - Material traceability procedure - Manufacturing process - Weld Procedure qualification - Welding parameter used - Welding consumable details - Cleaning procedure - Cleaning consumable details - NDE procedure details - Assembly procedure for BSC - Assembly procedure for HAM - Dimensional stability control procedure - Packing procedure	One soft copy and one hard copy of approved procedures and qualifications performed during the scope of work execution	
8.	Testing and Inspection report – - Dimension check report for individual part of BSC / HAM - Dimension check report for assembly of BSC / HAM - Visual inspection report - NDE test report	Report containing each of following covering total scope of procurement of BSC/HAM A. Visual inspection for part/assembly B. Dimension check for parts (Set) C. Dimension check for assembly (Set)	

Sr. No	Item (Applicable to both BSC and HAM)	Form of submission Unit / Quantity	Confirm Status
		D. NDE testing for raw material E. NDE test reports for welding	
9.	Vacuum Leak Testing – - List and specifications of equipment and instruments used - Vacuum leak test report with details of magnitude of leak detected and its location	Report containing vacuum leak testing records for parts, weld joint and assembly of BSC/HAM chambers A. Substantiated leak test results with identified location, magnitude with acceptance status B. In case of non-accepted vacuum leak recorded details of repairs and outcome of further leak test record status	
10.	Ultimate Vacuum Demonstration – - List and specifications of equipment and instruments used - Pump down curve covering duration to achieve 1 X 10^{-7} mbar pressure inside chamber	Report consisting of 1. List of used equipment 2. Technical specification of equipment 3. Pump down procedure adopted 4. Pump down curve covering vacuum pumping duration until realization of $1X10^{-7}$ mbar ultimate vacuum	
11.	End of manufacturing report – - Digital photograph of critical operations and stages - Video covering material procurement stage till the demonstration of ultimate vacuum in BSC / HAM - Nonconformity report covering duration of entire scope of work	Report consisting of 1. Nonconformity report 2. Deviation/Change request with their resolution status 3. As Built Drawing set 4. Specified set of digital photographs in soft copies on storage media	

Sr. No	Item (Applicable to both BSC and HAM)	Form of submission Unit / Quantity	Confirm Status
		5. Specified video in soft copy on storage media	

Table 21: List of Deliverables

B. Items in the physical form –

Items included in below tables are the physical items. These items along with temporary support structure to store dismantled parts of BSC & HAM in stable configuration when these chambers are opened (listed at serial no 6 in Table 21: List of Deliverable) shall be transported and delivered to RRCAT, Indore after FAT and dispatch clearance in the form of complete assembly of one number of BSC and one number of HAM:

1. Assembly of Basic Symmetric Chamber (BSC) Chamber:

Sr. No.	Parts name	Total no required
1	Upper part	01
2	Lower part	01
3	End cover Type A11	02
4	End cover Type 1	02
5	Annulus Tubing Assembly	01 set
6	Floor Assembly	01
7	Nut, Bolt, Washer (set)	As specified in BoM in approved Manufacturing drawing and additional quantity of 15% (set) as spare packed separately
8	ConFlat (CF) blank flange of different size with set of fasteners	As specified in BoM in approved Manufacturing drawing and one additional flange of each type as spare packed separately
9	Vacuum Seals – "O" Ring and ConFlat (CF) copper gaskets	As specified in BoM in approved Manufacturing drawing and additional 1 set of "O" rings and CF gasket per joint as spare

Sr. No.	Parts name	Total no required
10	All the heating element/pads used for baking of chamber along with controller shall be supplied by vendor to purchaser	01 set used for BSC chamber

Table 22: List of Deliverables – BSC Assembly

2. Assembly of Horizontal Access Module (HAM) Chamber:

Sr. No.	Parts name	Total Quantity (no. off / Set)
1	HAM shell (cylindrical part with big port)	01
2	Support	01 set
3	End cover (Small)	02
4	End cover (BIG)	02
5	Annulus Tubing Assembly	01 set
6	Set of Nut, Bolt and Washer per flange	As specified in BoM in approved Manufacturing drawing and additional quantity of 15% (set) as spare packed separately
7	ConFlat (CF) blank flange of different size	As specified in BoM in approved Manufacturing drawing and one additional flange of each type as spare packed separately
8	Vacuum Seals – “O” Ring and ConFlat (CF) copper gaskets	As specified in BoM in approved Manufacturing drawing and additional 1 set of “O” rings and CF gasket per joint as spare
9	All the heating element/pads used for baking of chamber along with controller shall be supplied by vendor to purchaser	01 set used for HAM chamber

Table 23: List of Deliverables – HAM Assembly

Vendor shall provide guarantee of performance of Assembly of BSC and HAM for period of one year at least from the date of site acceptance after delivery.

All the listed items included in table 22 & 23 above shall be delivered in assembled form (except spares).

(Complete assembly each of the chamber i.e. BSC and HAM, with all openings / ports covered and sealed with blank off flanges and "O" ring / metals gasket seals. Internal volume of the chamber shall be filled with the dry nitrogen (5N purity) gas up to 1.2 bar pressure and suitably connected with pressure gauge to monitor internal pressure and observe leakage if any).

Tools which are used as attachments between parts of chamber and handling during lifting **(e.g. shackles, lifting ropes or chains etc.)** shall be part of deliverables to enable handling of deliverable at delivery site which is RRCAT, Indore, Madhya Pradesh.

All the custom built tools and fixtures used during execution of scope of work shall be part of deliverable and will be delivered at IPR, Gandhinagar, Gujarat.

List of ABBREVIATION's used in document

AC: After Completing (of activity)

ASME: American Society of Mechanical Engineers

ASNT: American Society for Nondestructive Testing

ASTM: American Society for Testing and Materials

AOD: Argon Oxygen Decarburization

BSC: Basic Symmetric Chamber

BS: Before Start (of Manufacturing)

BOM: Bill of Material

CAD: Computer Aided Design

CF: ConFlat (CF) Flange

CS: Carbon Steel

DM: Demineralization

DR: Deviation Requests

EF: End of the Factory acceptance

F&D: Flanged and Dished

GTAW: Gas Tungsten Arc Welding

H: Hold Point

HAM: Horizontal Access Module

IPR: Institute for Plasma Research

ISNT: Indian Society for Non-Destructive Testing

ISO: International Standards Organization

KOM: Kick of Meeting

LIGO: Laser Interferometer Gravitational Wave Observatory

LOI: letter of Intent

LPT: Liquid Penetration Test

MSLD: Mass Spectrometer Leak Detector

MDLR: Minimum Detectable Leak Rate

N: Notification point

NDE: Nondestructive Examination

NDT: Non Destructive Testing

MIP: Manufacturing and Inspection Plan

OD: Outer Diameter

OFHC: Oxygen Free High Conductivity (Copper)

PAW: Plasma Arc Welding

PQR: Procedure Qualification Record

PMI: Positive Metal Identification

PPM: Part Per Million

PWHT: Post Weld Heat Treatment

QAP: Quality Assurance Plan

QP: Quality Plan

RGA: Residual Gas Analyzer

RMS: Root Mean Square

SS: Stainless Steel

SWP: Shop Weld Plan

UHV: Ultra High Vacuum

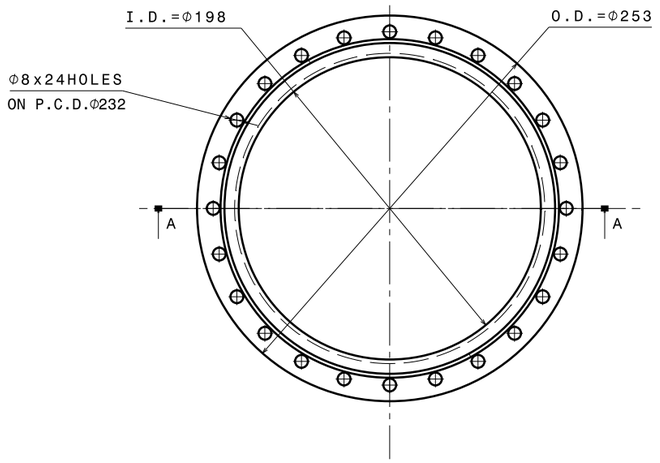
VOD: Vacuum Oxygen Decarburization

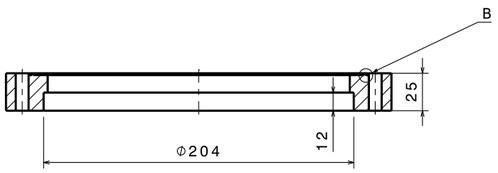
WDS: Weld Data Sheet

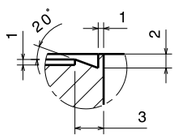
WOPQ: Welding Operator Performance Qualification

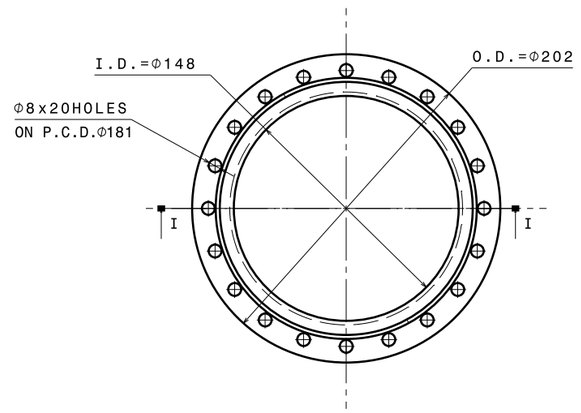
WPQ: Welder Performance Qualification

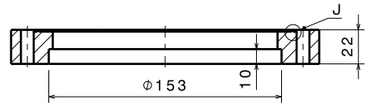
WPS: Welding Procedure Specification

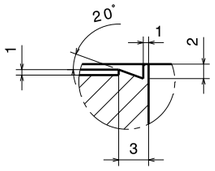


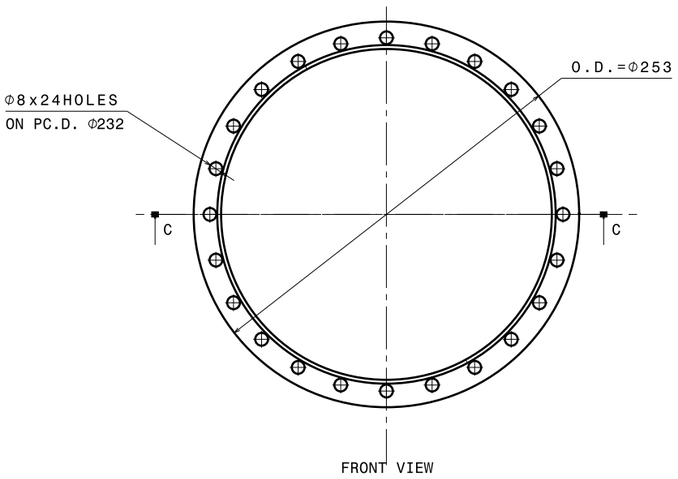


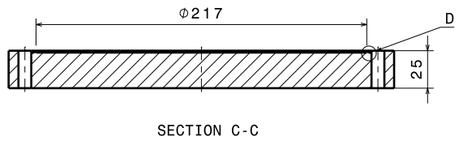


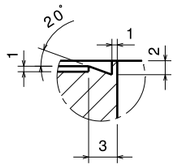


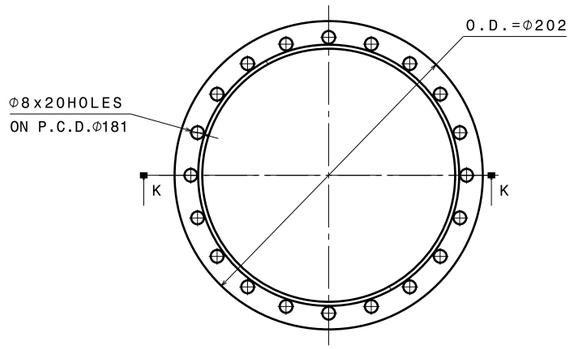


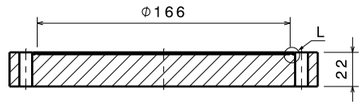


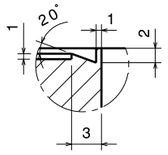












DN 200CF BLANK FLANGE

DN 160CF BLANK FLANGE

DN 200CF COVER FLANGE

DN 160CF COVER FLANGE

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025			
CO-ORDINATED BY							
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS							
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

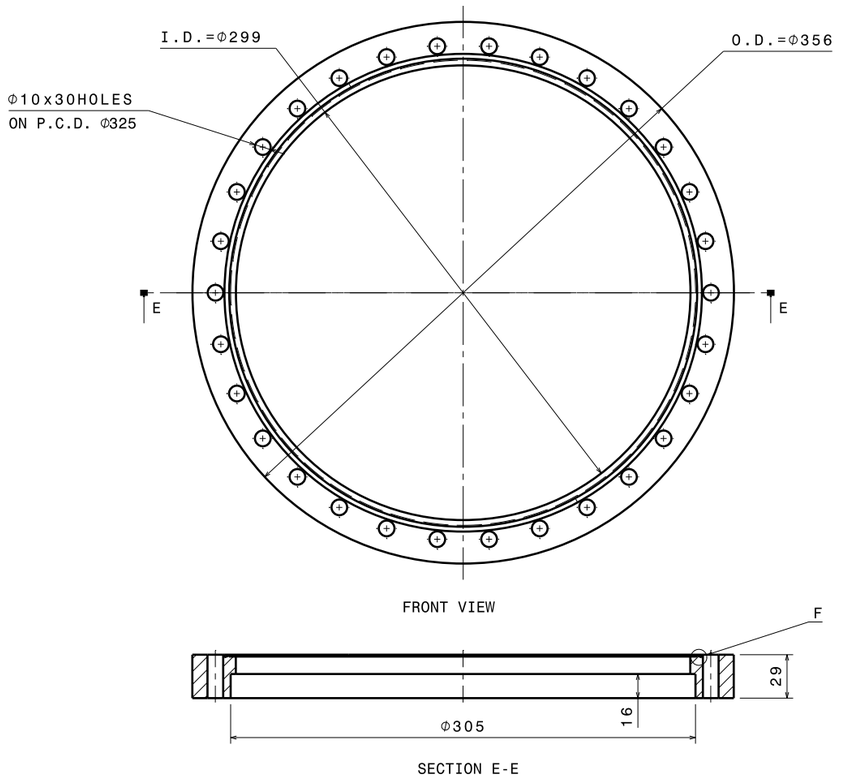
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:2	DATE
DRAWN	A.N.N.	04/06/2014
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

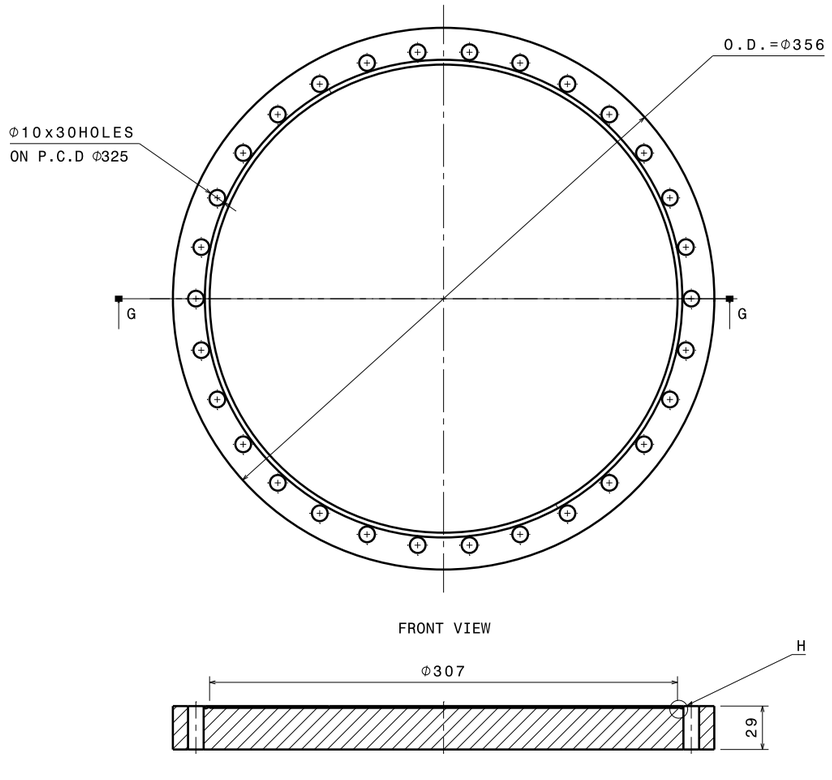
THIRD ANGLE PROJECTION

TITLE STANDARD FLANGES

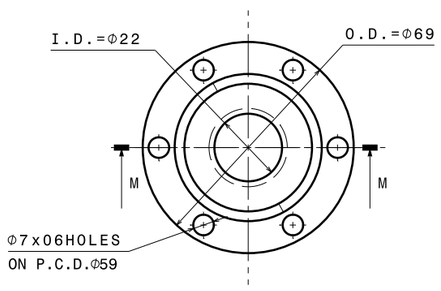
REF DRG NO: **NA**		REV R0
DRG.NO	V001-001-R0	SHEET 01 OF 05

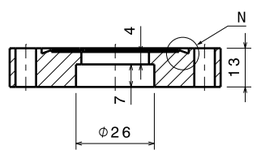


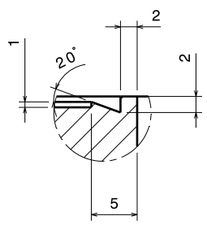
CUSTOM CF BLANK FLANGE (14")
SCALE-1:2



CUSTOM CF COVER FLANGE (14")
SCALE-1:2

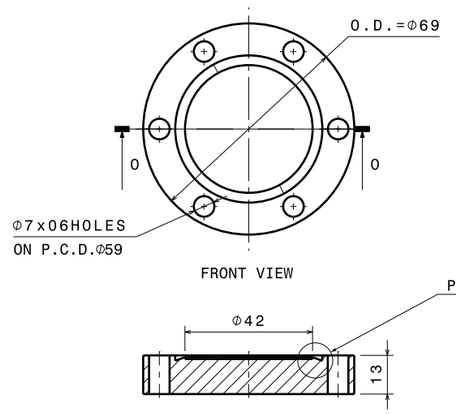


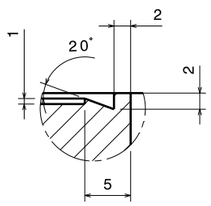




DETAIL VIEW-N
SCALE-3:1

DN 40CF BLANK FLANGE
SCALE-1:1





DETAIL VIEW-P
SCALE-3:1

DN 40CF COVER FLANGE
SCALE-1:1

MATERIAL:	8-25	1.6-8	0.025-1.6	< 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED		SIZE	A1
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	
DRAWN	A.N.N.	04/06/2014	
CHECKED	R.K.		
APPROVED	M.K.G.		

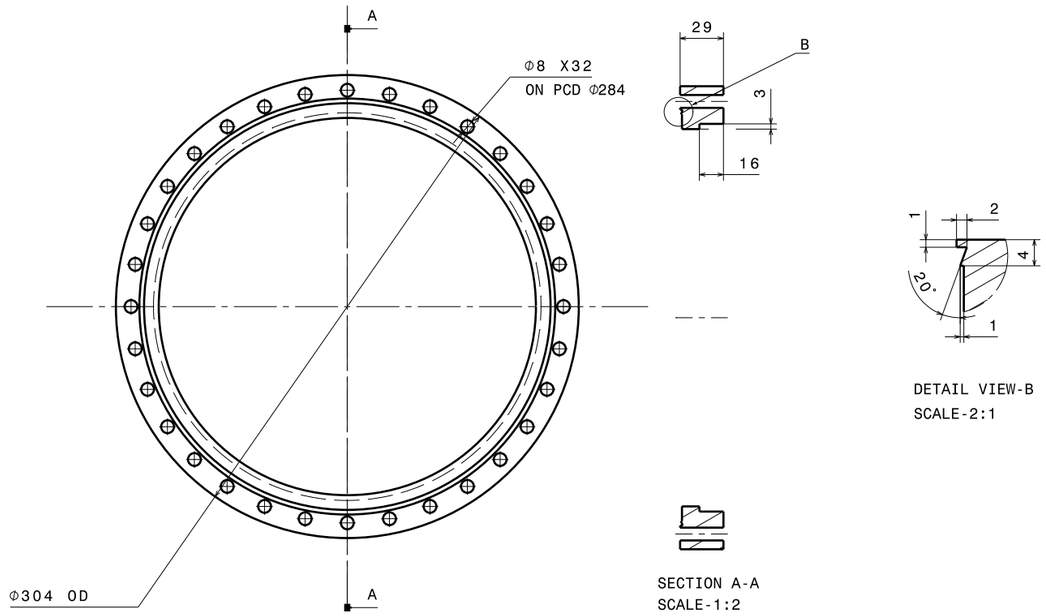
THIRD ANGLE PROJECTION

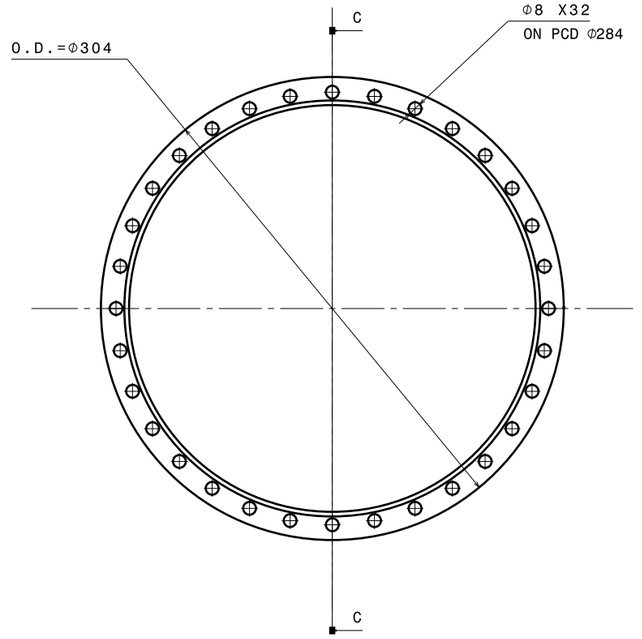
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

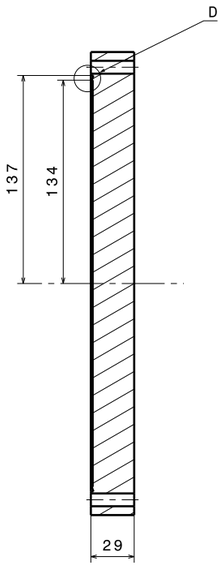
TITLE: STANDARD FLANGES

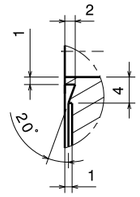
REF DRG NO: NA — REV R0

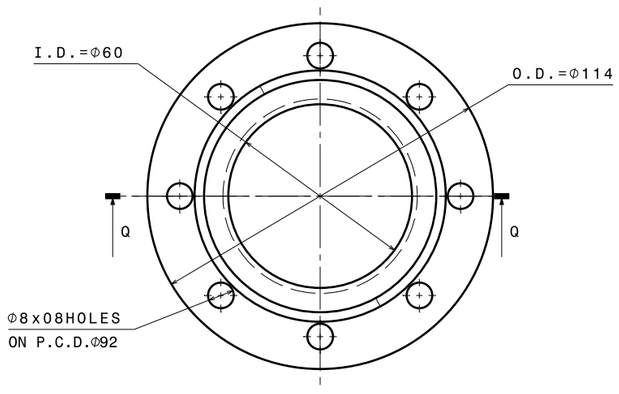
DRG.NO: V001-001-R0 — SHEET 02 OF 05

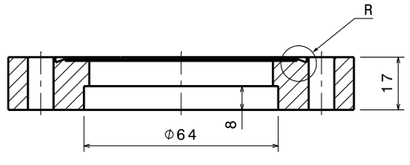


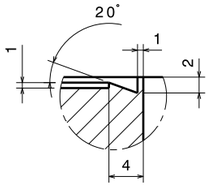


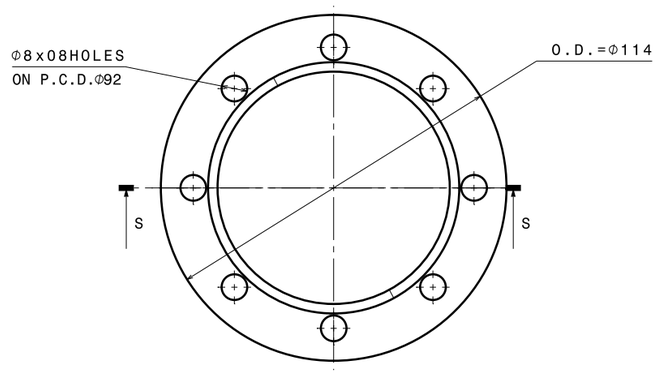


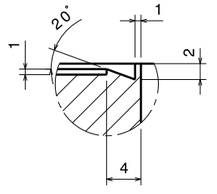


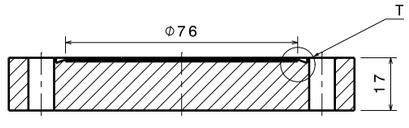












DN 250CF BLANK FLANGE
SCALE-1:2

DN 250CF COVER FLANGE
SCALE-1:2

DN 63CF BLANK FLANGE
SCALE-1:1

DN 63CF COVER FLANGE
SCALE-1:1

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

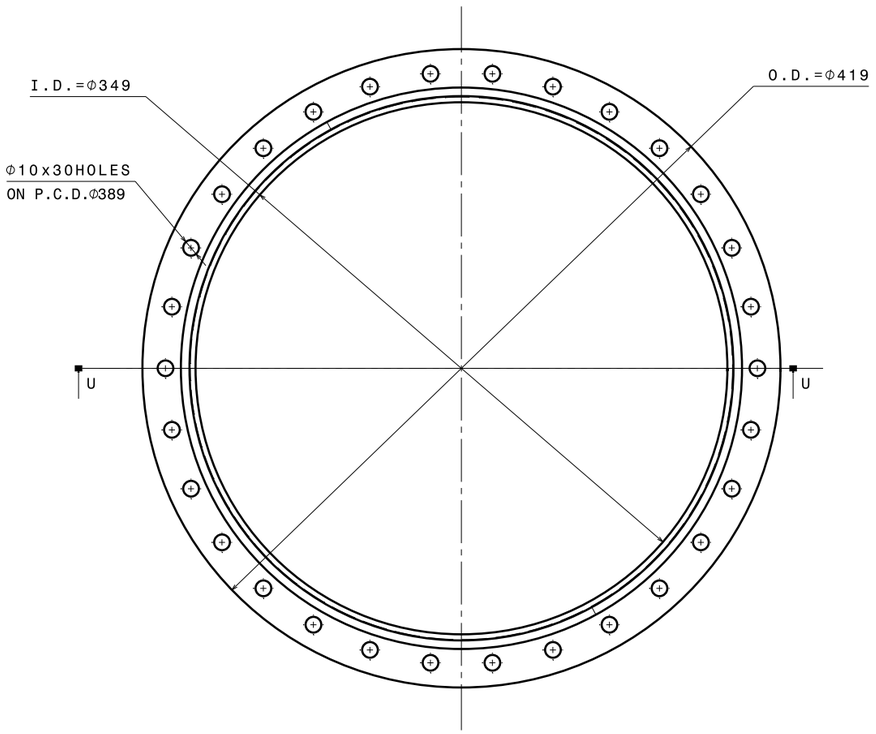
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	AS NOTED	DATE
DRAWN	A.N.N.	04/06/2014
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

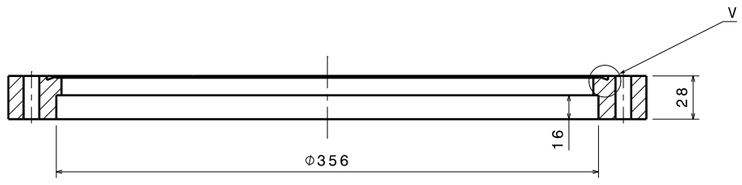
THIRD ANGLE PROJECTION

TITLE
STANDARD FLANGES

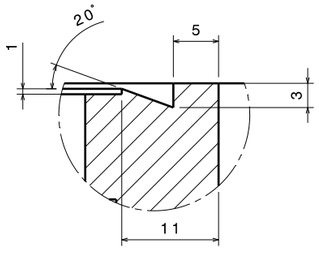
REF DRG NO: NA
REV R0
DRG.NO V001-001-R0
SHEET 03 OF 05



FRONT VIEW

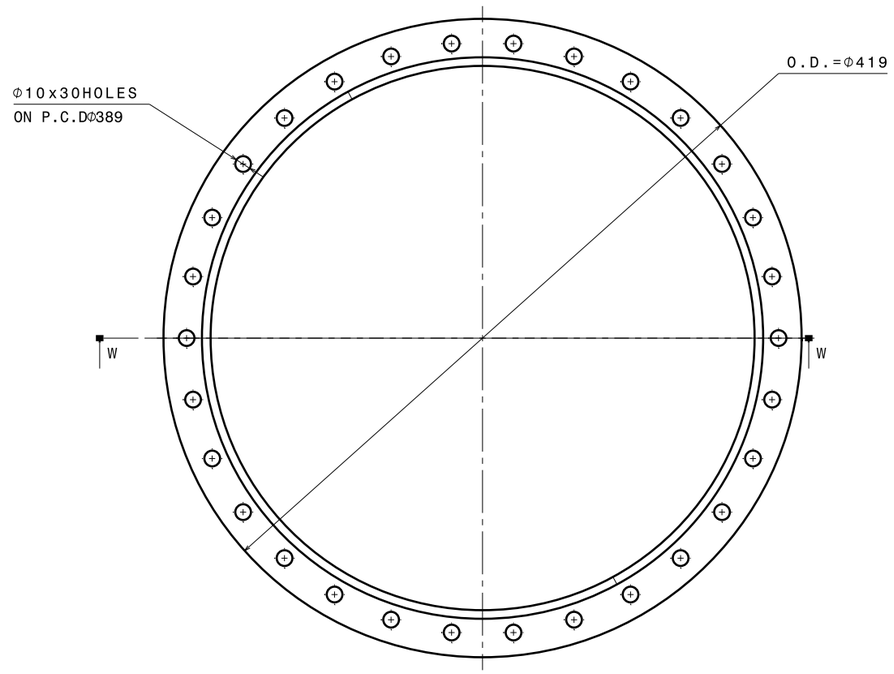


SECTION U-U

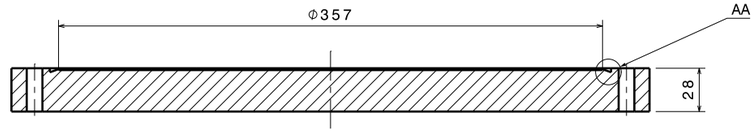


DETAIL VIEW-V
SCALE-3:1

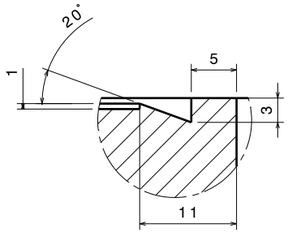
CUSTOM CF BLANK FLANGE (16 1/2")



FRONT VIEW



SECTION W-W



DETAIL VIEW-AA
SCALE-3:1

CUSTOM CF COVER FLANGE (16 1/2")

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

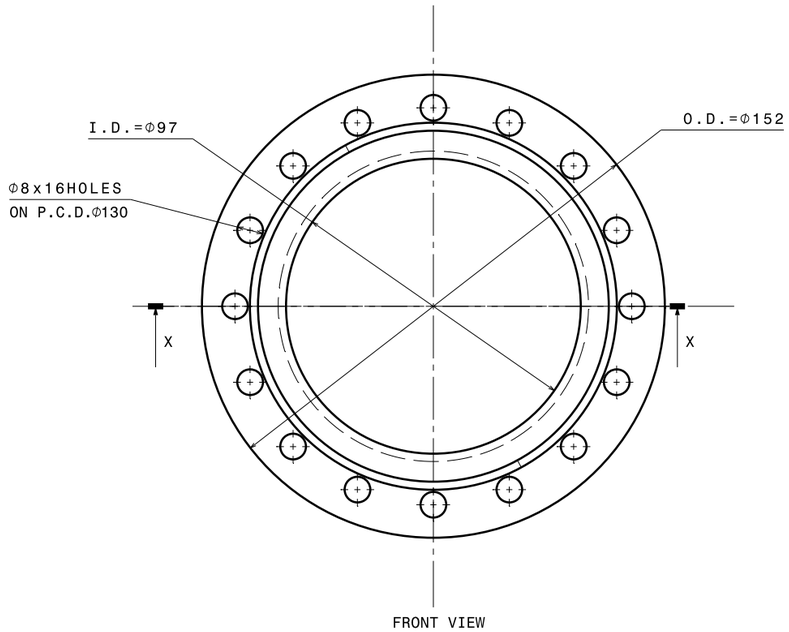
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:2	DATE
DRAWN	A.N.N.	04/06/2014
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

THIRD ANGLE PROJECTION

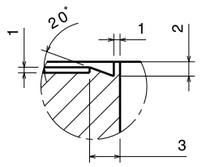
TITLE
STANDARD FLANGES

REF DRG NO: **NA**		REV R0
DRG.NO	V001-001-R0	SHEET 04 OF 05



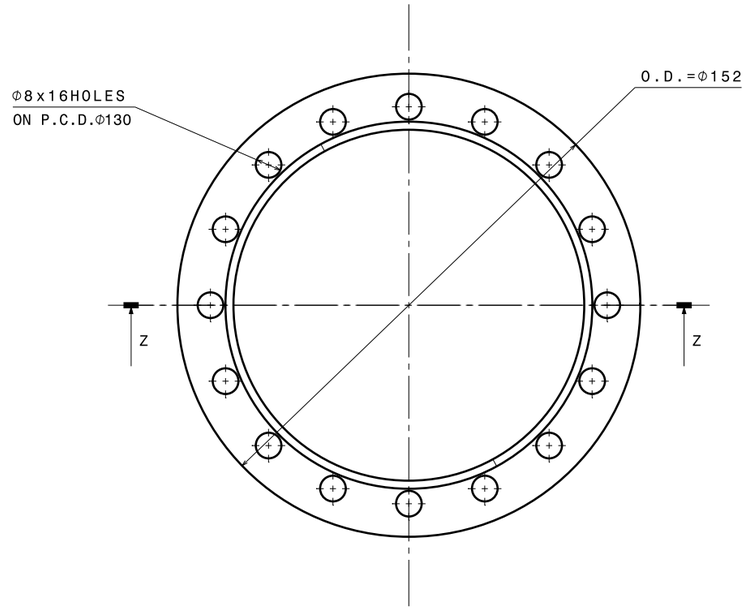
FRONT VIEW

SECTION X-X

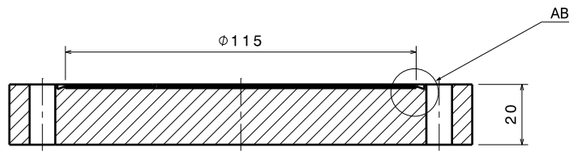


DETAIL VIEW-Y
SCALE-3:1

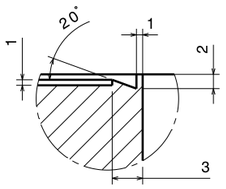
DN 100CF BLANK FLANGE



FRONT VIEW



SECTION Z-Z



DETAIL VIEW-AB
SCALE-3:1

DN 100CF COVER FLANGE

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

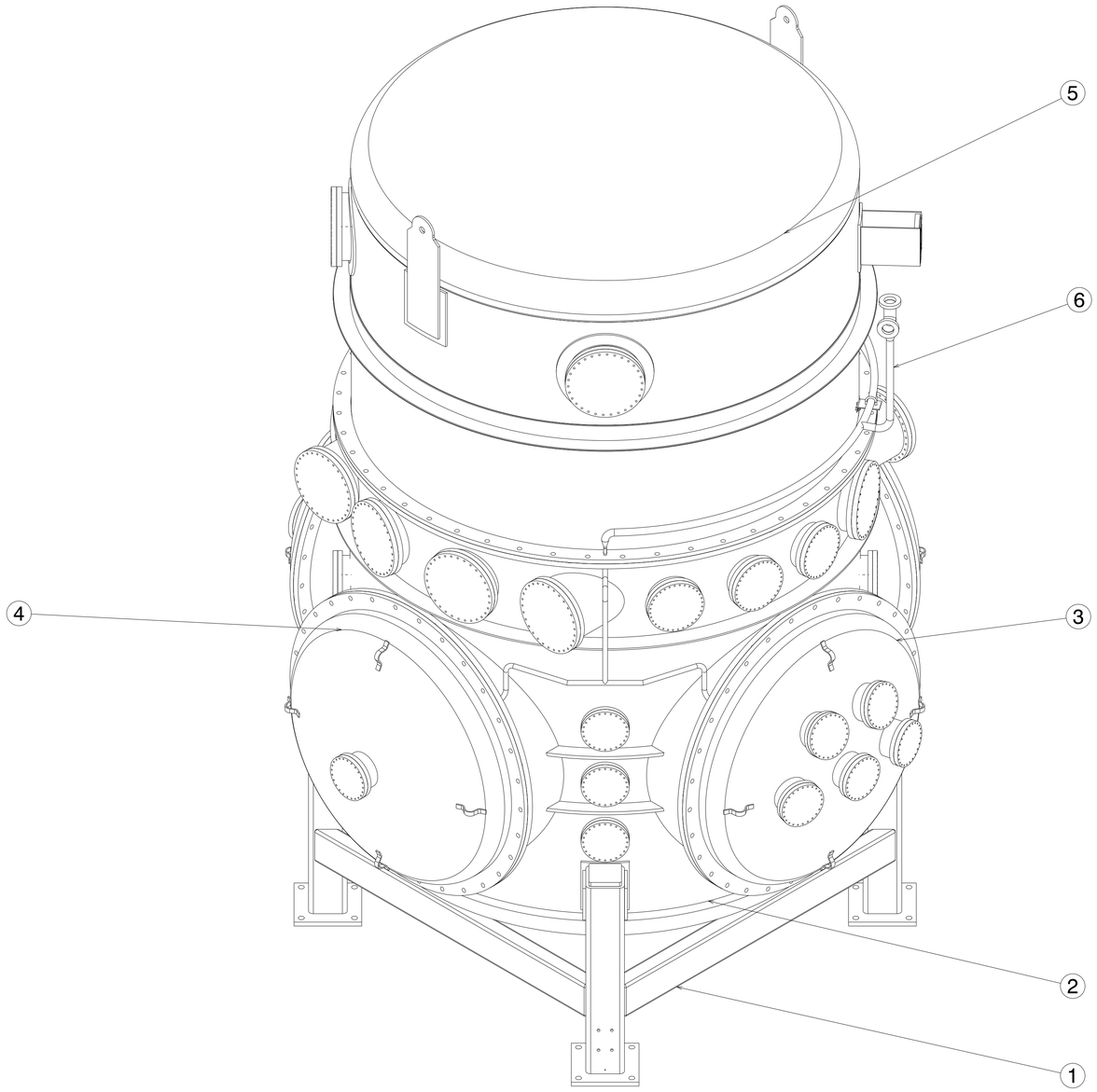
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:1	DATE
DRAWN	A.N.N.	04/06/2014
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

THIRD ANGLE PROJECTION

TITLE
STANDARD FLANGES

REF DRG NO: **NA**
REV R0
DRG.NO V001-001-R0
SHEET 05 OF 05



BASIC SYMMETRIC CHAMBER

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
6	01	ANNULUS TUBING ASSEMBLY	SS304L	VB01-008-R1	-
5	01	UPPER PART	SS304L	VB01-007-R1	-
4	02	END COVER TYPE-A11	SS304L	VB01-006-R1	-
3	02	END COVER TYPE-1	SS304L	VB01-005-R1	-
2	01	LOWER PART	SS304L	VB01-003-R1	-
1	01	SUPPORT ASSEMBLY	CARBON STEEL	VB01-002-R1	-

MATERIAL: ▽ 8-25 ▽▽ 1.6-8 ▽▽▽ 0.025-1.6 ▽▽▽▽ < 0.025

CO-ORDINATED BY

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED | SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

SCALE 1:15 | DATE

DRAWN A.N.N. 01/07/2015

CHECKED R.K.

APPROVED M.K.G.

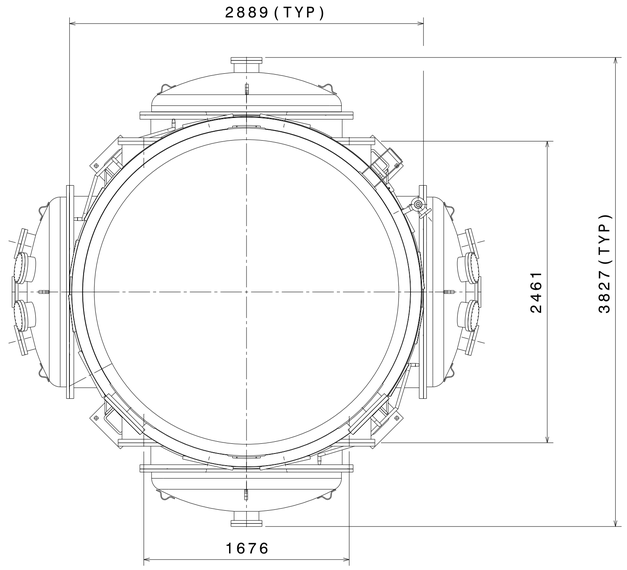
THIRD ANGLE PROJECTION

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

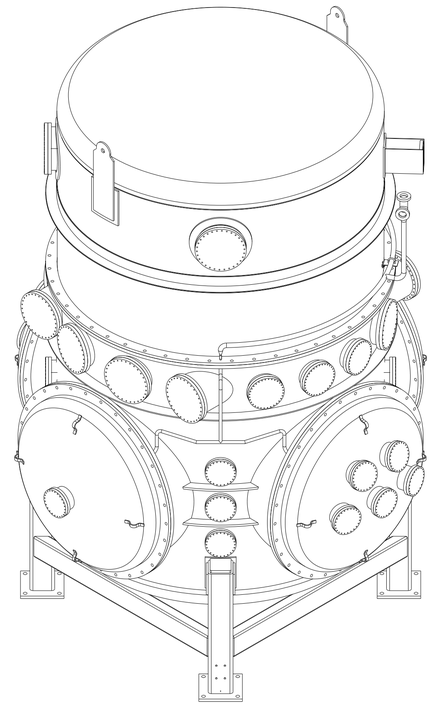
TITLE
BASIC SYMMETRIC CHAMBER

REF DRG NO: NA | REV R1

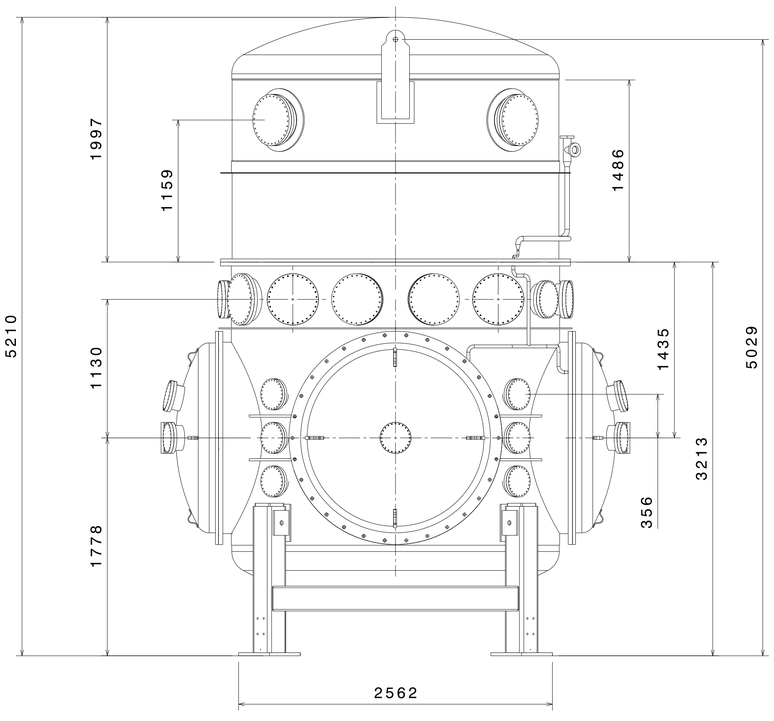
DRG.NO VB01-001-R1 | SHEET 01 OF 03



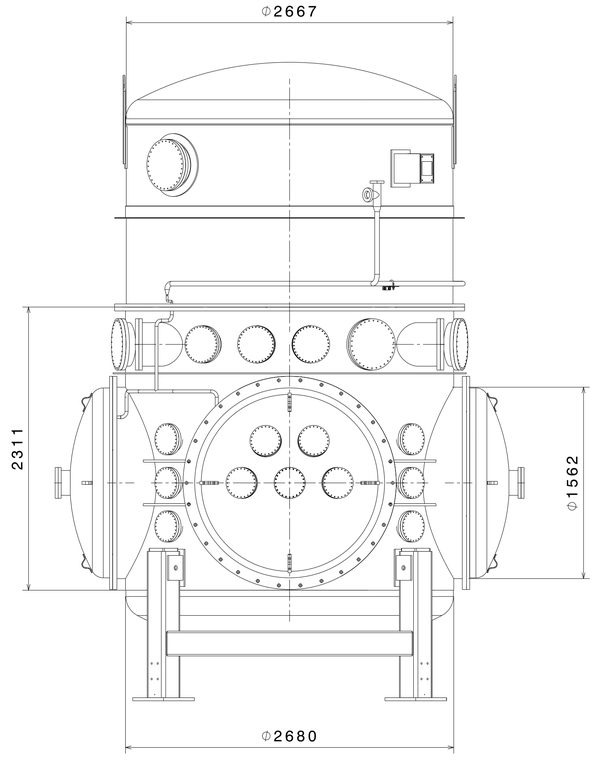
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		+0.1	+0.2	+0.3	+0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

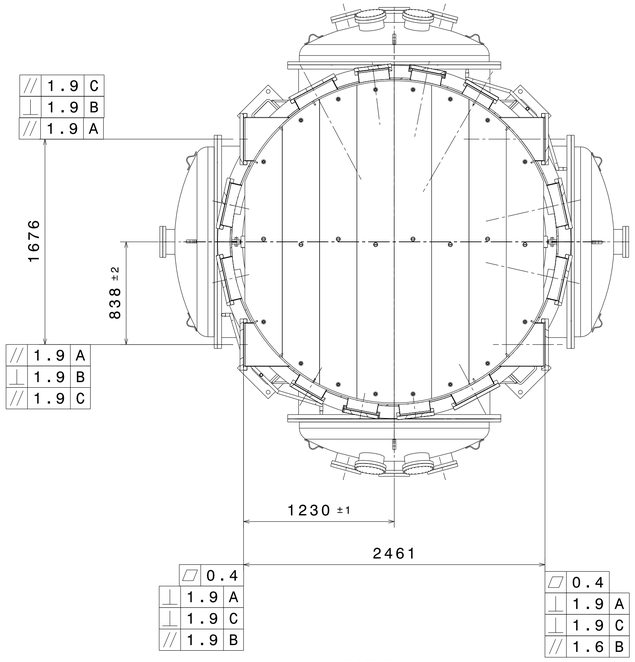
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:25	DATE
DRAWN	A.N.N.	01/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

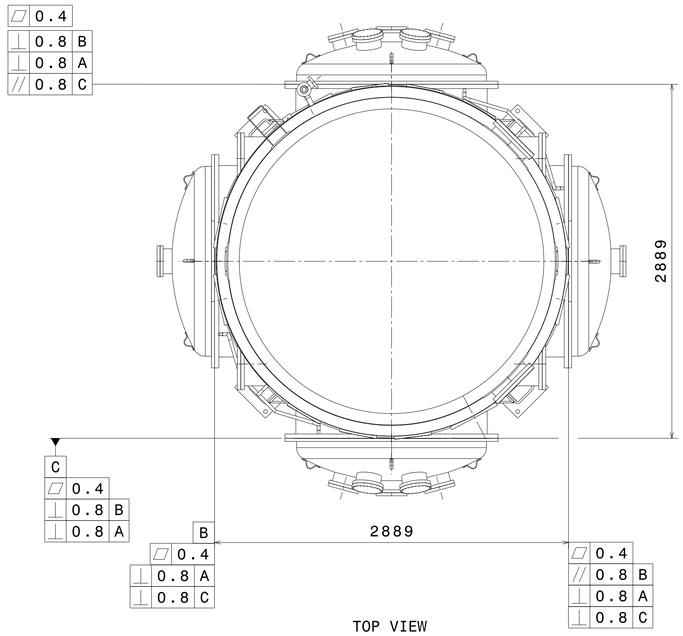
THIRD ANGLE PROJECTION

TITLE
BASIC SYMMETRIC CHAMBER

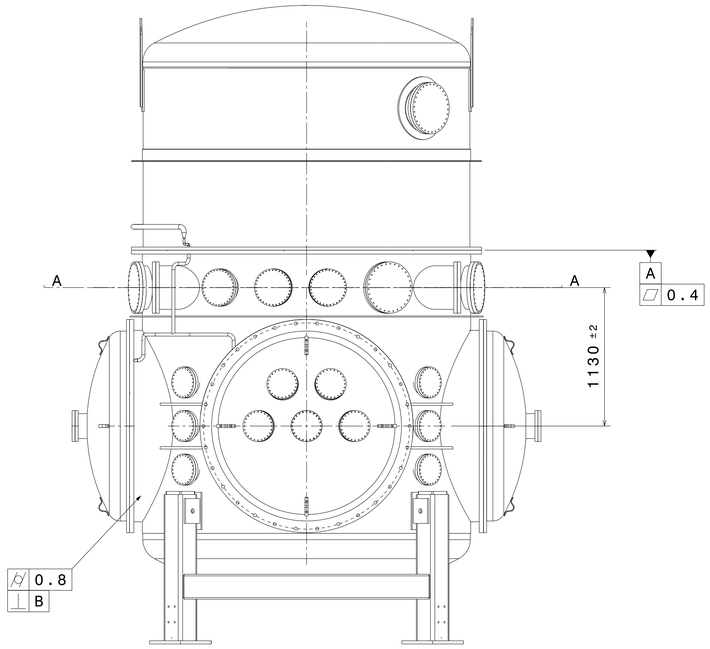
REF DRG NO: **NA**
REV R1
DRG.NO VB01-001-R1
SHEET 02 OF 03



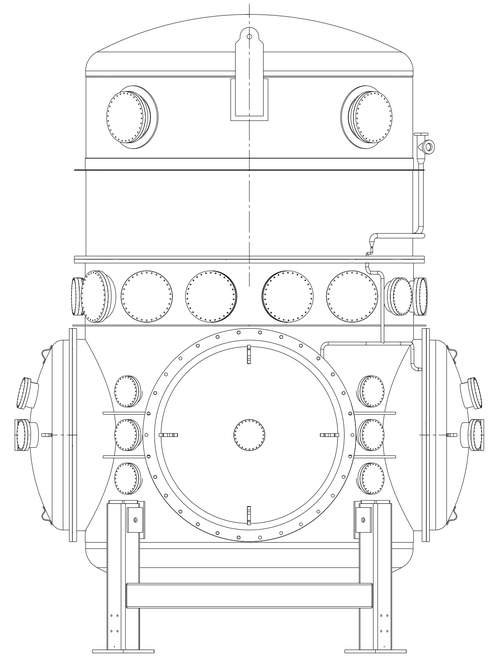
SECTION A-A



TOP VIEW



FRONT VIEW



RIGHT SIDE VIEW

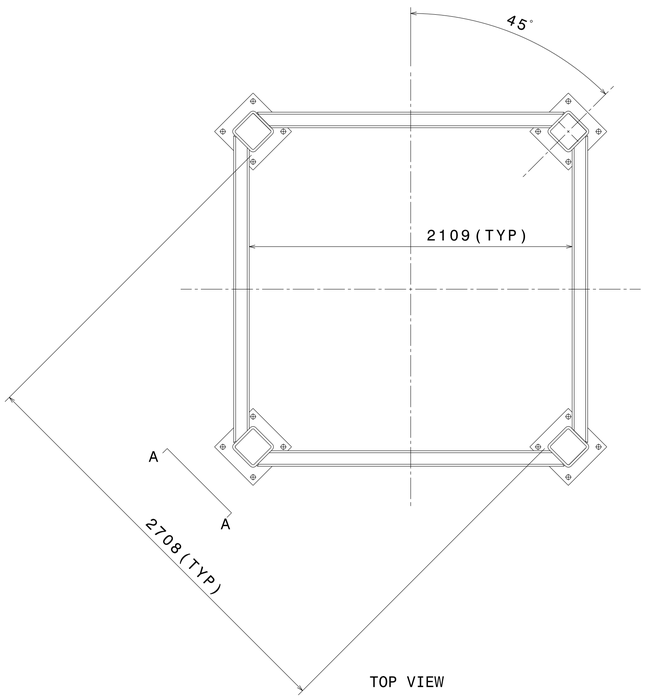
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

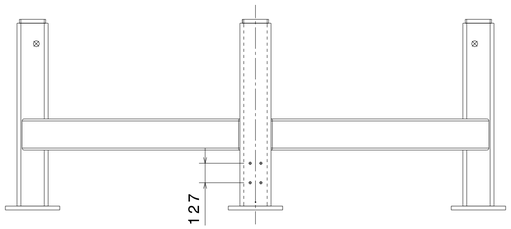
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

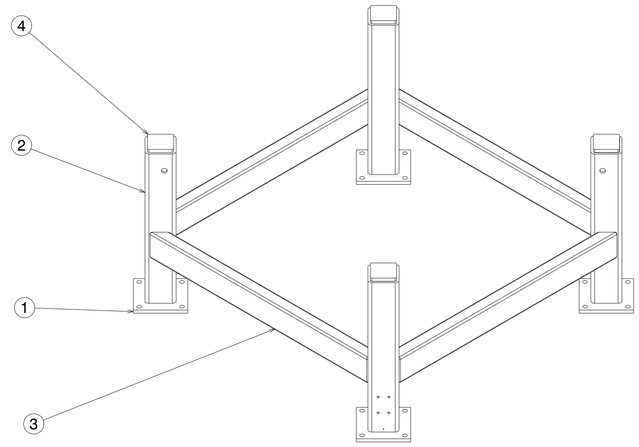
MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.	
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:15	DATE	TITLE: BASIC SYMMETRIC CHAMBER
DRAWN	A.N.N.	01/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		REF DRG NO: NA — REV R1
APPROVED	M.K.G.		DRG.NO: VB01-001-R1 — SHEET 03 OF 03



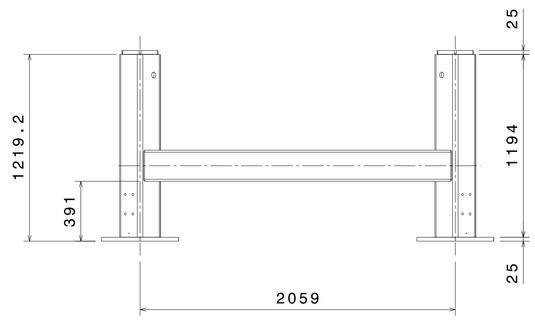
TOP VIEW



AUXILIARY VIEW A-A



ISOMETRIC VIEW



FRONT VIEW

01 SUPPORT ASSEMBLY

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
4	04	TOP PLATE	CARBON STEEL	VB01-002-R1/SHEET 02	-
3	04	TUBE STEEL-2	CARBON STEEL	VB01-002-R1/SHEET 02	-
2	04	TUBE STEEL-1	CARBON STEEL	VB01-002-R1/SHEET 02	-
1	04	BASE PLATE	CARBON STEEL	VB01-002-R1/SHEET 02	-

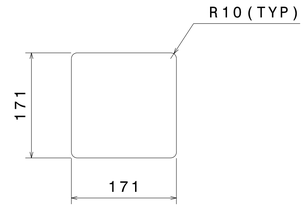
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS									
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.	
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:20	DATE	TITLE: SUPPORT ASSEMBLY
DRAWN	A.N.N.	02/07/2015	
CHECKED	R.K.		REF DRG NO: VB01-001-R1 — REV R1
APPROVED	M.K.G.		DRG.NO VB01-002-R1 — SHEET 01 OF 02

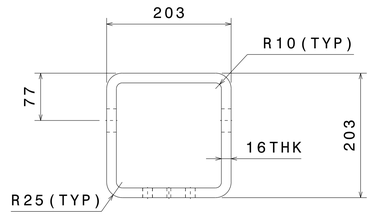
THIRD ANGLE PROJECTION



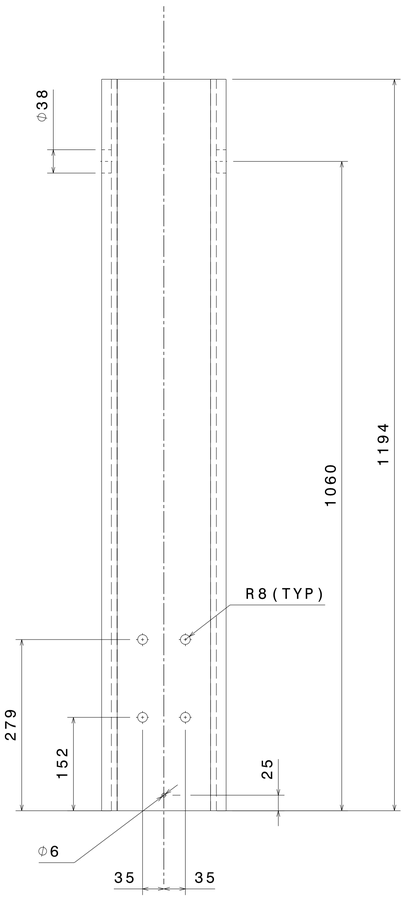
TOP VIEW

FRONT VIEW

④ TOP PLATE
SCALE-1:5

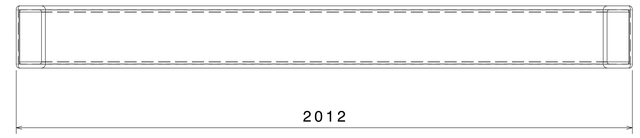


TOP VIEW

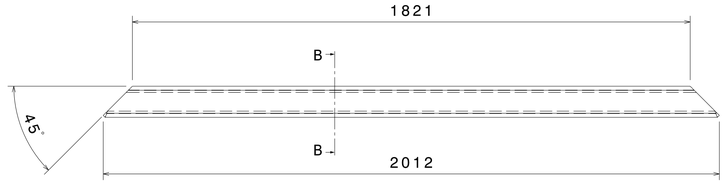


FRONT VIEW

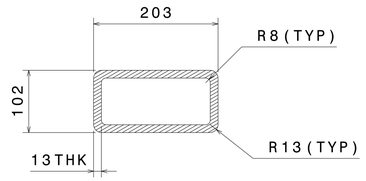
② TUBE STEEL-1
SCALE-1:5



TOP VIEW

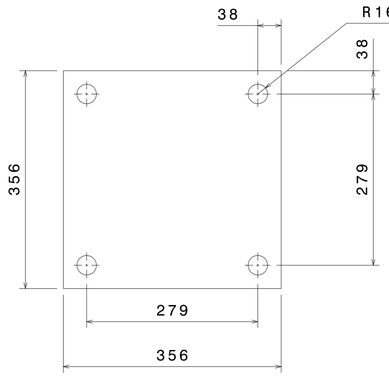


FRONT VIEW



SECTION B-B
SCALE-1:5

③ TUBE STEEL-2
SCALE-1:10

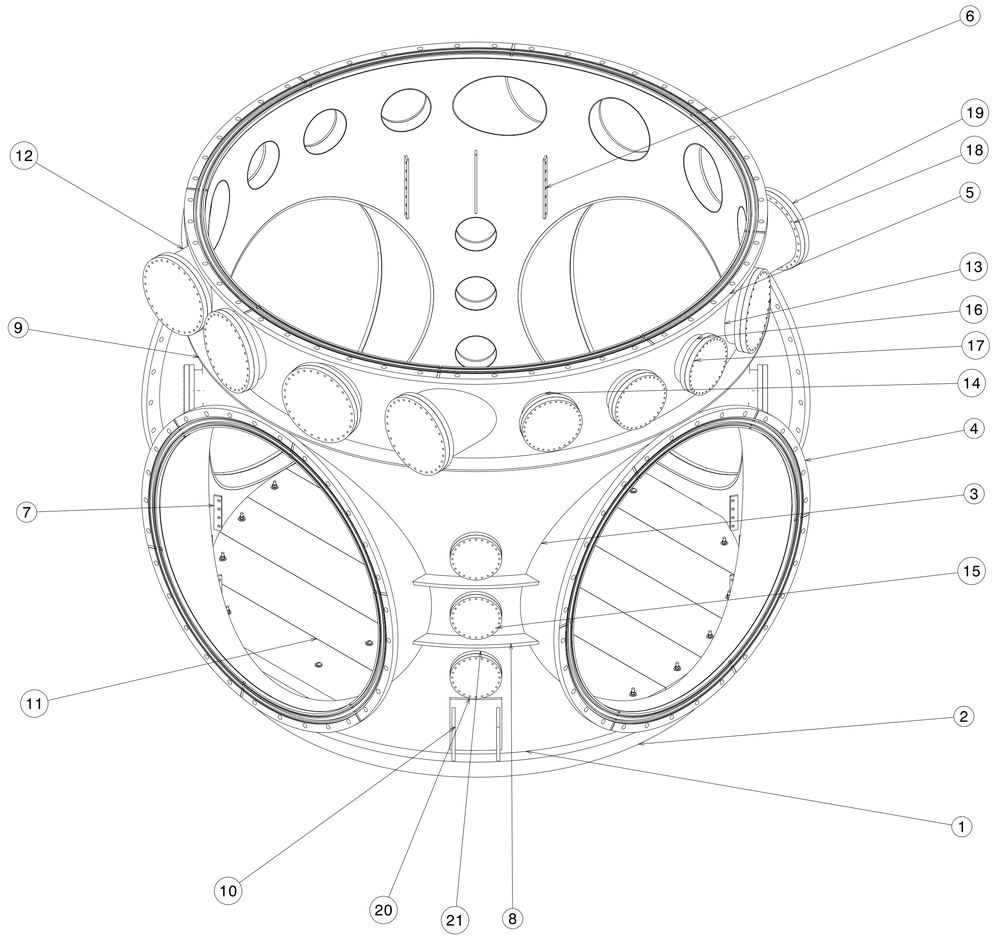


TOP VIEW

FRONT VIEW

① BASE PLATE
SCALE-1:5

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025	REVISION COLUMN						MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.				
CO-ORDINATED BY					REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED						
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS											SCALE	AS NOTED	DATE	TITLE	SUPPORT ASSEMBLY		
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315			DRAWN	A.N.N.	02/07/2015	THIRD ANGLE PROJECTION			
UPTO 10	10-50	50-120	OVER 120-400								CHECKED	R.K.		REF DRG NO:	VB01-001-R1		REV R1
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5			APPROVED	M.K.G.		DRG.NO	VB01-002-R1		SHEET 02 OF 02



02 LOWER PART

21	12	DN 200CF BLANK FLANGE	SS304L	VO01-001-RO/SHEET 01	-
20	12	DN 200CF COVER FLANGE	SS304L	VO01-001-RO/SHEET 01	-
19	10	CUSTOM CF COVER FLANGE (16 1/2")	SS304L	VO01-001-RO/SHEET 04	-
18	10	CUSTOM CF BLANK FLANGE (16 1/2")	SS304L	VO01-001-RO/SHEET 04	-
17	06	DN 250CF COVER FLANGE	SS304L	VO01-001-RO/SHEET 04	-
16	06	DN 250CF BLANK FLANGE	SS304L	VO01-001-RO/SHEET 04	-
15	12	PORT-G NOZZLE	SS304L	VB01-003-R1/SHEET 09	-
14	06	PORT-F NOZZLE	SS304L	VB01-003-R1/SHEET 09	-
13	06	PORT-E NOZZLE	SS304L	VB01-003-R1/SHEET 09	-
12	04	PORT-D NOZZLE	SS304L	VB01-003-R1/SHEET 09	-
11	01	FLOOR ASSEMBLY	ALUMINIUM	VB01-004-R1	-
10	04	SUPPORT PAD	SS304L	VB01-003-R1/SHEET 08	-
9	01	SHELL STIFFENER	SS304L	VB01-003-R1/SHEET 08	-
8	08	STIFFENER 60" PORT	SS304L	VB01-003-R1/SHEET 08	-
7	12	INTERNAL ATTACHMENT-2	SS304L	VB01-003-R1/SHEET 05	-
6	12	INTERNAL ATTACHMENT-1	SS304L	VB01-003-R1/SHEET 05	-
5	01	FLANGE GROOVED (104.5"ID)	SS304L	VB01-003-R1/SHEET 07	-
4	04	FLANGE GROOVED (60.5"ID)	SS304L	VB01-003-R1/SHEET 06	-
3	04	SIDE CYLINDRICAL PART	SS304L	VB01-003-R1/SHEET 05	-
2	01	BOTTOM F & D HEAD	SS304L	VB01-003-R1/SHEET 04	-
1	01	CYLINDRICAL SHELL	SS304L	VB01-003-R1/SHEET 04	-
PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK

MATERIAL: ▽ 8-25 ▽▽ 1.6-8 ▽▽▽ 0.025-1.6 ▽▽▽▽ < 0.025

CO-ORDINATED BY

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1'	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

REVISION COLUMN

MED | SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

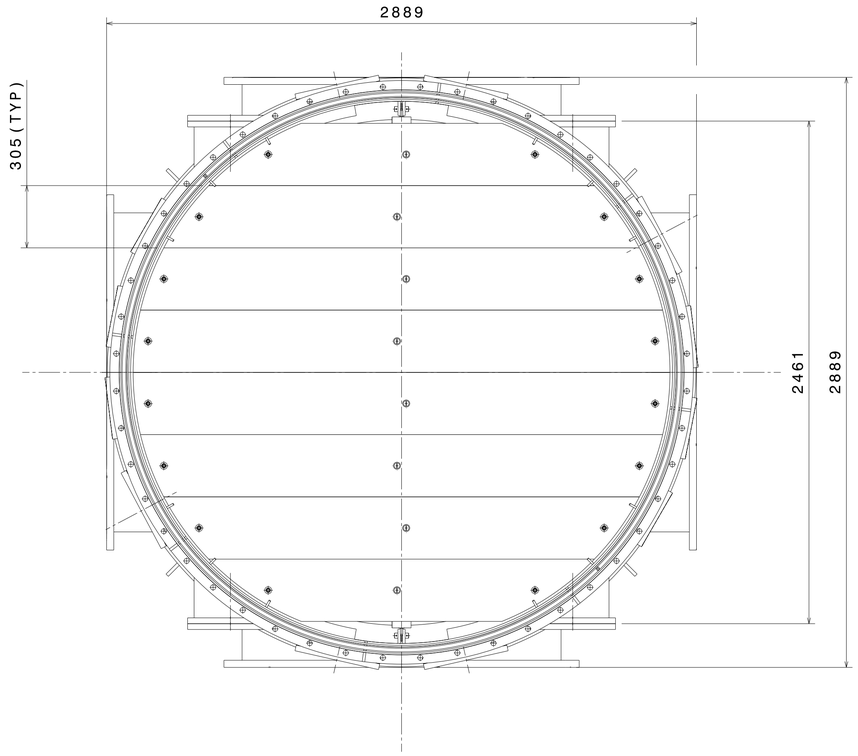
INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

SCALE	1:15	DATE	
DRAWN	A.N.N.	05/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		
APPROVED	M.K.G.		

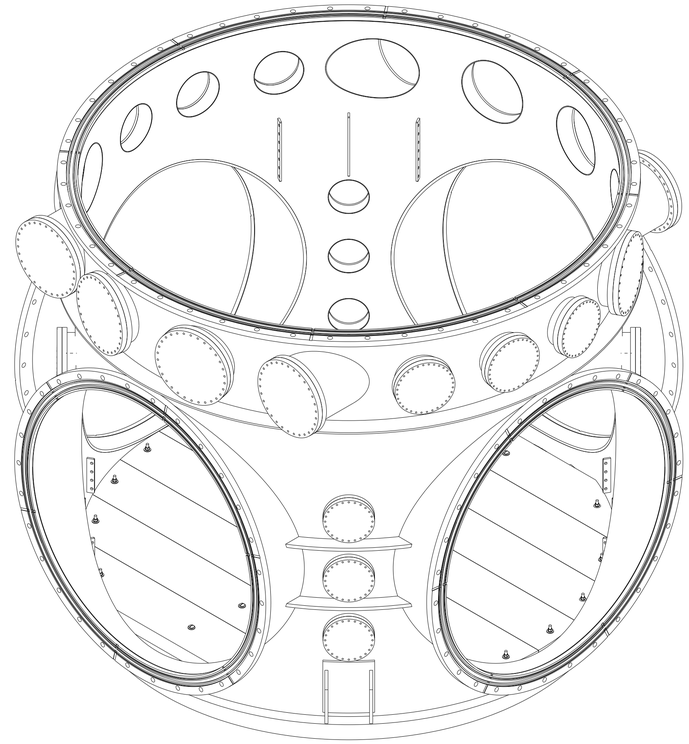
TITLE: LOWER PART

REF DRG NO: VB01-001-R1 REV R1

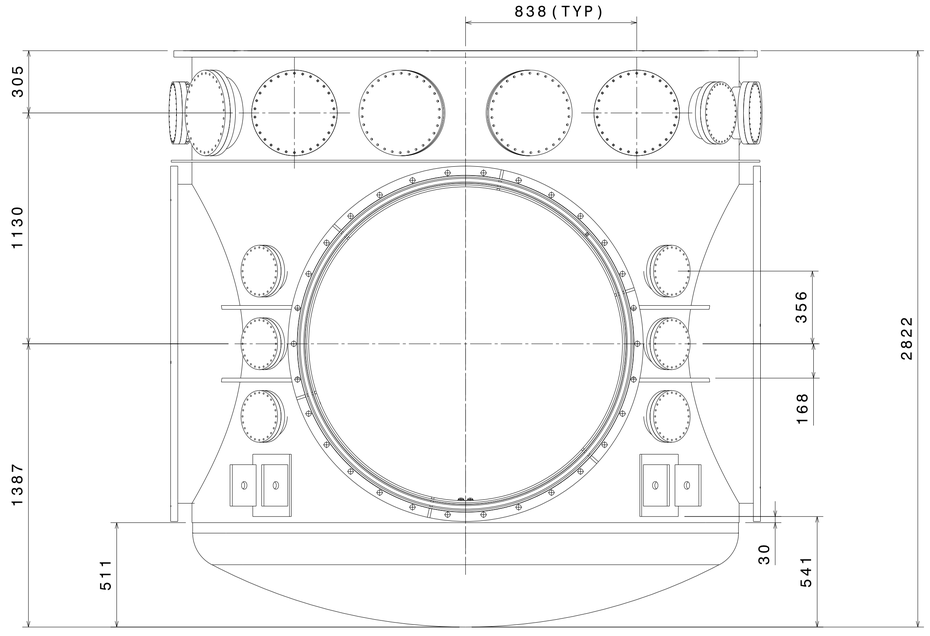
DRG.NO VB01-003-R1 SHEET 01 OF 09



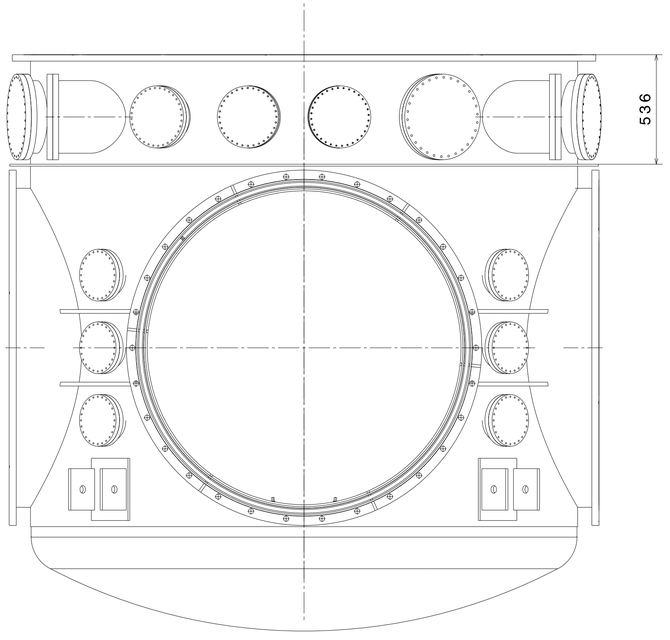
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

02 LOWER PART

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

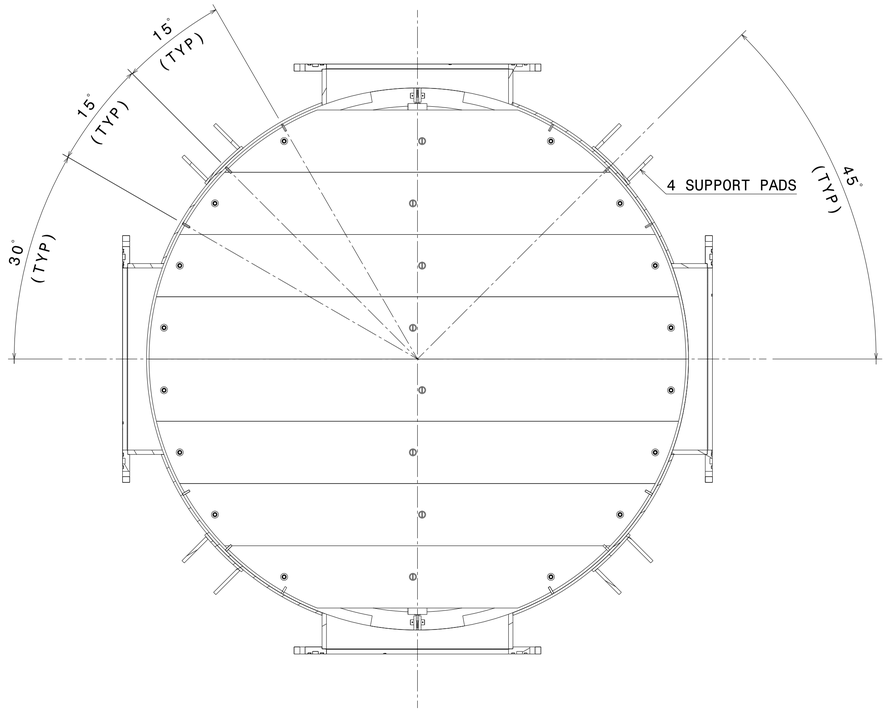
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1'	±0'-30'	±0'-20'	±0'-10'		±0.1	±0.2	±0.3	±0.5

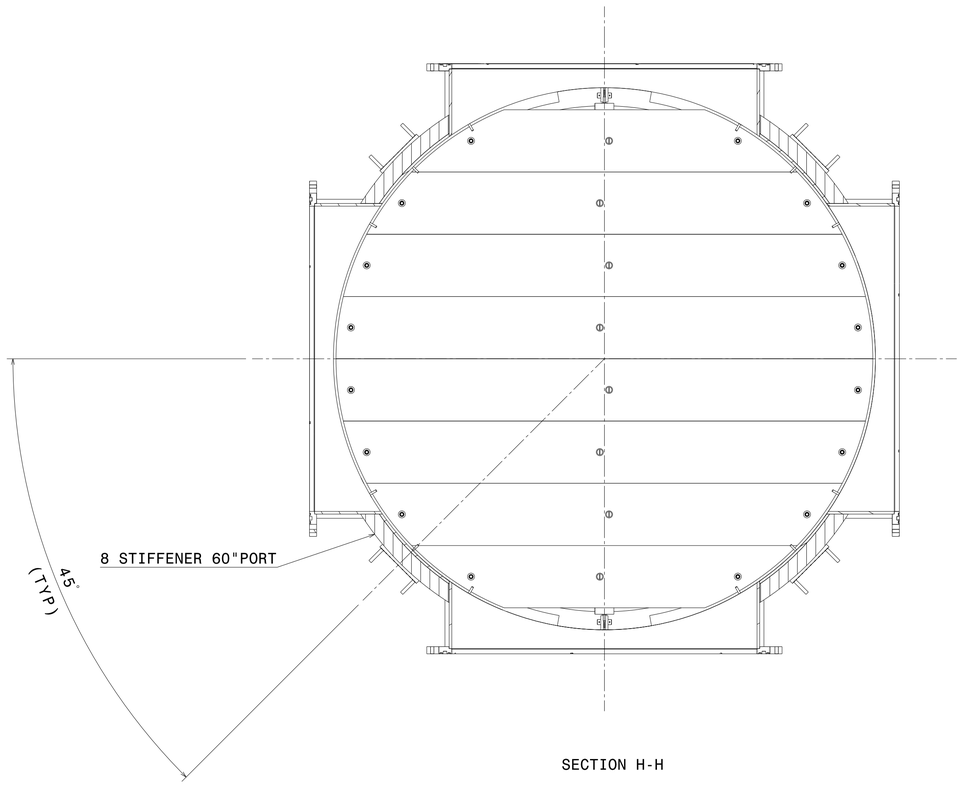
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

REVISION COLUMN

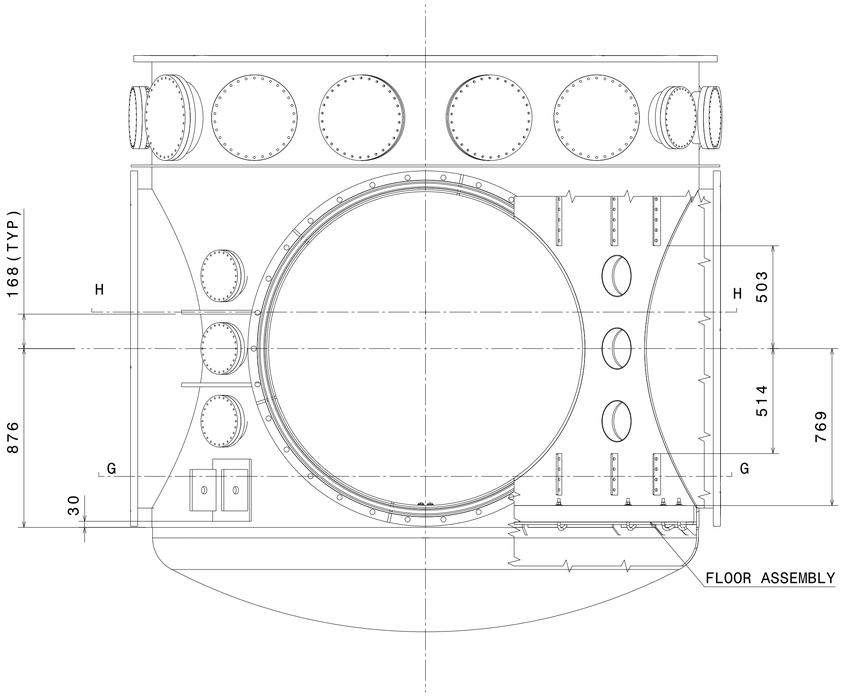
MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.	
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:15	DATE	TITLE: LOWER PART
DRAWN	A.N.N.	05/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		REF DRG NO: VB01-001-R1 — REV R1
APPROVED	M.K.G.		DRG.NO VB01-003-R1 — SHEET 02 OF 09



SECTION G-G



SECTION H-H



FRONT BREAKOUT VIEW

02 LOWER PART

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		+0.1	+0.2	+0.3	+0.5
+1°	+0°-30'	+0°-20'	+0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:15	DATE
DRAWN	A.N.N.	05/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

THIRD ANGLE PROJECTION

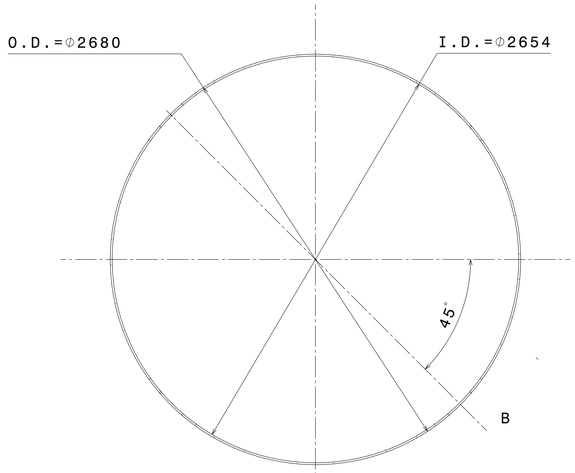
TITLE LOWER PART

REF DRG NO: VB01-001-R1

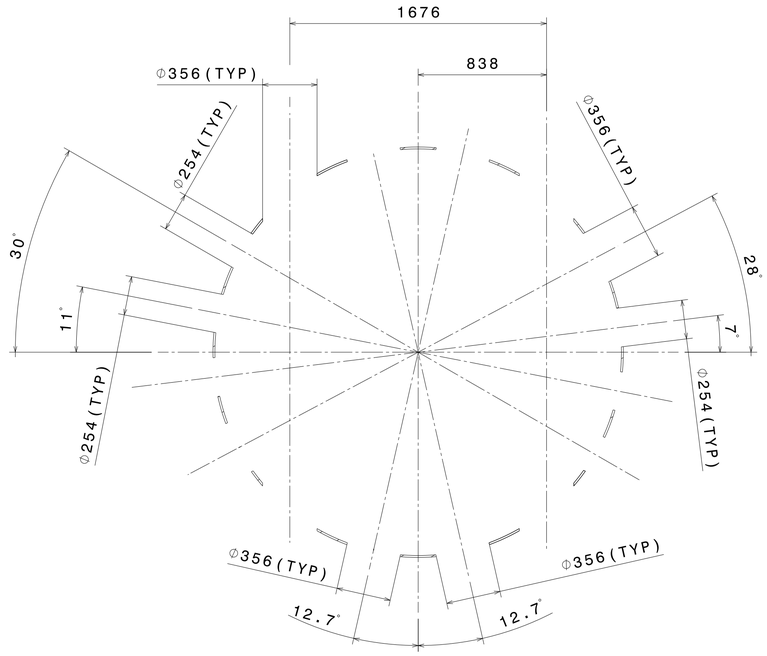
REV R1

DRG.NO VB01-003-R1

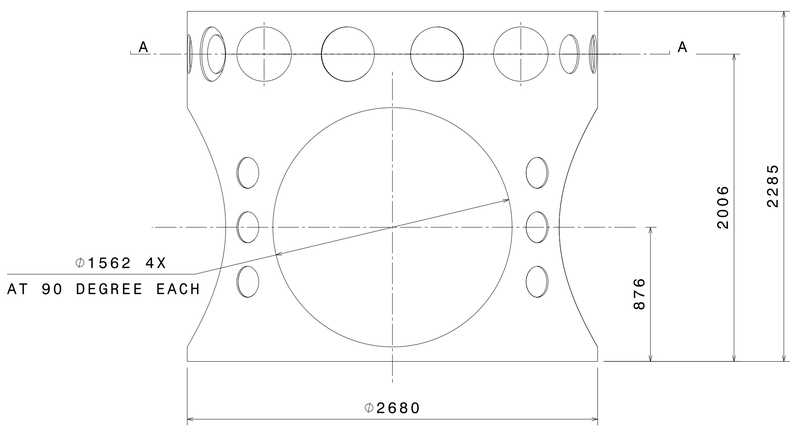
SHEET 03 OF 09



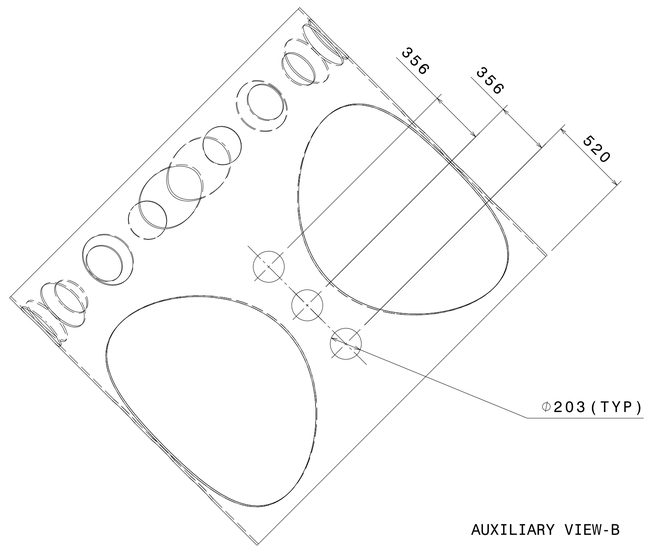
TOP VIEW



SECTION A-A

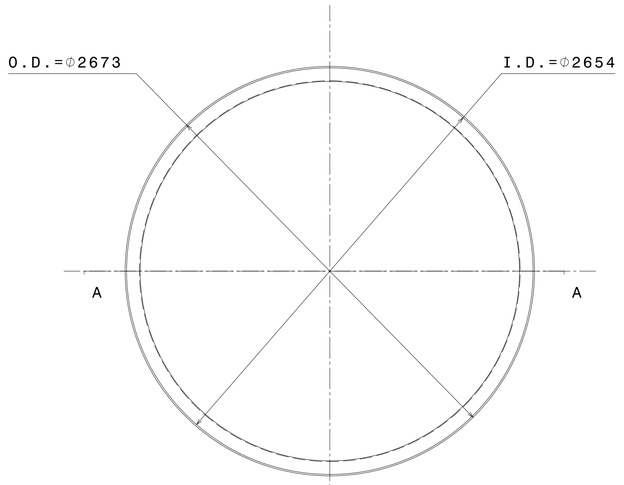


FRONT VIEW

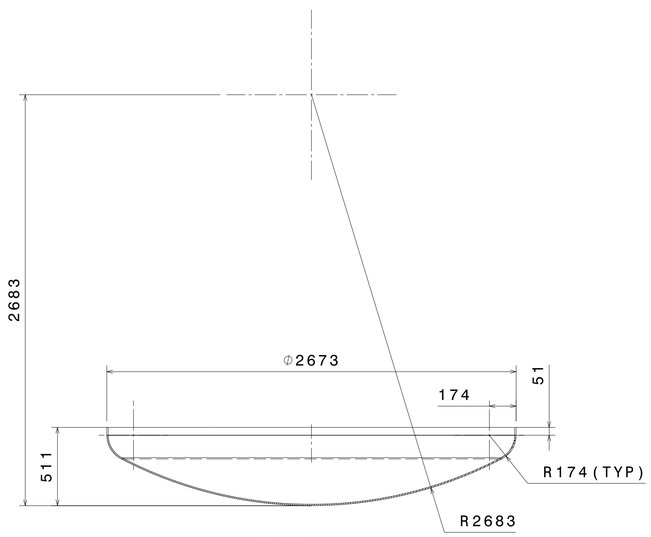


AUXILIARY VIEW-B

① CYLINDRICAL SHELL



FRONT VIEW



SECTION A-A

② BOTTOM F & D HEAD

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025				
CO-ORDINATED BY								
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

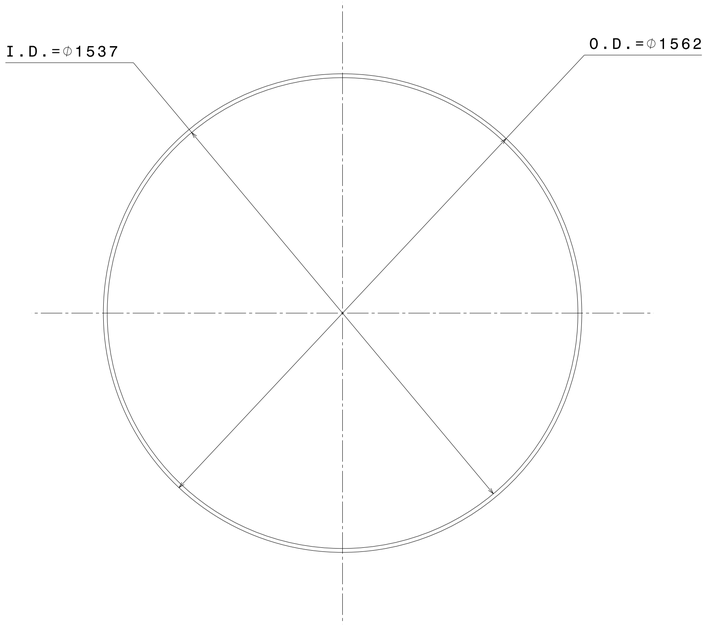
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:20	DATE
DRAWN	A.N.N.	05/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

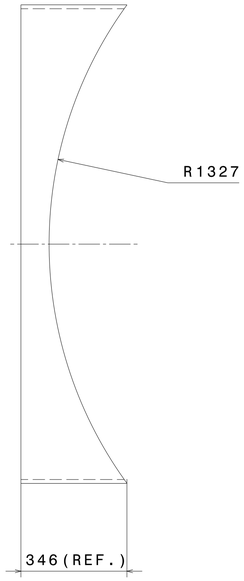
THIRD ANGLE PROJECTION

TITLE
LOWER PART

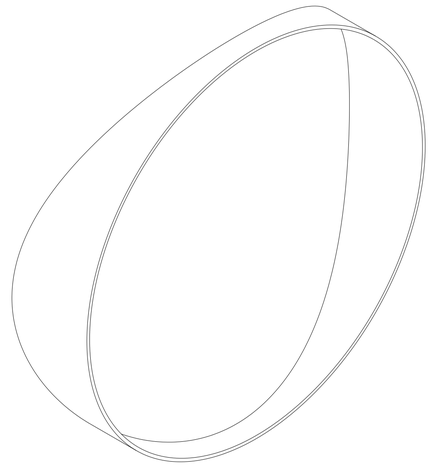
REF DRG NO:	VB01-001-R1	REV R1
DRG.NO	VB01-003-R1	SHEET 04 OF 09



FRONT VIEW

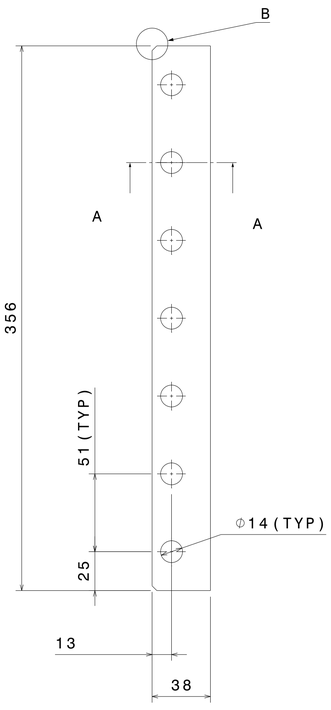


SIDE VIEW

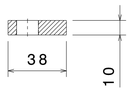


ISOMETRIC VIEW

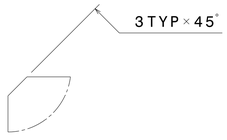
③ SIDE CYLINDRICAL PART
SCALE-1:10



FRONT VIEW

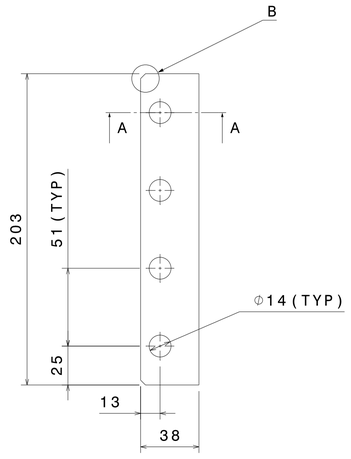


SECTION A-A

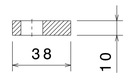


DETAIL VIEW-B
SCALE-2:1

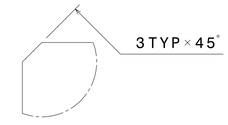
⑥ INTERNAL ATTACHMENT-1
SCALE-1:2



FRONT VIEW



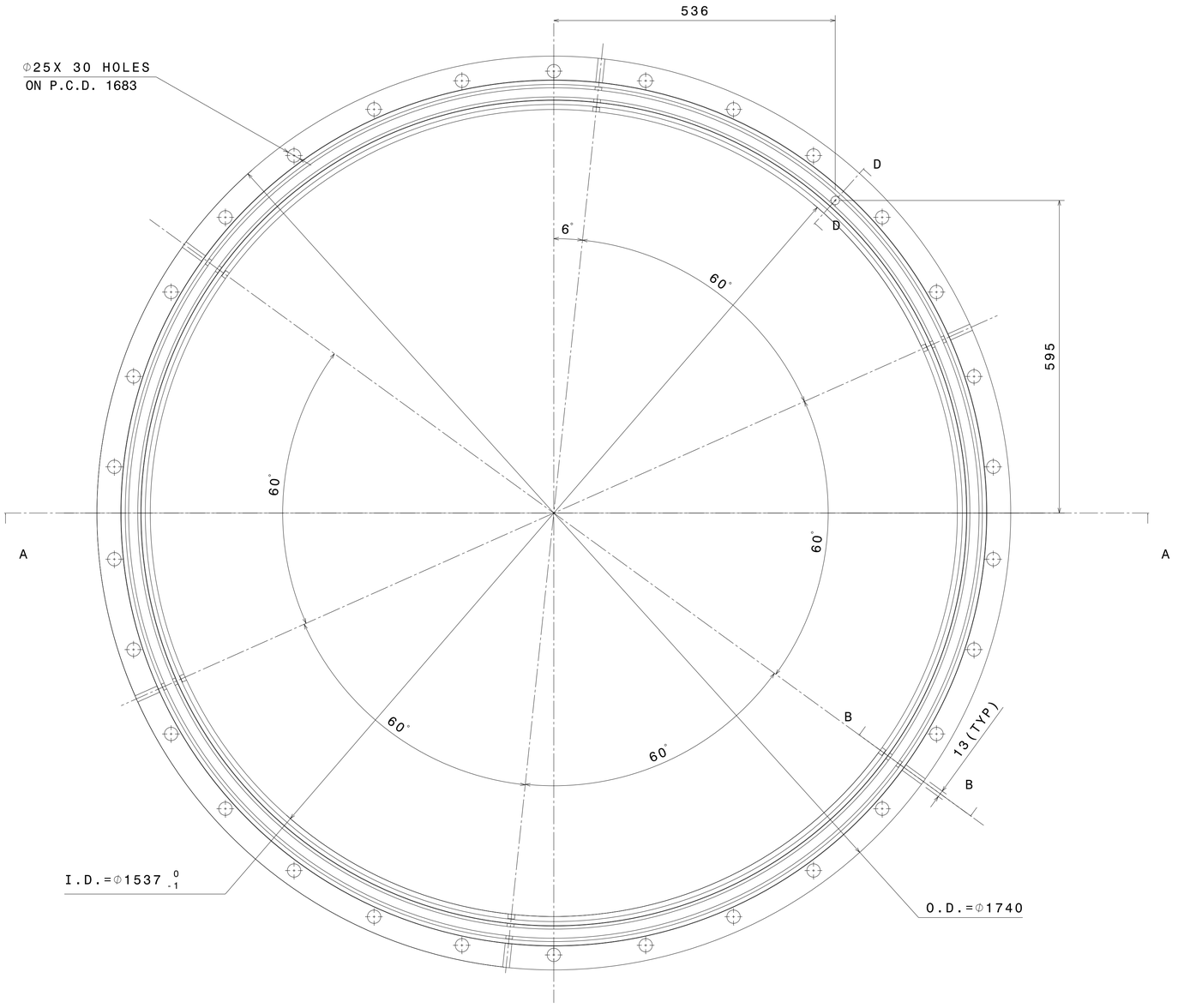
SECTION A-A



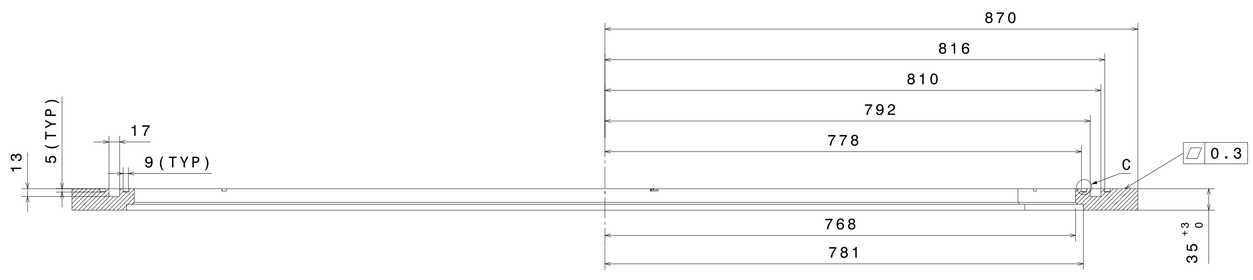
DETAIL VIEW-B
SCALE-2:1

⑦ INTERNAL ATTACHMENT-2
SCALE-1:2

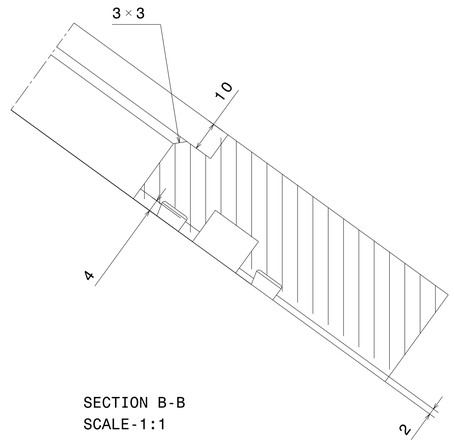
MATERIAL:		▽ 8-25		▽▽ 1.6-8		▽▽▽ 0.025-1.6		▽▽▽▽ < 0.025		REVISION COLUMN						MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.	
CO-ORDINATED BY										REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN mm' UNLESS OTHERWISE STATED			
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS																SCALE	AS NOTED	DATE	TITLE: LOWER PART
LENGTH IN mm OF SHORTER SIDE OF ANGLES					LENGTH OR DIA	UPTO 6	6-30	30-120	120-315							DRAWN	A.N.N.	05/07/2015	THIRD ANGLE PROJECTION
UPTO 10	10-50	50-120	OVER 120-400													CHECKED	R.K.		REF DRG NO: VB01-001-R1 REV R1
±1°	±0°-30'	±0°-20'	±0°-10'			±0.1	±0.2	±0.3	±0.5							APPROVED	M.K.G.		DRG.NO VB01-003-R1 SHEET 05 OF 09



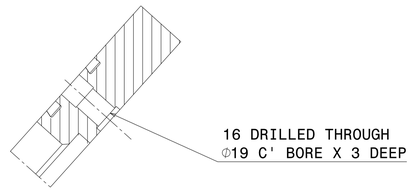
FRONT VIEW
SCALE-1:5



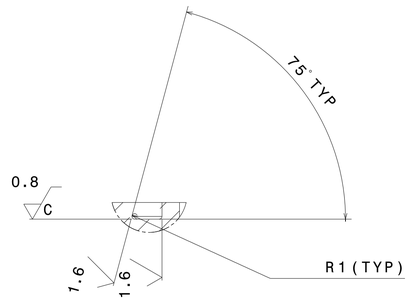
SECTION A-A
SCALE-1:5



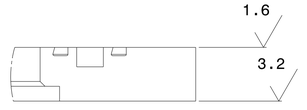
SECTION B-B
SCALE-1:1



SECTION D-D
SCALE-1:2



DETAIL VIEW-C
SCALE-1:1



SURFACE ROUGHNESS RA MICROMETER

(4) FLANGE GROOVED (60.5"ID)

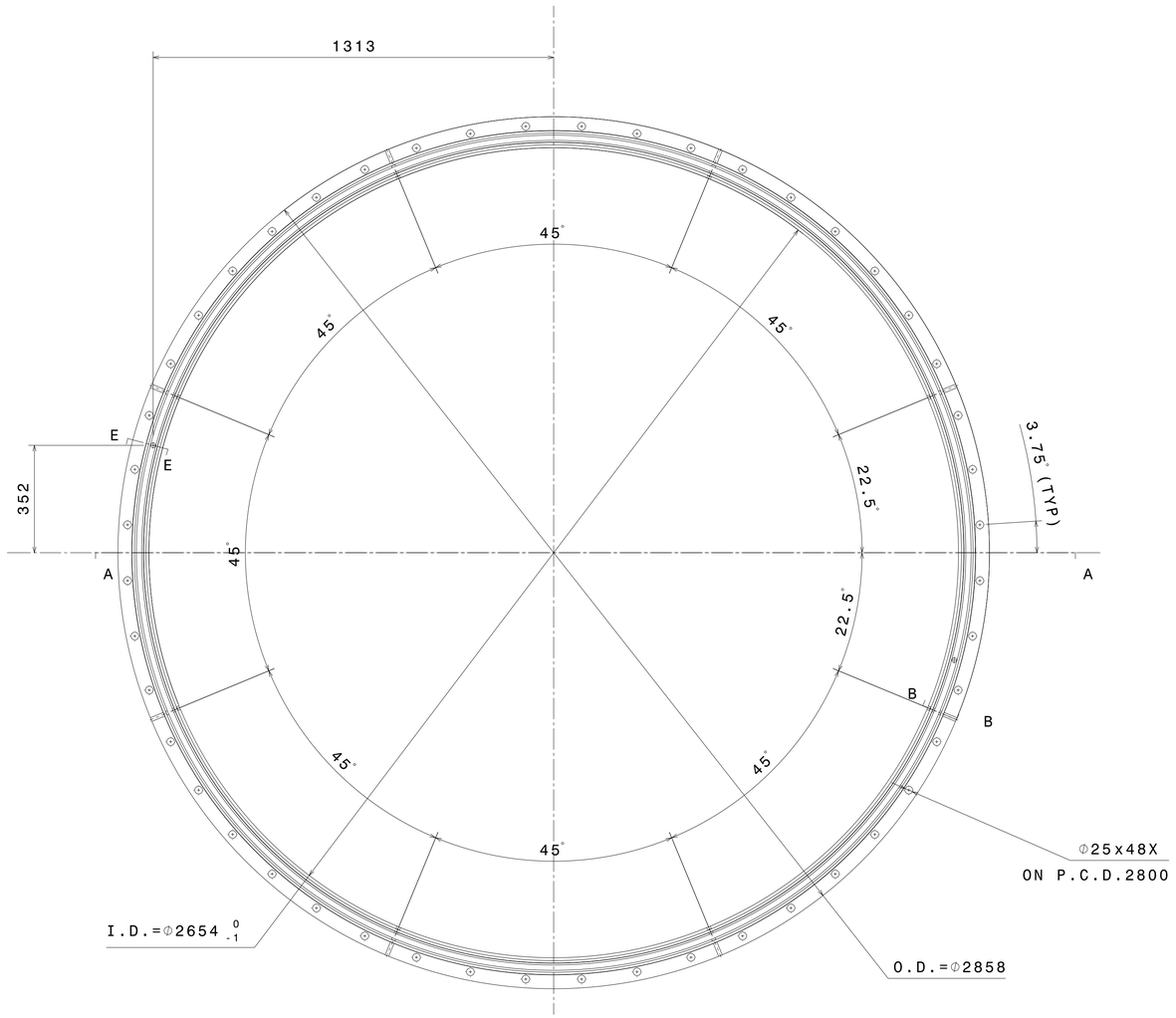
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

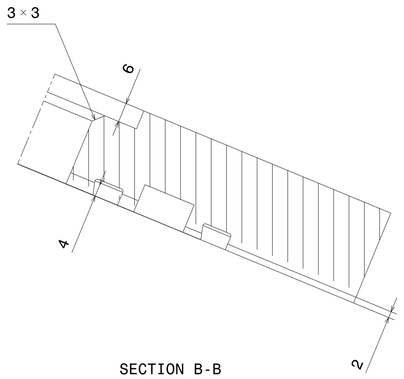
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

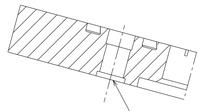
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	TITLE: LOWER PART
DRAWN	A.N.N.	05/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		REF DRG NO: VB01-001-R1 — REV R1
APPROVED	M.K.G.		DRG.NO VB01-003-R1 — SHEET 06 OF 09



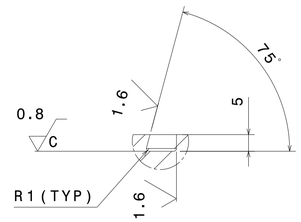
FRONT VIEW
SCALE-1:10



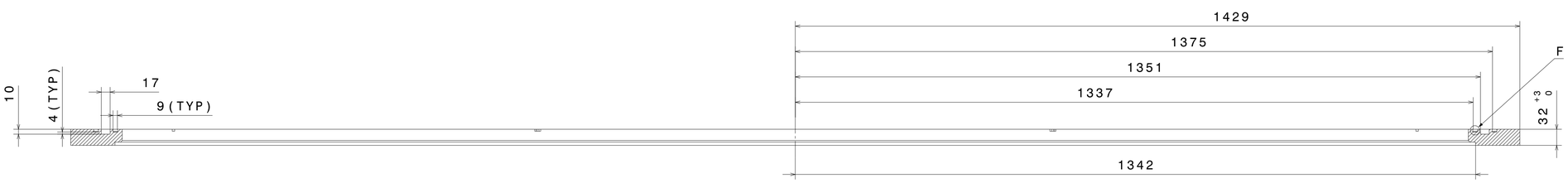
SECTION B-B
SCALE-1:1



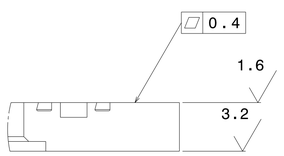
SECTION E-E
SCALE-1:2



DETAIL VIEW-F
SCALE-1:1



SECTION A-A
SCALE-1:5



(5) FLANGE GROOVED (104.5"ID)

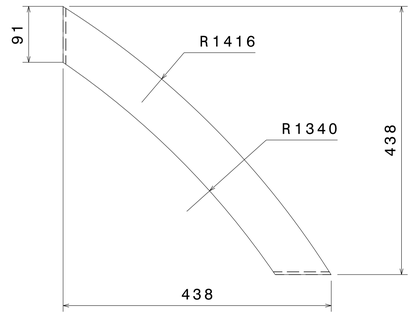
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

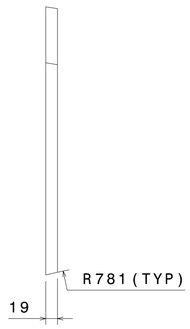
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.	
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	TITLE: LOWER PART
DRAWN	A.N.N.	05/07/2015	
CHECKED	R.K.		REF DRG NO: VB01-001-R1 — REV R1
APPROVED	M.K.G.		DRG.NO VB01-003-R1 — SHEET 07 OF 09



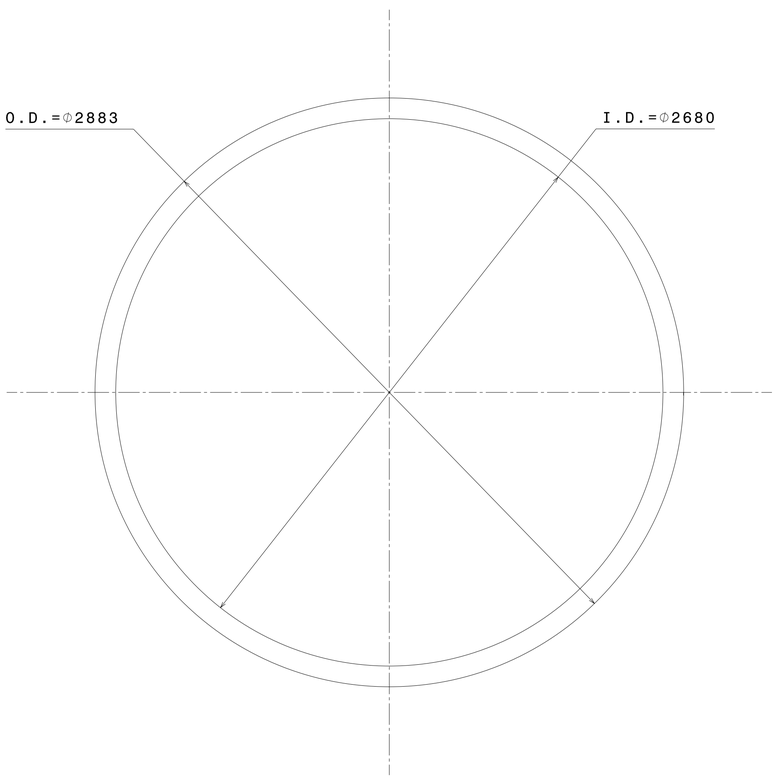
FRONT VIEW



SIDE VIEW

ISOMETRIC VIEW

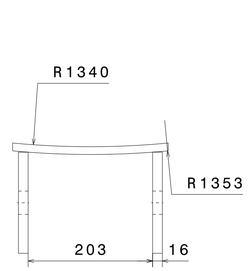
⑧ STIFFENER 60" PORT
SCALE-1:5



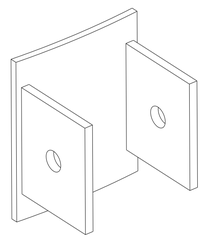
FRONT VIEW

SIDE VIEW

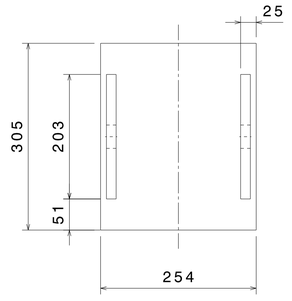
⑨ SHELL STIFFENER
SCALE-1:10



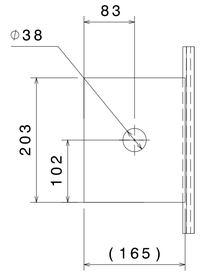
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

⑩ SUPPORT PAD
SCALE-1:5

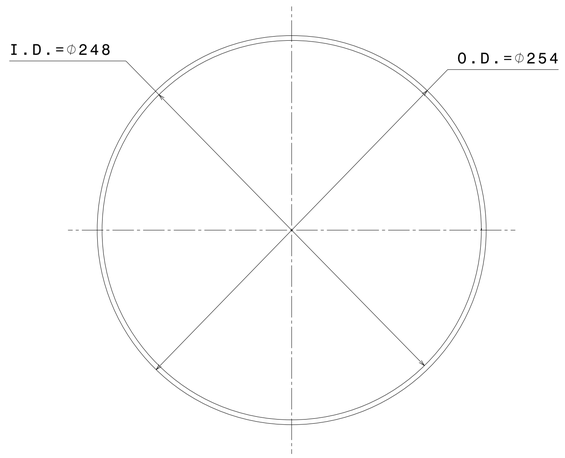
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

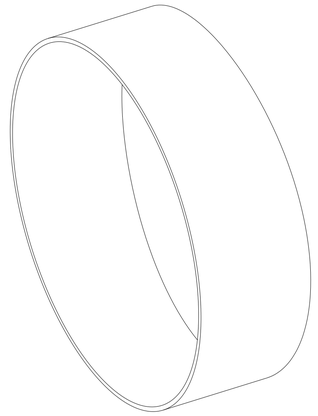
REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.	
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	TITLE: LOWER PART
DRAWN	A.N.N.	05/07/2015	
CHECKED	R.K.		REF DRG NO: VB01-001-R1 — REV R1
APPROVED	M.K.G.		DRG.NO VB01-003-R1 — SHEET 08 OF 09

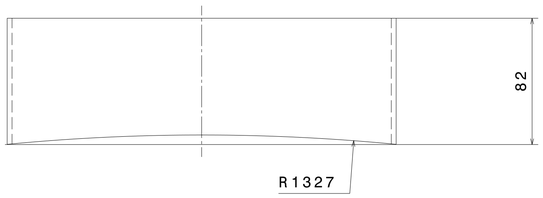
THIRD ANGLE PROJECTION



TOP VIEW

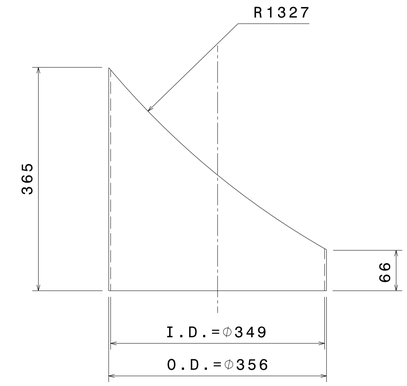


ISOMETRIC VIEW

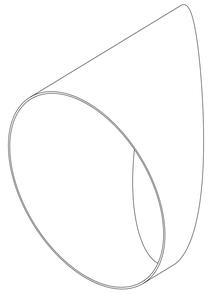


FRONT VIEW

14 PORT-F NOZZLE
SCALE-1:2

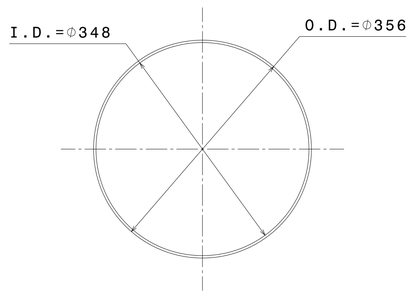


FRONT VIEW

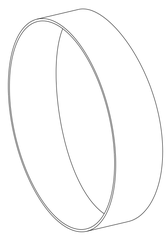


ISOMETRIC VIEW

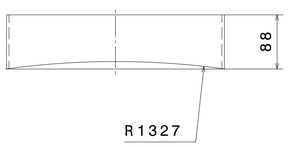
12 PORT-D NOZZLE
SCALE-1:5



TOP VIEW

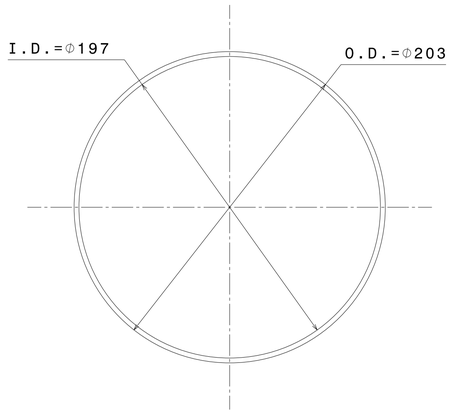


ISOMETRIC VIEW

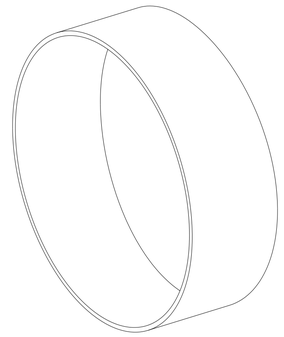


FRONT VIEW

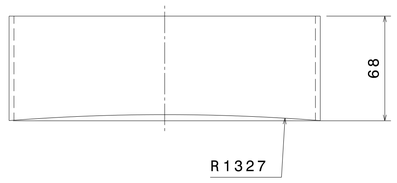
13 PORT-E NOZZLE
SCALE-1:5



TOP VIEW



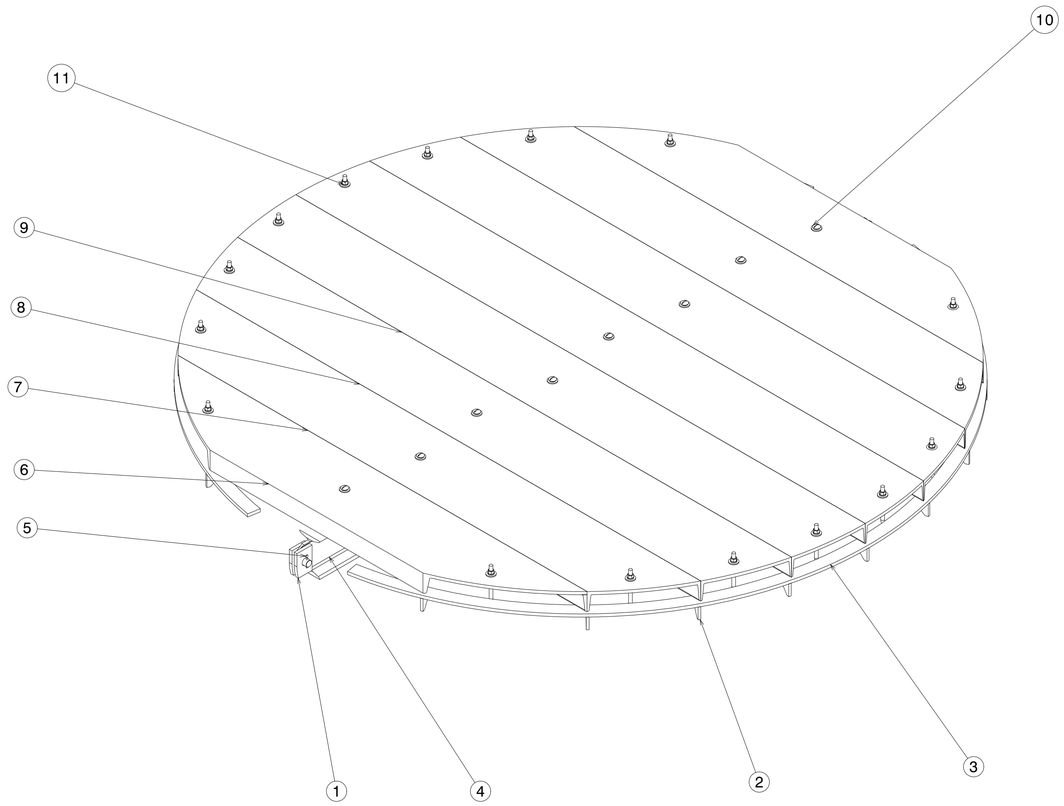
ISOMETRIC VIEW



FRONT VIEW

15 PORT-G NOZZLE
SCALE-1:2

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025	REVISION COLUMN						MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.						
CO-ORDINATED BY					REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED						
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS											SCALE	AS NOTED	DATE		TITLE		
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315			DRAWN	A.N.N.	05/07/2015	THIRD ANGLE PROJECTION	LOWER PART		
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5			CHECKED	R.K.			REF DRG NO: VB01-001-R1		REV R1
±1°	±0°-30'	±0°-20'	±0°-10'								APPROVED	M.K.G.			DRG.NO	VB01-003-R1	SHEET 09 OF 09



11 FLOOR ASSEMBLY

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
11	16	FLOOR HOLDING ROD ASSEMBLY	ALUMINIUM	VB01-004-R1/SHEET 04	-
10	08	SCREW ASSEMBLY	ALUMINIUM	VB01-004-R1/SHEET 04	-
9	02	FLOOR PLATE-4	ALUMINIUM	VB01-004-R1/SHEET 04	-
8	02	FLOOR PLATE-3	ALUMINIUM	VB01-004-R1/SHEET 04	-
7	02	FLOOR PLATE-2	ALUMINIUM	VB01-004-R1/SHEET 04	-
6	02	FLOOR PLATE-1	ALUMINIUM	VB01-004-R1/SHEET 04	-
5	02	PIN ASSEMBLY	ALUMINIUM	VB01-004-R1/SHEET 03	-
4	01	SUPPORT BAR	ALUMINIUM	VB01-004-R1/SHEET 03	-
3	02	SUPPORT RING	ALUMINIUM	VB01-004-R1/SHEET 03	-
2	18	SUPPORT BRACKET-2	ALUMINIUM	VB01-004-R1/SHEET 03	-
1	04	SUPPORT BRACKET-1	ALUMINIUM	VB01-004-R1/SHEET 03	-

MATERIAL: ▽ 8-25 | ▽▽ 1.6-8 | ▽▽▽ 0.025-1.6 | ▽▽▽▽ < 0.025

CO-ORDINATED BY

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED | SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

SCALE 1:10 | DATE

THIRD ANGLE PROJECTION

TITLE: FLOOR ASSEMBLY

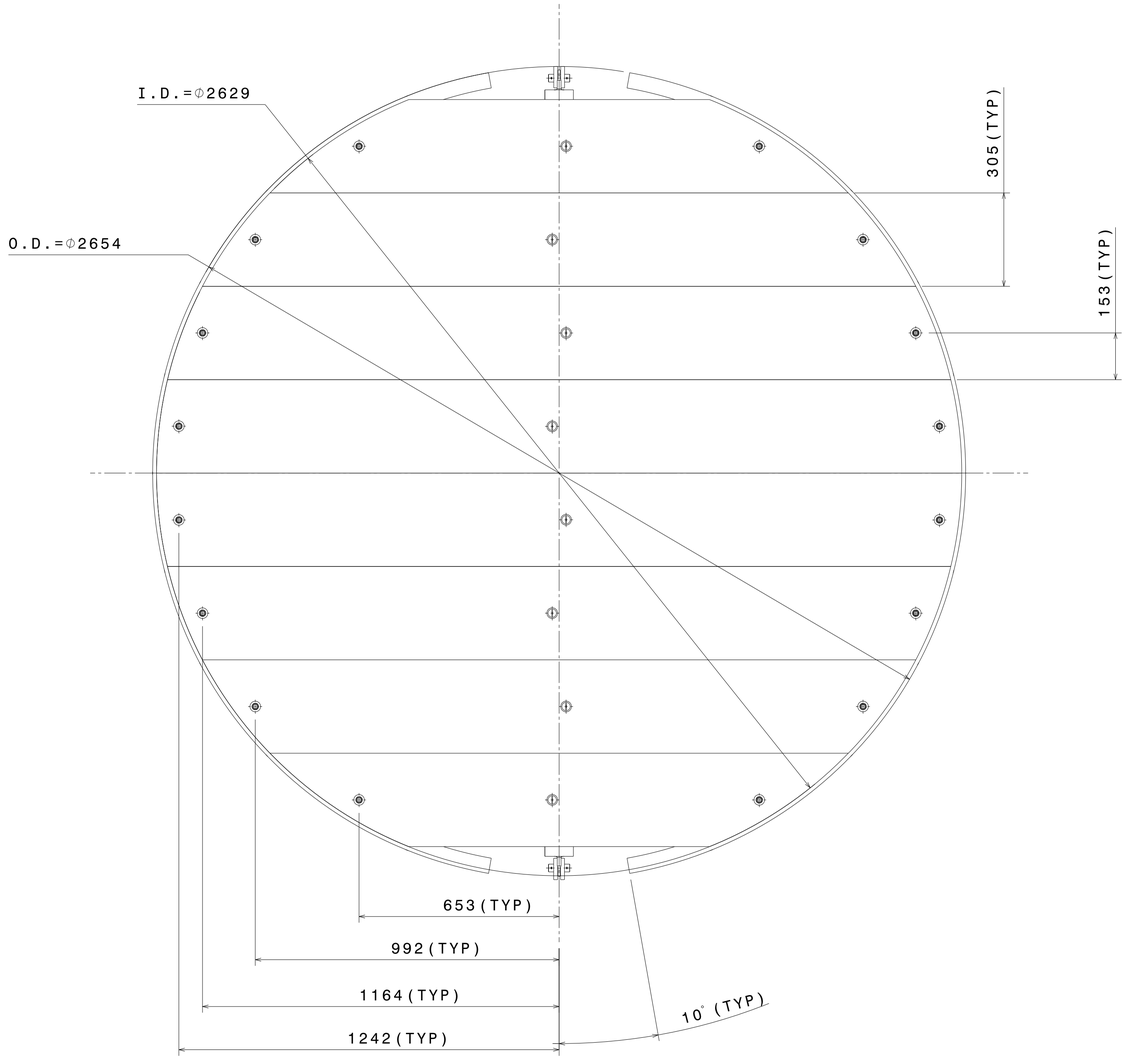
DRAWN A.N.N. 06/07/2015

CHECKED R.K.

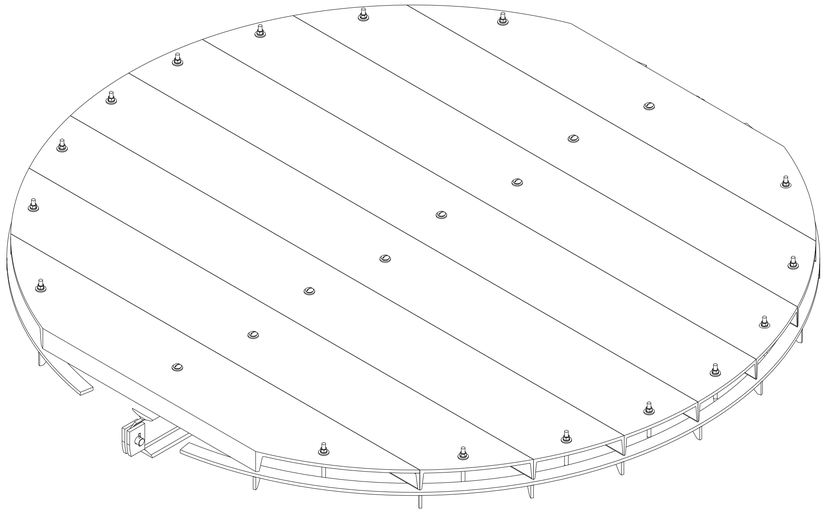
APPROVED M.K.G.

REF DRG NO: VB01-003-R1 | REV R1

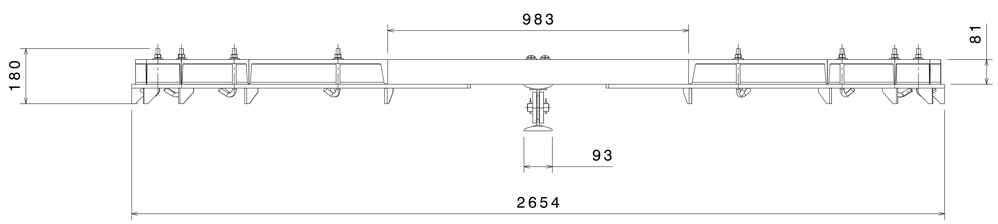
DRG.NO VB01-004-R1 | SHEET 01 OF 04



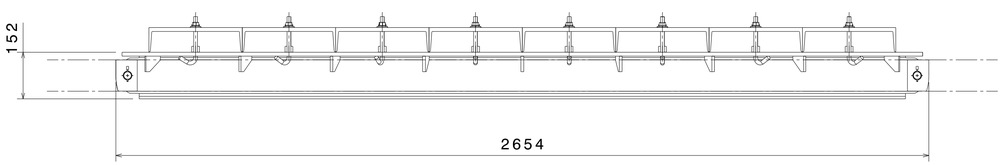
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

⑪ FLOOR ASSEMBLY

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

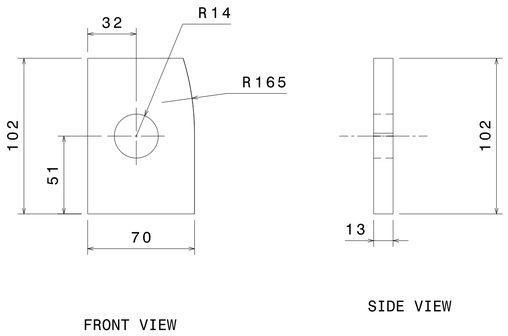
MED			SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED			
SCALE	1:10	DATE	
DRAWN	A.N.N.	06/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

THIRD ANGLE PROJECTION

TITLE
FLOOR ASSEMBLY

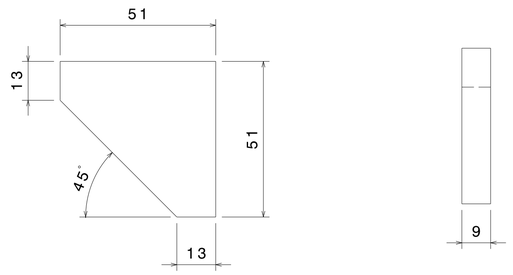
REF DRG NO: VB01-003-R1
REV R1
DRG.NO VB01-004-R1
SHEET 02 OF 04



FRONT VIEW

SIDE VIEW

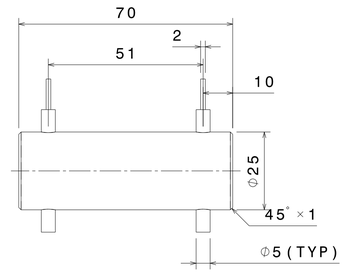
(1) SUPPORT BRACKET-1
SCALE-1:2



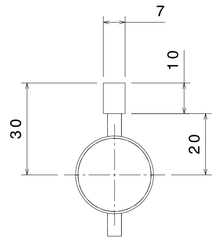
FRONT VIEW

SIDE VIEW

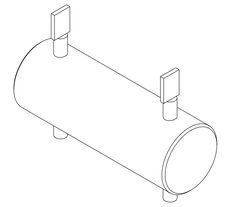
(2) SUPPORT BRACKET-2
SCALE-1:1



FRONT VIEW



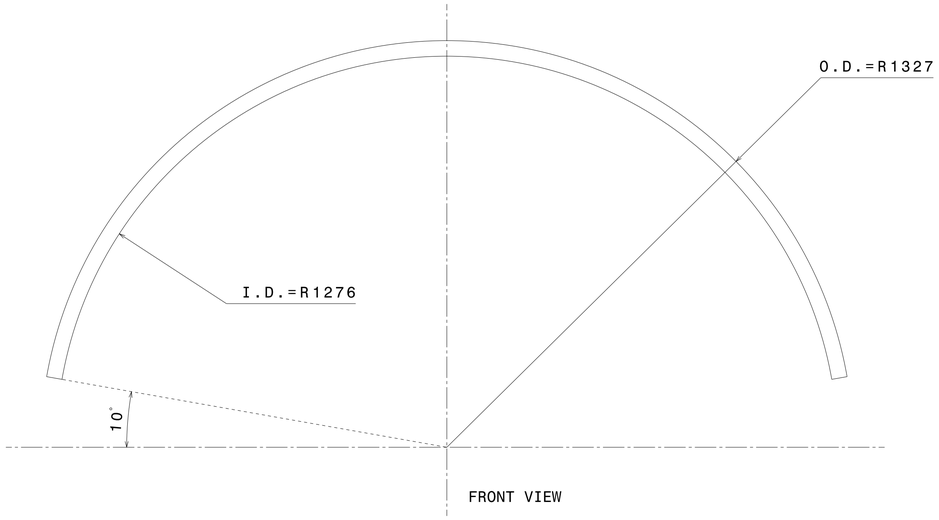
SIDE VIEW



ISOMETRIC VIEW

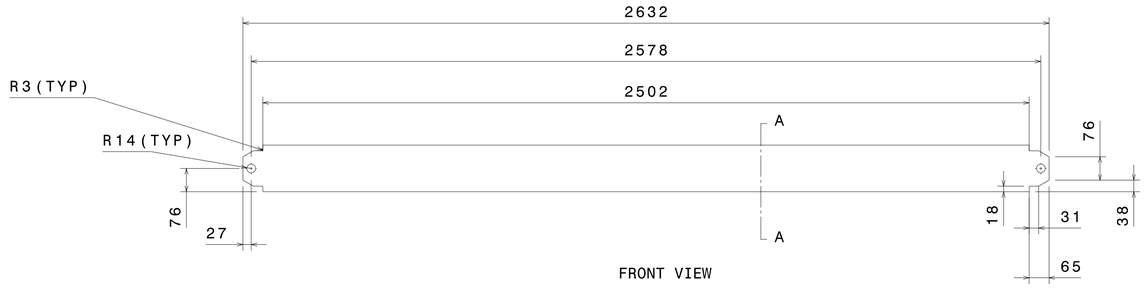
(5) PIN ASSEMBLY
SCALE-1:1

TOP VIEW

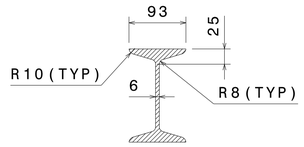


FRONT VIEW

(3) SUPPORT RING
SCALE-1:10



FRONT VIEW



SECTION A-A
SCALE-1:5

(4) SUPPORT BAR
SCALE-1:10

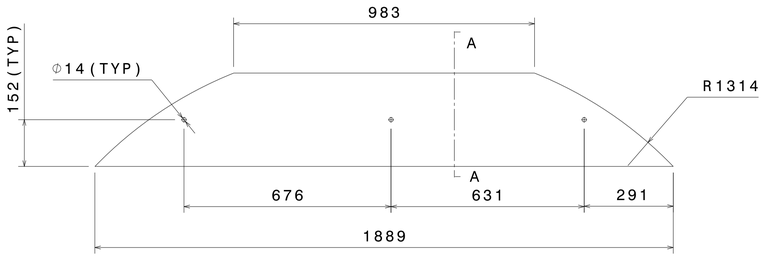
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

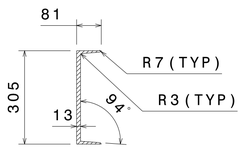
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	TITLE: FLOOR ASSEMBLY
DRAWN	A.N.N.	06/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		REF DRG NO: VB01-003-R1 — REV R1
APPROVED	M.K.G.		DRG.NO VB01-004-R1 — SHEET 03 OF 04

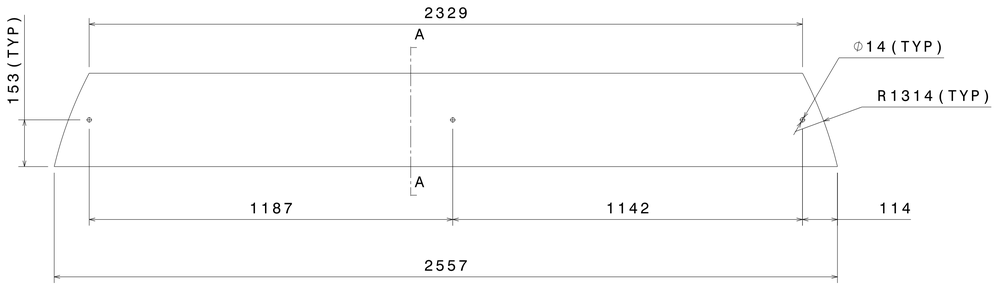


FRONT VIEW

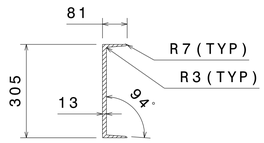


SECTION A-A

6 FLOOR PLATE-1
SCALE-1:10

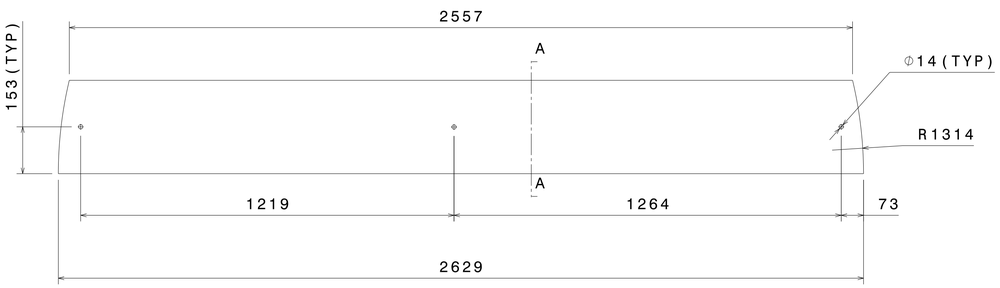


FRONT VIEW

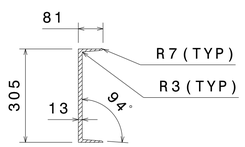


SECTION A-A

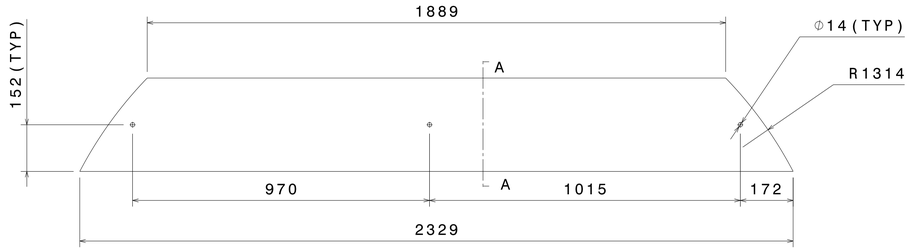
9 FLOOR PLATE-4
SCALE-1:10



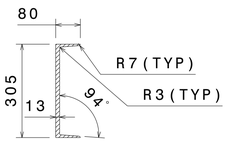
FRONT VIEW



SECTION A-A

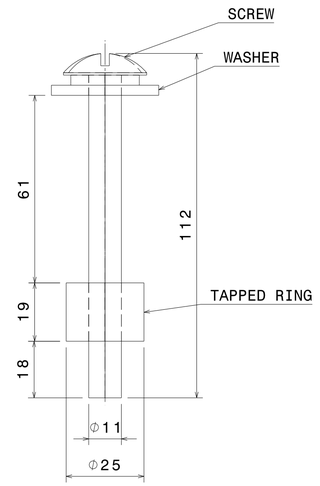


FRONT VIEW



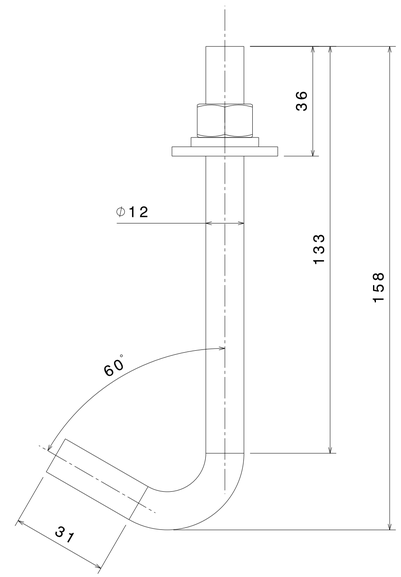
SECTION A-A

7 FLOOR PLATE-2
SCALE-1:10



FRONT VIEW

10 SCREW ASSEMBLY
SCALE-1:1



FRONT VIEW

11 FLOOR HOLDING ROD ASSEMBLY
SCALE-1:1

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025															
CO-ORDINATED BY																			
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS																			
LENGTH IN mm OF SHORTER SIDE OF ANGLES					LENGTH OR DIA	UPTO 6	6-30	30-120	120-315										
UPTO 10	10-50	50-120	OVER 120-400																
±1°	±0°-30'	±0°-20'	±0°-10'			±0.1	±0.2	±0.3	±0.5										

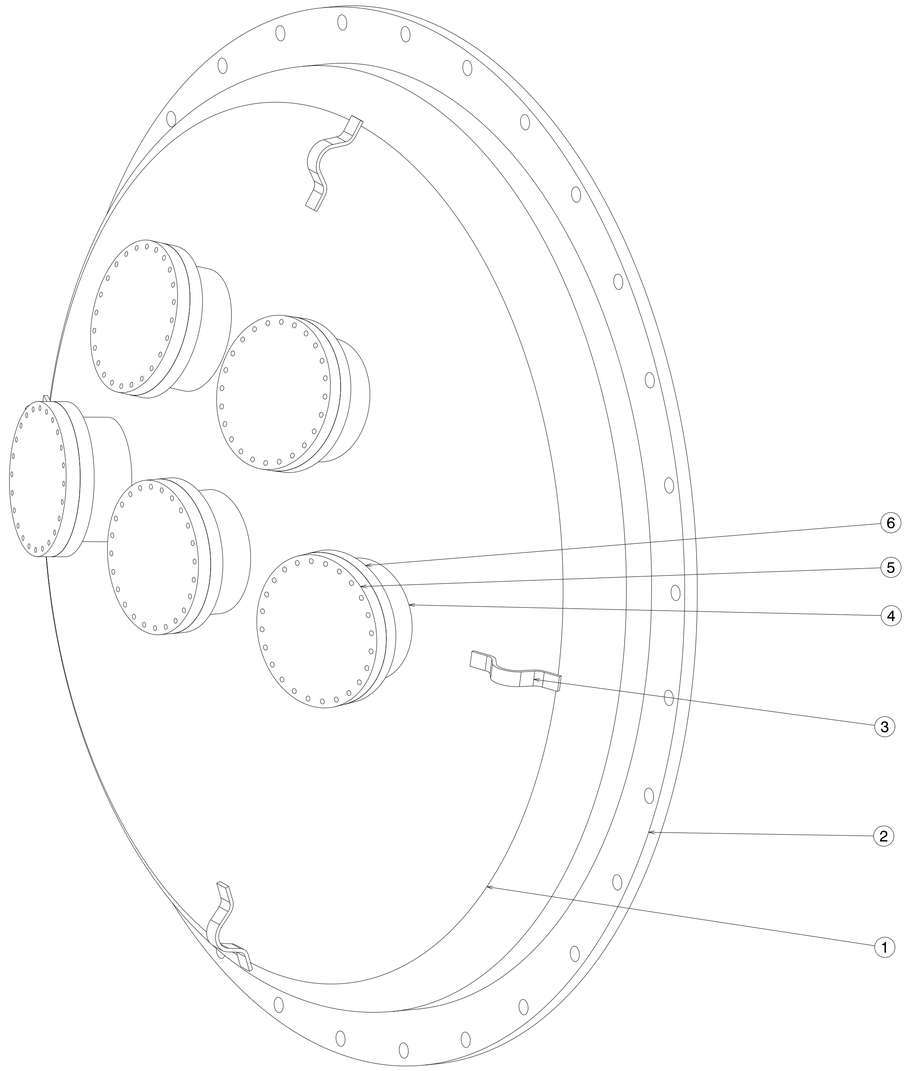
REVISION COLUMN						
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	

MED		SIZE	A1
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	
DRAWN	A.N.N.	06/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		
DRG.NO	VB01-004-R1		SHEET 04 OF 04
REF DRG NO:	VB01-003-R1		REV R1

THIRD ANGLE PROJECTION

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

TITLE
FLOOR ASSEMBLY



03 END COVER TYPE-1

PART NO.	QUANTITY	PART NAME	MATERIAL	REF.DWG. NO.	REMARK
6	05	DN 200CF BLANK FLANGE	SS304L	V001-001-R0/SHEET 01	
5	05	DN 200CF COVER FLANGE	SS304L	V001-001-R0/SHEET 01	-
4	05	PORT NOZZLE	SS304L	VB01-005-R1/SHEET 03	-
3	04	LIFTING LUG	SS304L	VB01-005-R1/SHEET 03	-
2	01	FLANGE FLAT(60.5"ID)	SS304L	VB01-005-R1/SHEET 03	-
1	01	F & D HEAD	SS304L	VB01-005-R1/SHEET 03	-

MATERIAL: ▽ 8-25 | ▽▽ 1.6-8 | ▽▽▽ 0.025-1.6 | ▽▽▽▽ < 0.025

CO-ORDINATED BY

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1'	±0'-30'	±0'-20'	±0'-10'		±0.1	±0.2	±0.3	±0.5

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

REVISION COLUMN

MED | SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

SCALE 1:5 | DATE

THIRD ANGLE PROJECTION

TITLE: END COVER TYPE-1

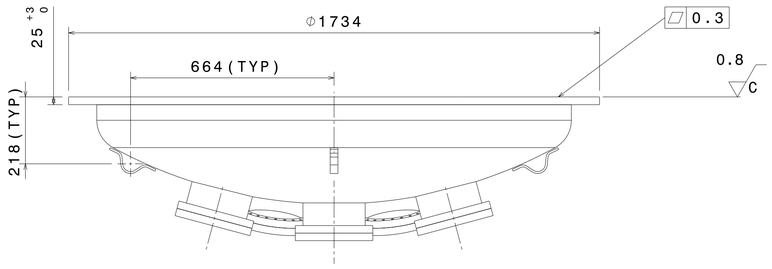
DRAWN A.N.N. 09/07/2015

CHECKED R.K.

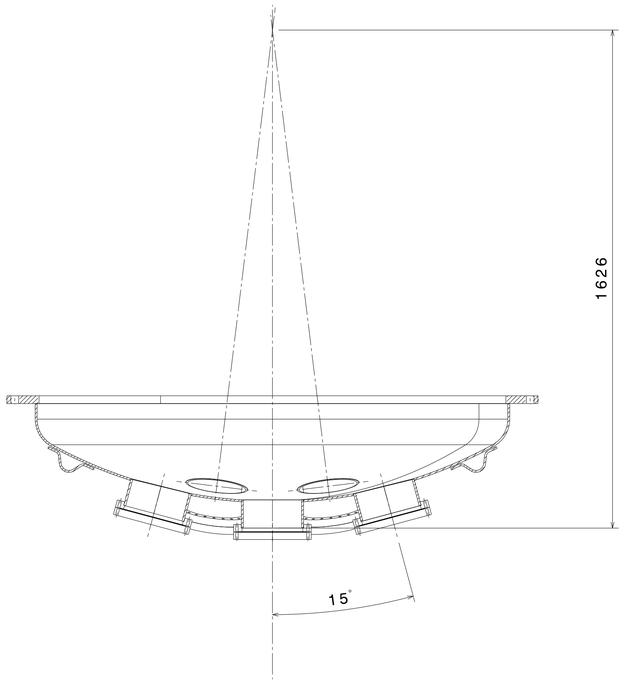
APPROVED M.K.G.

REF DRG NO: VB01-001-R1 | REV R1

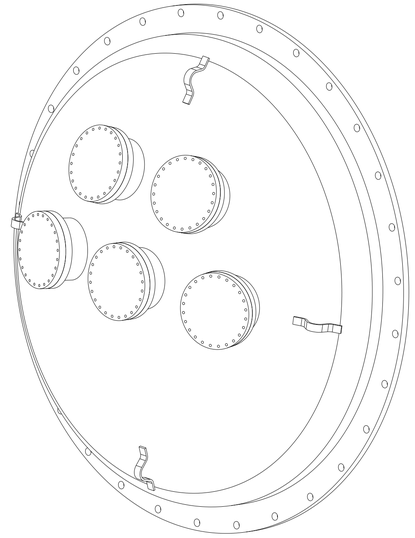
DRG.NO VB01-005-R1 | SHEET 01 OF 03



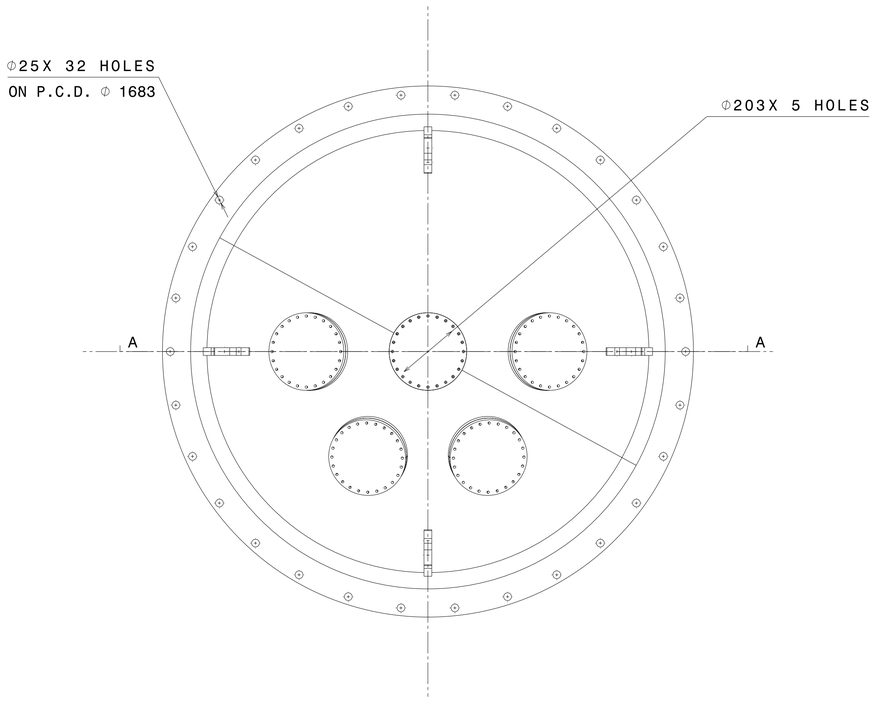
FRONT VIEW



SECTION A-A



ISOMETRIC VIEW



BOTTOM VIEW

(3) END COVER TYPE-1

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

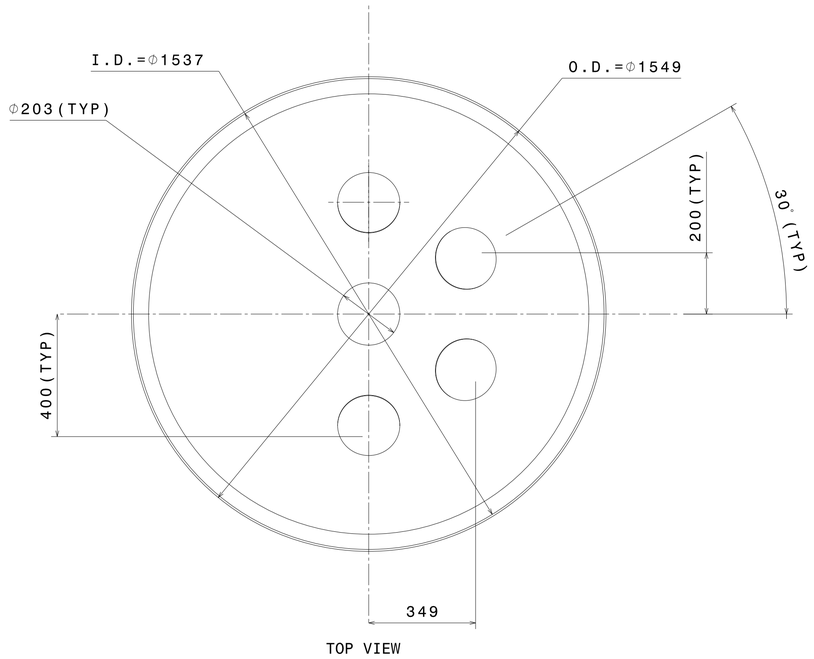
MED		SIZE	A1
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:10	DATE	
DRAWN	A.N.N.	09/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

THIRD ANGLE PROJECTION

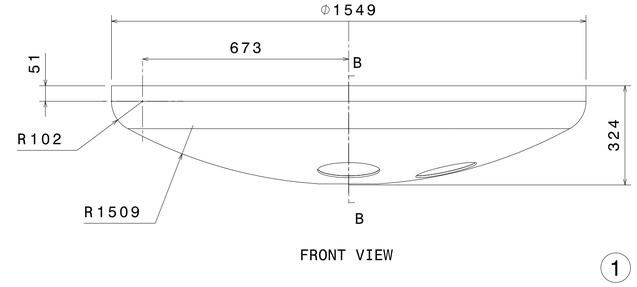
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

TITLE
END COVER TYPE-1

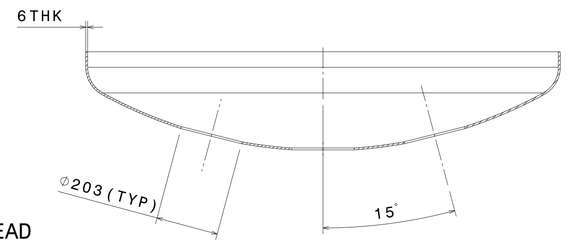
REF DRG NO:	VB01-001-R1		REV R1
DRG.NO	VB01-005-R1		SHEET 02 OF 03



TOP VIEW

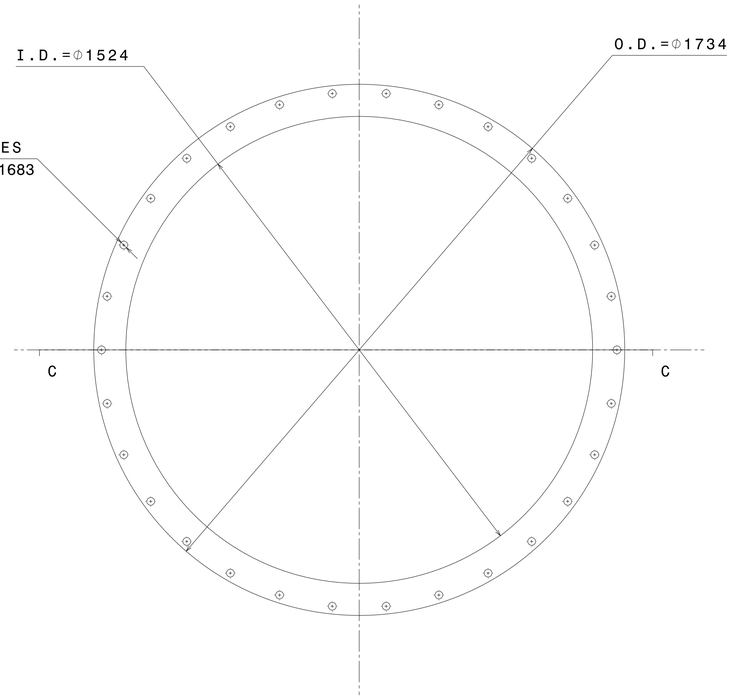


FRONT VIEW

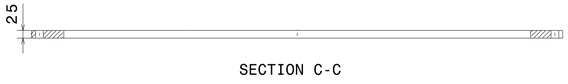


SECTION B-B

1 F & D HEAD
SCALE-1:10

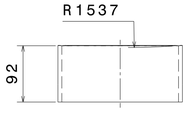


FRONT VIEW

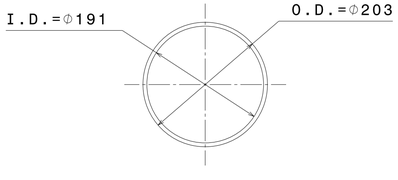


SECTION C-C

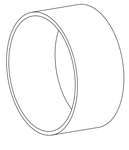
2 FLANGE FLAT (60.5"ID)
SCALE-1:10



TOP VIEW

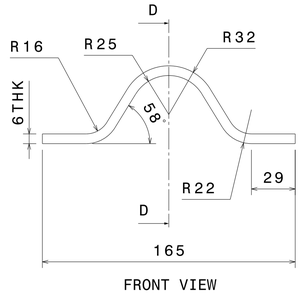


FRONT VIEW

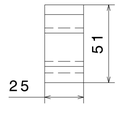


ISOMETRIC VIEW

4 PORT NOZZLE
SCALE-1:5



FRONT VIEW



SECTION D-D

3 LIFTING LUG
SCALE-1:2

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

MED | SIZE A1

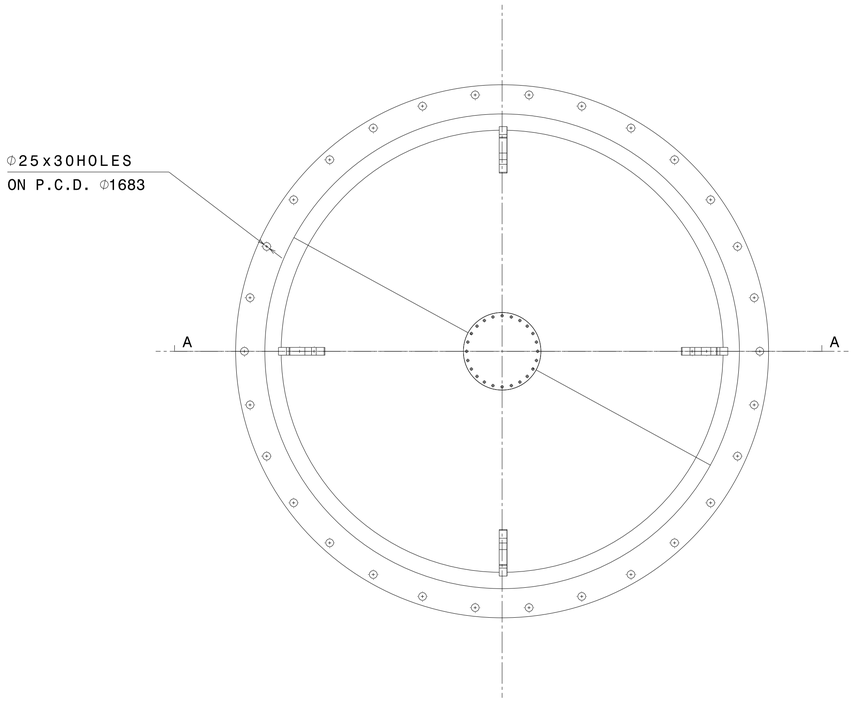
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

SCALE	AS NOTED	DATE	
DRAWN	A.N.N.	09/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		
APPROVED	M.K.G.		

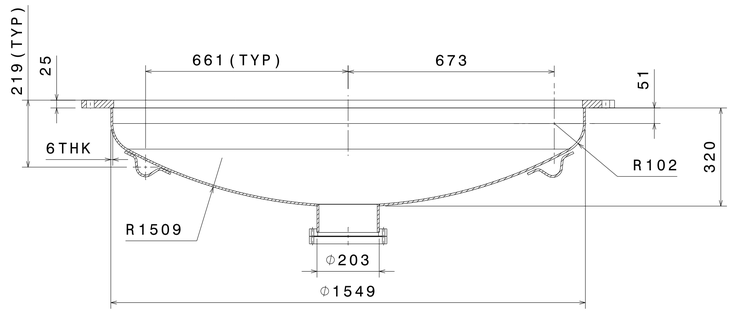
TITLE: END COVER TYPE-1

REF DRG NO: VB01-001-R1 REV R1

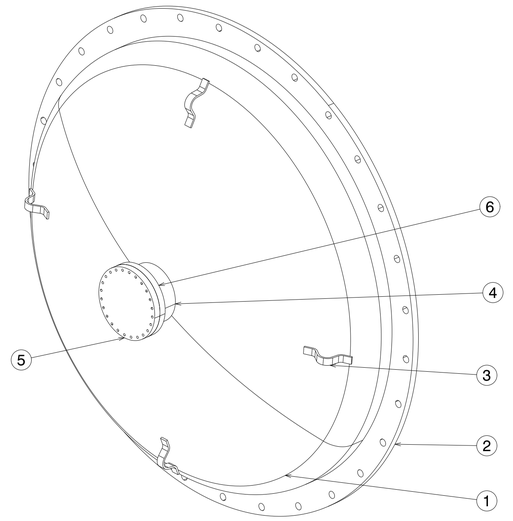
DRG.NO VB01-005-R1 SHEET 03 OF 03



FRONT VIEW



SECTION A-A



ISOMETRIC VIEW

6	01	DN 200CF BLANK FLANGE	SS304L	V001-001-R0/SHEET 01	
5	01	DN 200CF COVER FLANGE	SS304L	V001-001-R0/SHEET 01	-
4	01	PORT NOZZLE	SS304L	VB01-005-R1/SHEET 03	-
3	04	LIFTING LUG	SS304L	VB01-005-R1/SHEET 03	-
2	01	FLANGE FLAT(60.5"ID)	SS304L	VB01-005-R1/SHEET 03	-
1	01	F & D HEAD	SS304L	VB01-006-R1/SHEET 01	
PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK

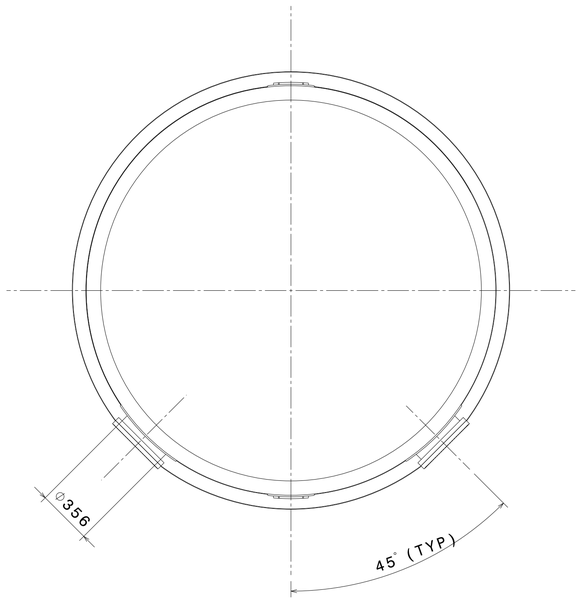
④ END COVER TYPE-A11

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

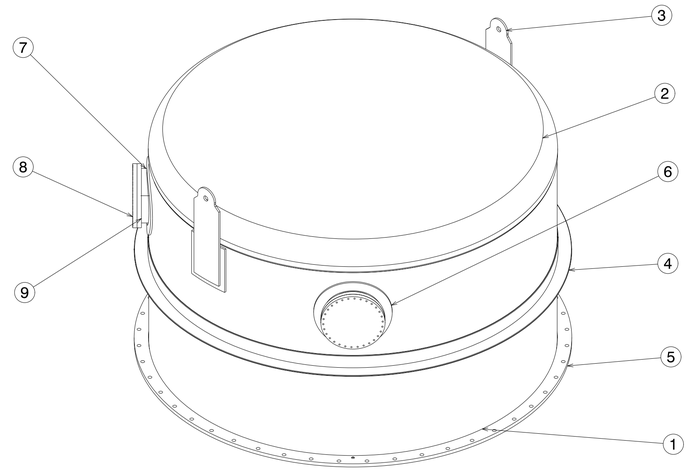
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

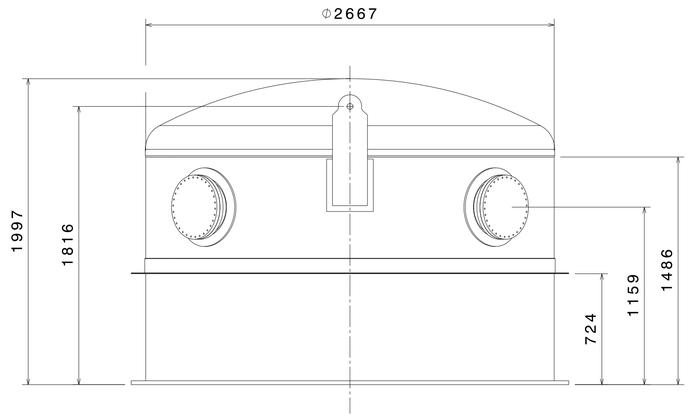
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:10	DATE	TITLE: END COVER TYPE-A11
DRAWN	A.N.N.	11/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		REF DRG NO: VB01-001-R1 — REV R1
APPROVED	M.K.G.		DRG.NO VB01-006-R1 — SHEET 01 OF 01



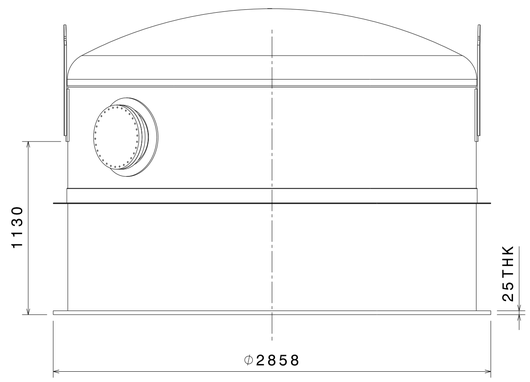
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
9	02	CUSTOM CF BLANK FLANGE (16 1/2")	SS304L	VO01-001-R0/SHEET 04	
8	02	CUSTOM CF COVER FLANGE (16 1/2")	SS304L	VO01-001-R0/SHEET 04	-
7	02	PORT NOZZLE	SS304L	VB01-007-R1/SHEET 03	-
6	02	RING NOZZLE	SS304L	VB01-007-R1/SHEET 03	-
5	01	FLANGE FLAT (104.5"ID)	SS304L	VB01-007-R1/SHEET 03	-
4	01	STIFFENER	SS304L	VB01-007-R1/SHEET 03	-
3	02	LIFTING LUG	SS304L	VB01-007-R1/SHEET 03	-
2	01	UPPER F & D HEAD	SS304L	VB01-007-R1/SHEET 02	-
1	01	CYLINDRICAL SHELL	SS304L	VB01-007-R1/SHEET 02	-

5 UPPER PART

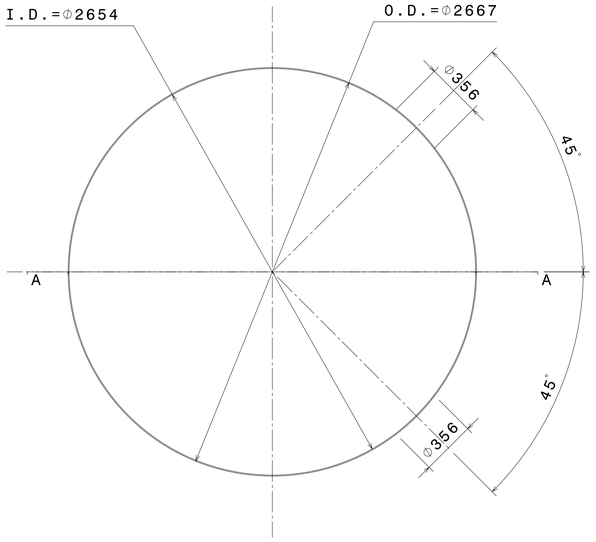
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

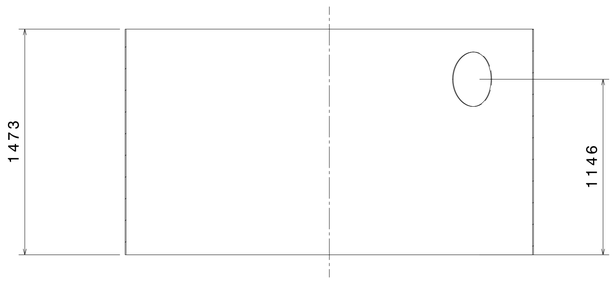
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:20	DATE	TITLE: UPPER PART
DRAWN	A.N.N.	12/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		REF DRG NO: VB01-001-R1 — REV R1
APPROVED	M.K.G.		DRG.NO: VB01-007-R1 — SHEET 01 OF 03

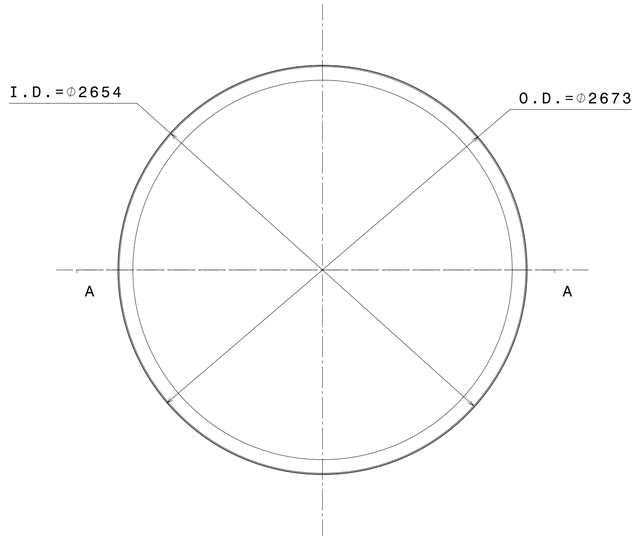


FRONT VIEW

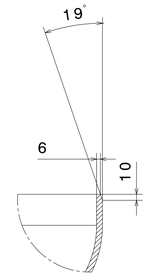


SECTION A-A

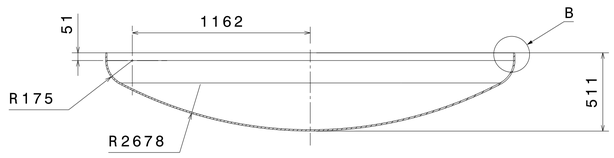
① CYLINDRICAL SHELL



FRONT VIEW



DETAIL VIEW-B
SCALE-1:5



SECTION A-A

② UPPER F & D HEAD

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES			
UPTO 10	10-50	50-120	OVER 120-400
±1°	±0°-30'	±0°-20'	±0°-10'

LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
	±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

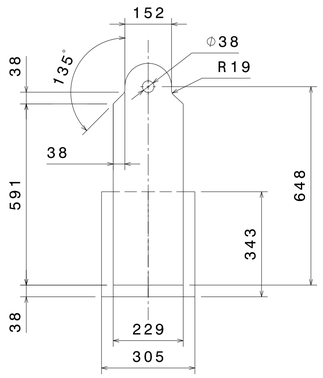
MED			SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED			
SCALE	1:20	DATE	
DRAWN	A.N.N.	12/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

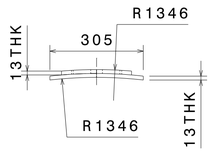
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

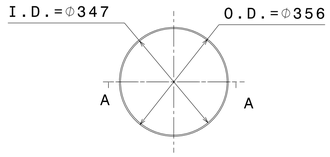
THIRD ANGLE PROJECTION

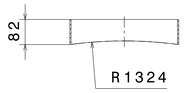
TITLE
UPPER PART

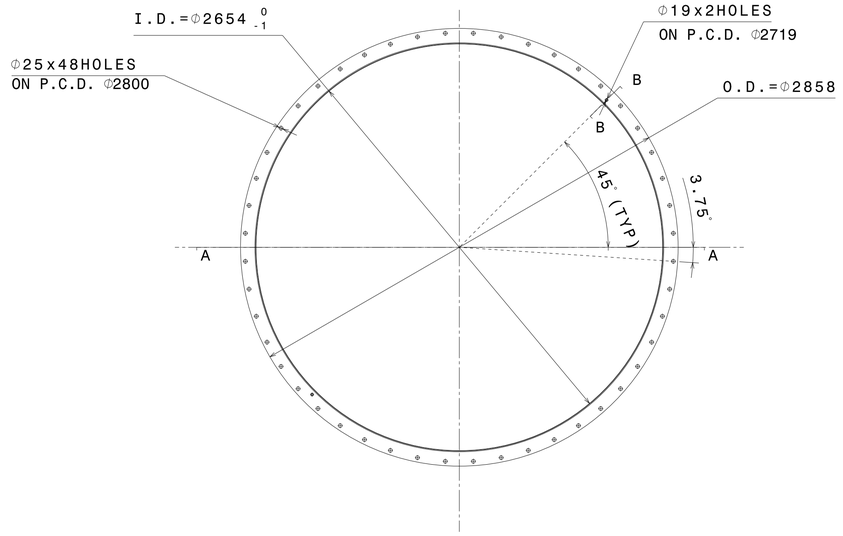
REF DRG NO: VB01-001-R1		REV R1
DRG.NO	VB01-007-R1	SHEET 02 OF 03

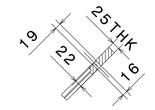


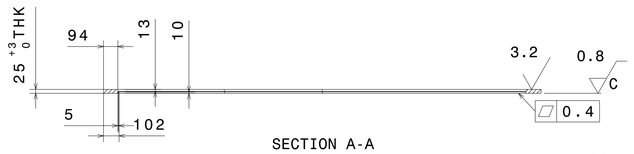


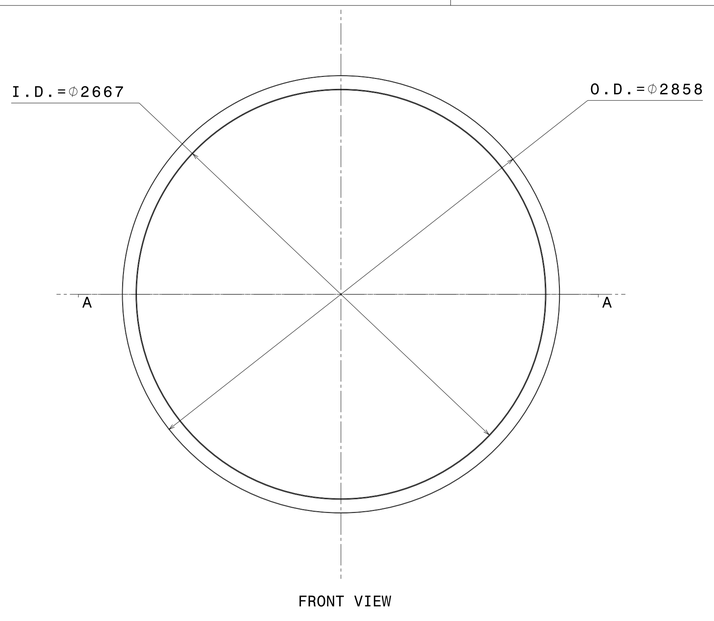


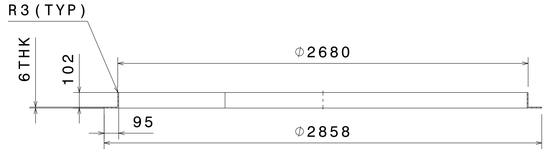


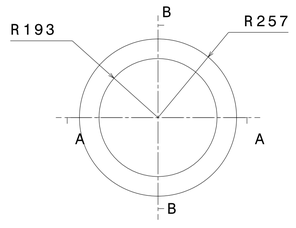


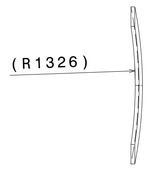


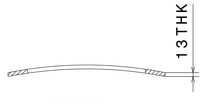












③ LIFTING LUG
SCALE-1:10

⑦ PORT NOZZLE
SCALE-1:10

⑤ FLANGE FLAT (104.5"ID)
SCALE-1:20

④ STIFFENER
SCALE-1:20

⑥ RING NOZZLE
SCALE-1:10

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	AS NOTED	DATE
DRAWN	A.N.N.	12/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

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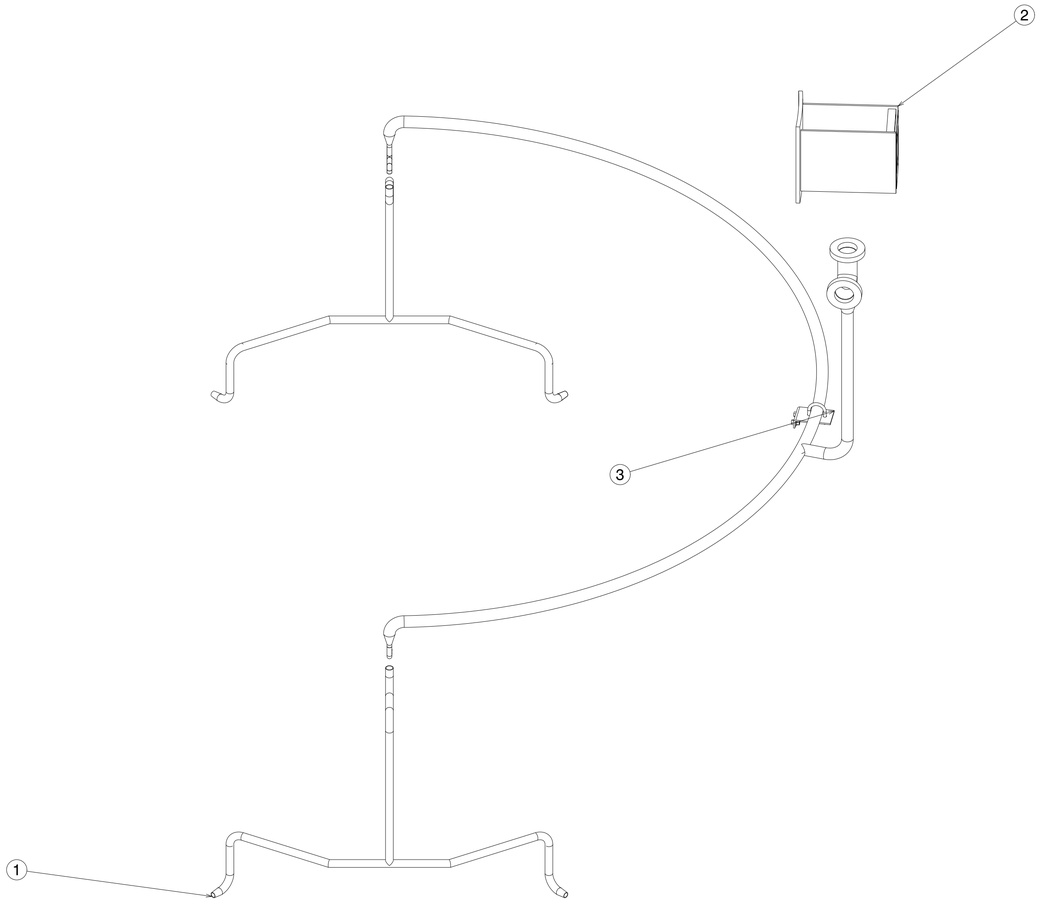
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

THIRD ANGLE PROJECTION

TITLE
UPPER PART

REF DRG NO:	VB01-001-R1	REV R1
DRG.NO	VB01-007-R1	SHEET 03 OF 03



6 ANNULUS TUBING ASSEMBLY

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
3	01	ANNULUS TUBE SUPPORT	SS304L	VB01-008-R1/SHEET 02	-
2	01	75 I/S ION PUMP SUPPORT	SS304L	VB01-008-R1/SHEET 02	-
1	01	TUBING ASSEMBLY	SS304L	VB01-008-R1/SHEET 02	-

MATERIAL: ▽ 8-25 ▽▽ 1.6-8 ▽▽▽ 0.025-1.6 ▽▽▽▽ < 0.025

CO-ORDINATED BY

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED | SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

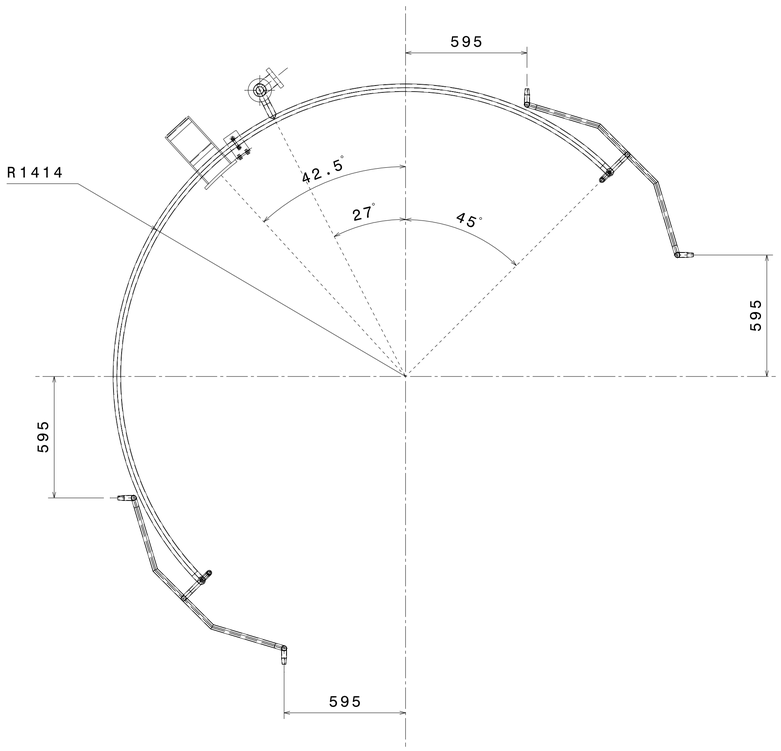
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

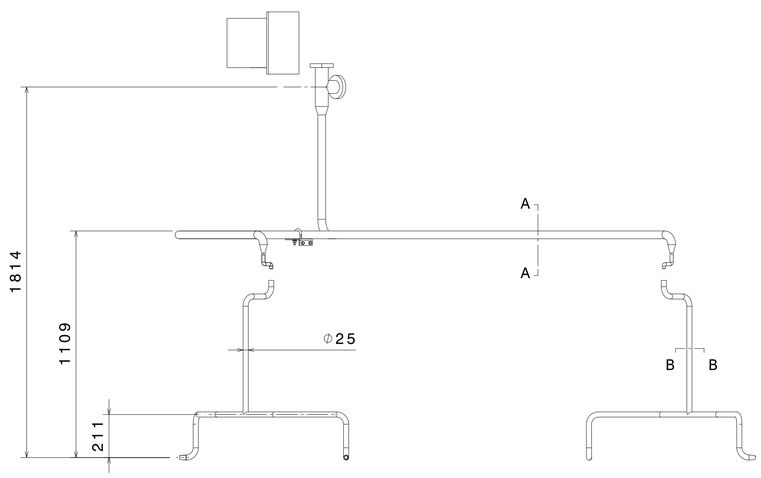
SCALE	1:10	DATE	
DRAWN	A.N.N.	13/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		
APPROVED	M.K.G.		

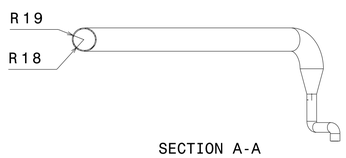
TITLE: ANNULUS TUBING ASSEMBLY

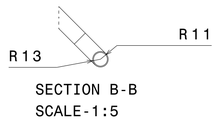
REF DRG NO: VB01-001-R1 REV R1

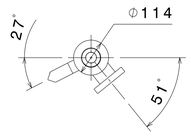
DRG.NO VB01-008-R1 SHEET 01 OF 02

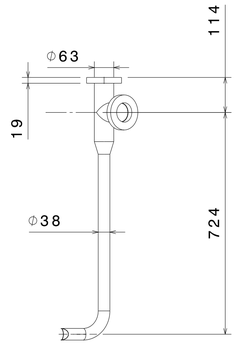


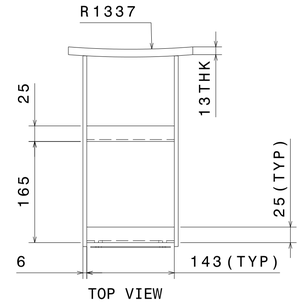


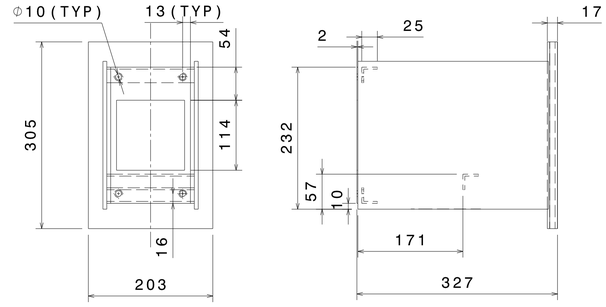


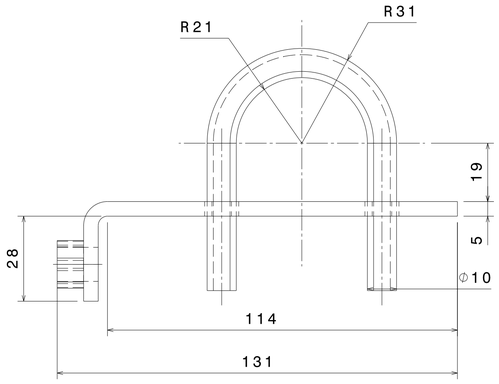


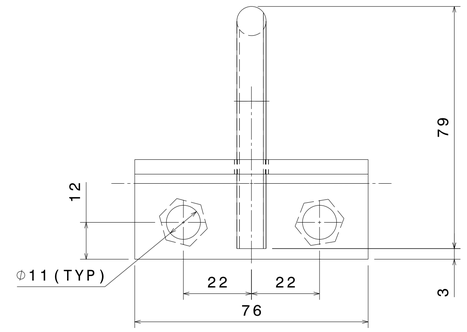












① TUBING ASSEMBLY
SCALE-1:15

② 75 I/S ION PUMP SUPPORT
SCALE-1:5

③ ANNULUS TUBE SUPPORT
SCALE-1:1

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025				
CO-ORDINATED BY								
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

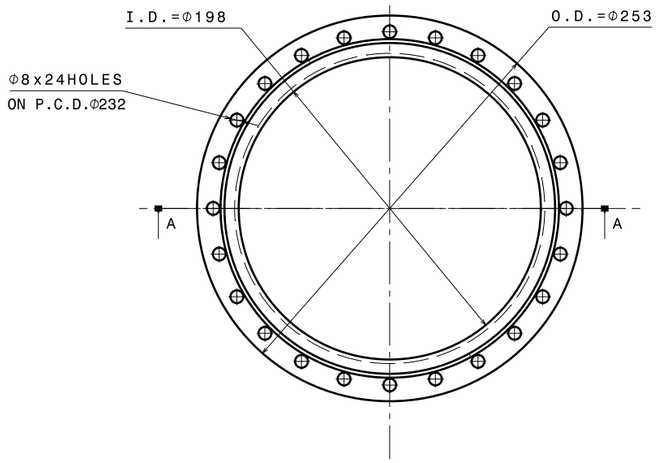
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	AS NOTED	DATE
DRAWN	A.N.N.	13/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

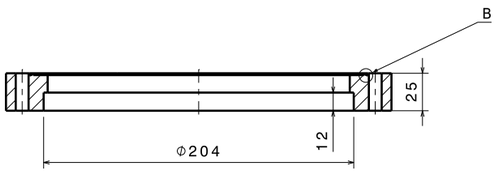
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

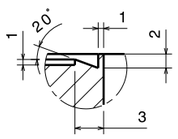
THIRD ANGLE PROJECTION

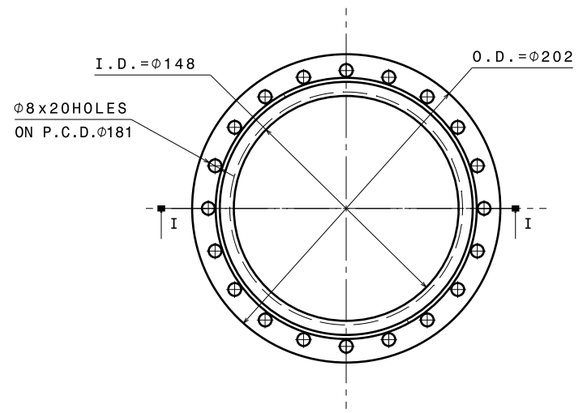
TITLE
ANNULUS TUBING ASSEMBLY

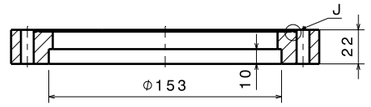
REF DRG NO:	VB01-001-R1	REV R1
DRG.NO	VB01-008-R1	SHEET 02 OF 02

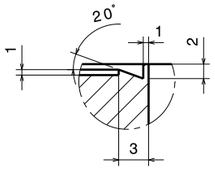


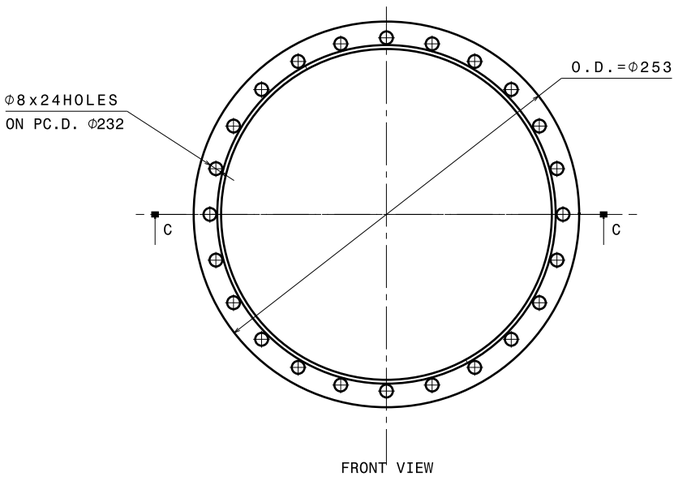


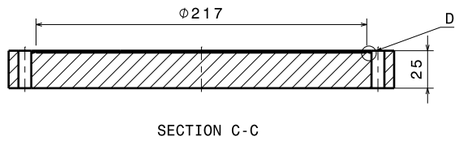


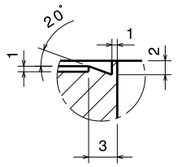


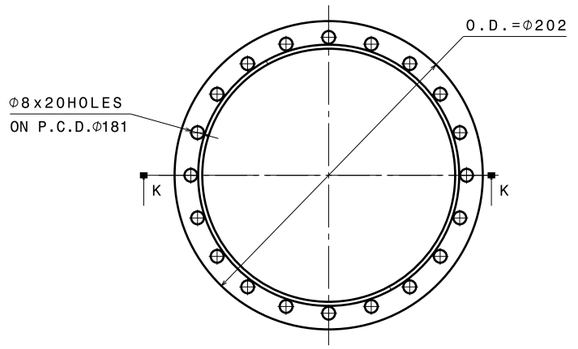


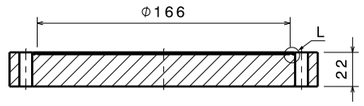


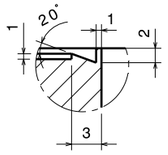












DN 200CF BLANK FLANGE

DN 160CF BLANK FLANGE

DN 200CF COVER FLANGE

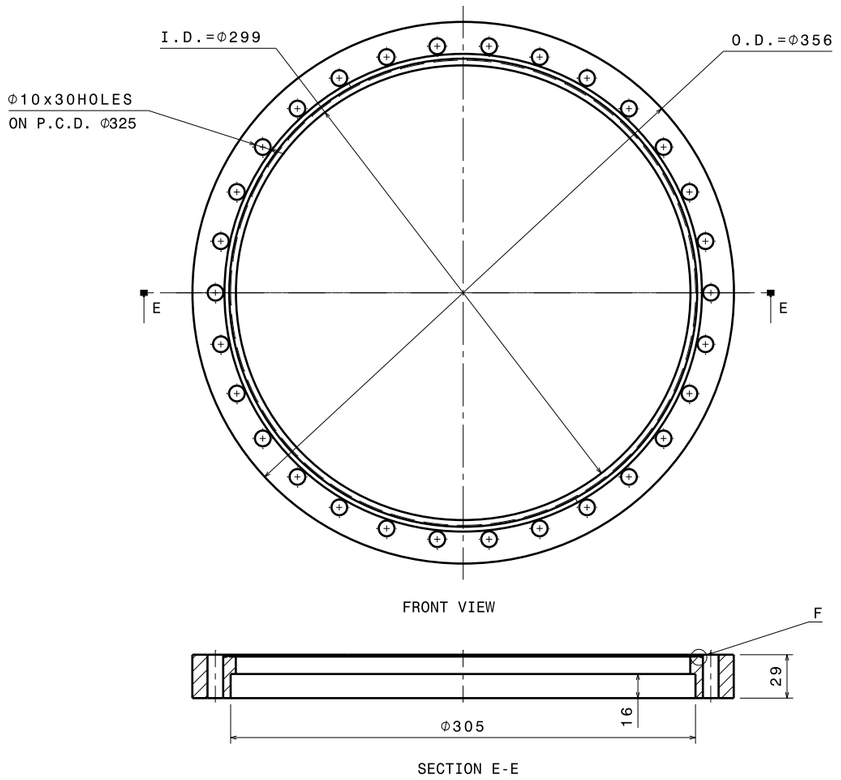
DN 160CF COVER FLANGE

MATERIAL:	▽ 8-25		▽▽ 1.6-8		▽▽▽ 0.025-1.6		▽▽▽▽ < 0.025	
CO-ORDINATED BY								
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

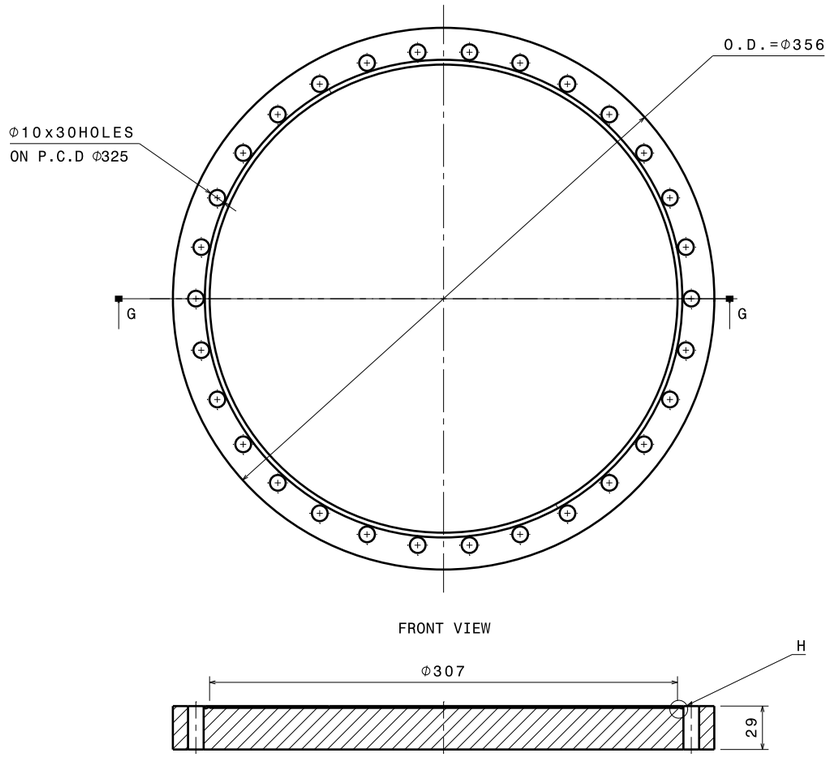
REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

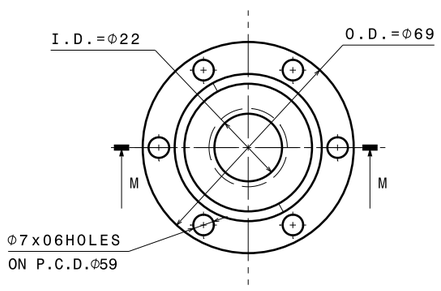
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.	
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED				
SCALE	1:2	DATE	THIRD ANGLE PROJECTION	TITLE STANDARD FLANGES
DRAWN	A.N.N.	04/06/2014		
CHECKED	R.K.		REF DRG NO: **NA**	REV R0
APPROVED	M.K.G.		DRG.NO V001-001-R0	SHEET 01 OF 05

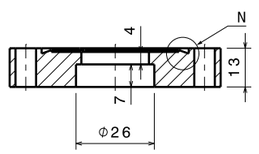


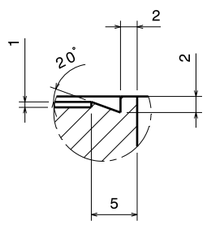
CUSTOM CF BLANK FLANGE (14")
SCALE-1:2



CUSTOM CF COVER FLANGE (14")
SCALE-1:2

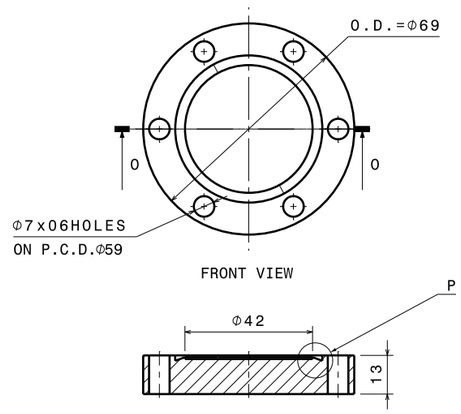


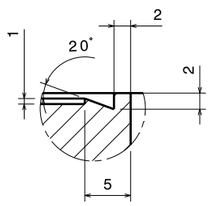




DETAIL VIEW-N
SCALE-3:1

DN 40CF BLANK FLANGE
SCALE-1:1





DETAIL VIEW-P
SCALE-3:1

DN 40CF COVER FLANGE
SCALE-1:1

MATERIAL:	8-25	1.6-8	0.025-1.6	< 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED		SIZE	A1
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	
DRAWN	A.N.N.	04/06/2014	
CHECKED	R.K.		
APPROVED	M.K.G.		

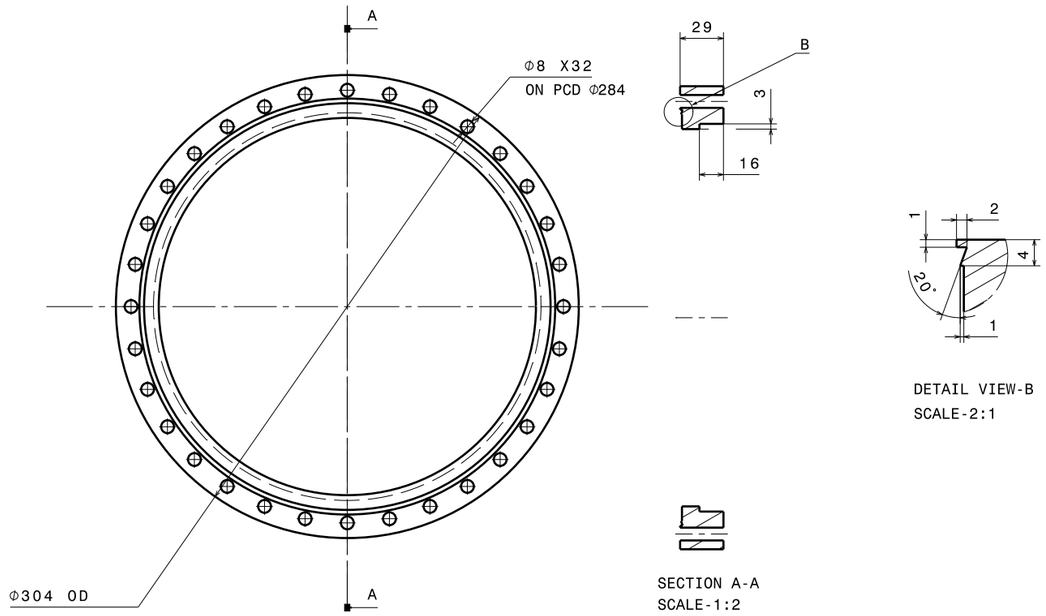
THIRD ANGLE PROJECTION

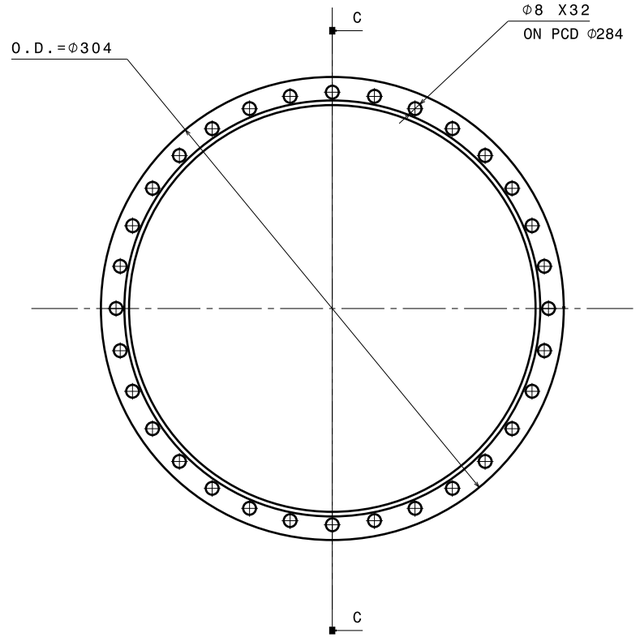
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

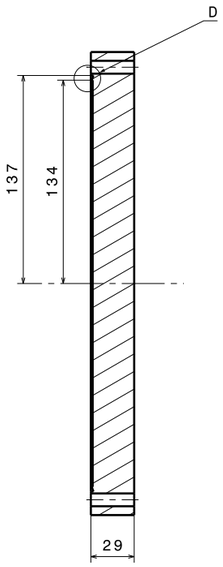
TITLE: STANDARD FLANGES

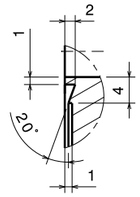
REF DRG NO: NA — REV R0

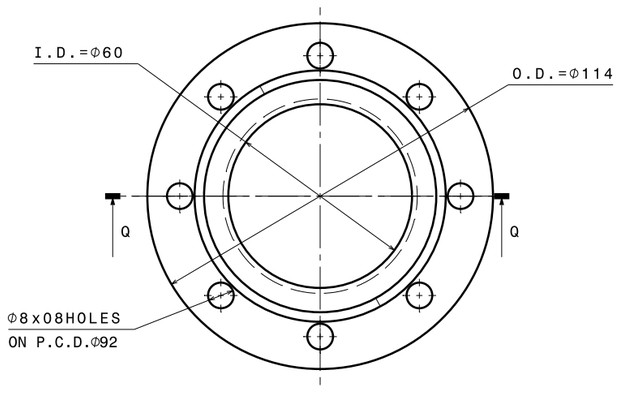
DRG.NO: V001-001-R0 — SHEET 02 OF 05

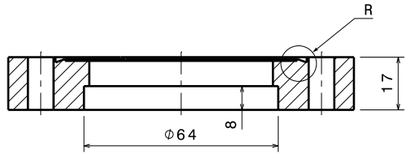


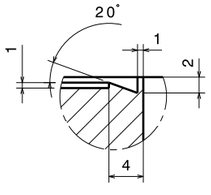


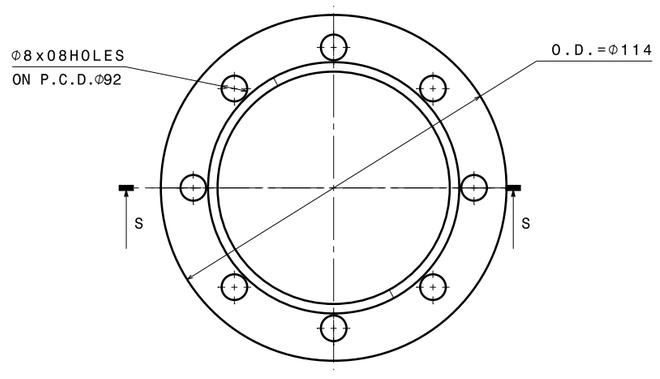


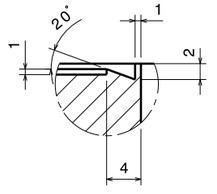


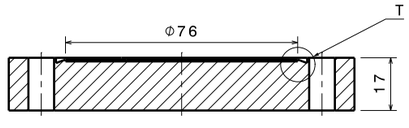












DN 250CF BLANK FLANGE
SCALE-1:2

DN 250CF COVER FLANGE
SCALE-1:2

DN 63CF BLANK FLANGE
SCALE-1:1

DN 63CF COVER FLANGE
SCALE-1:1

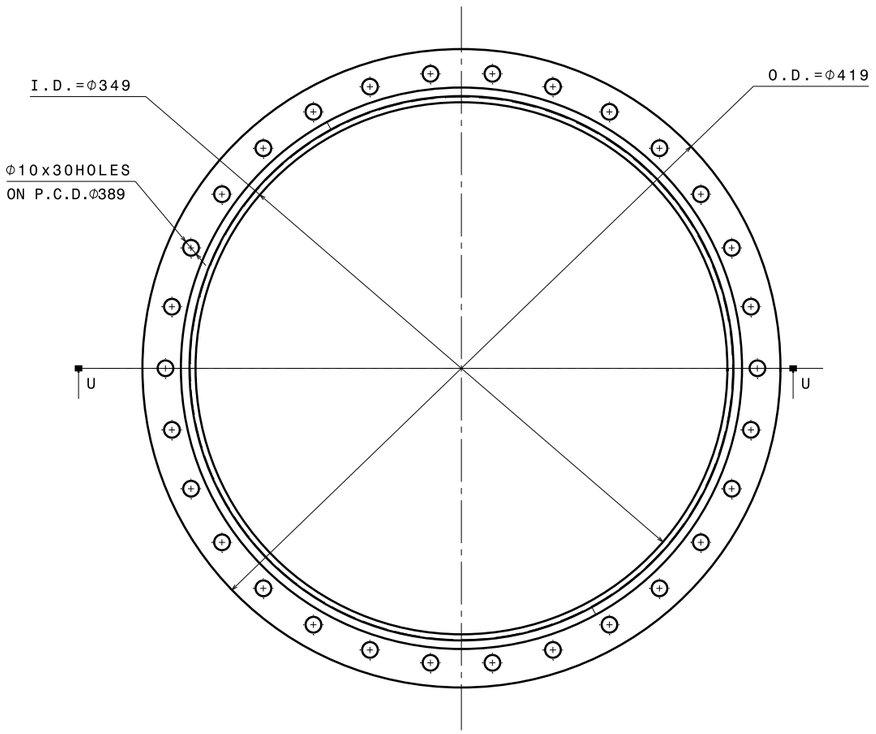
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

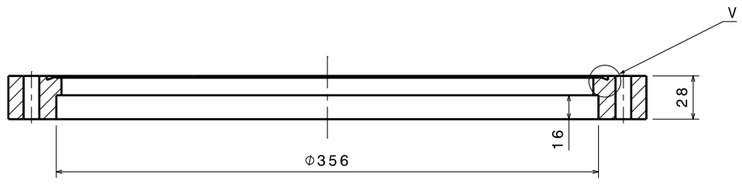
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

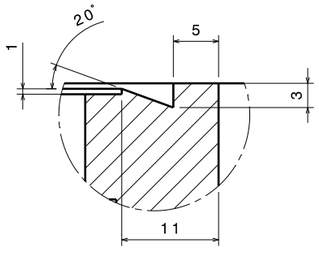
REVISION COLUMN

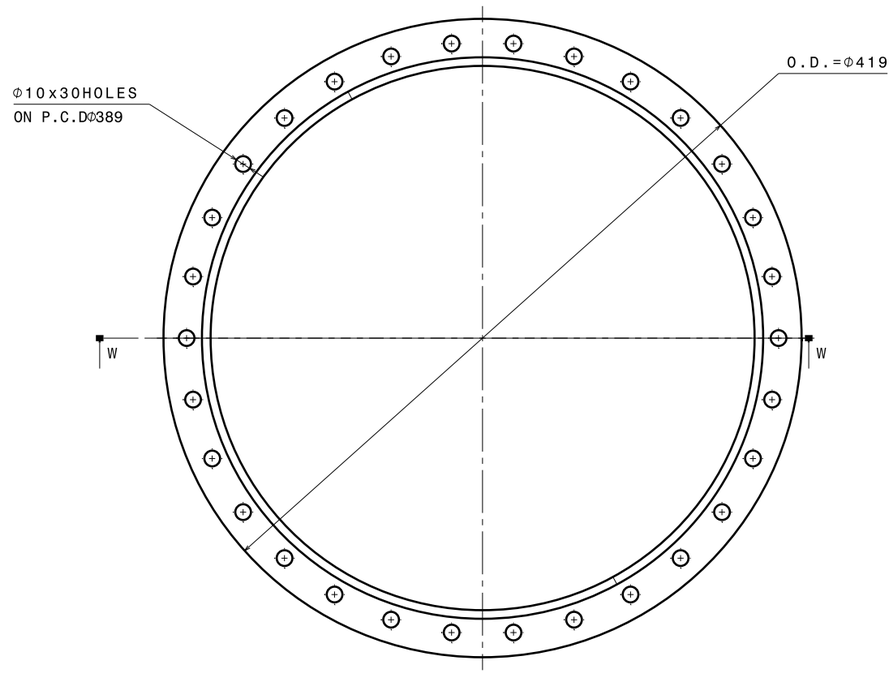
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

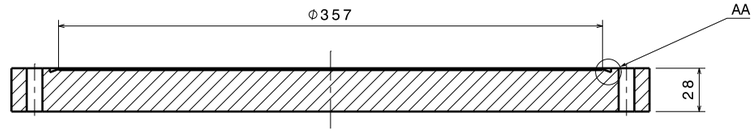
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	THIRD ANGLE PROJECTION — TITLE STANDARD FLANGES
DRAWN	A.N.N.	04/06/2014	
CHECKED	R.K.		REF DRG NO: NA — REV R0
APPROVED	M.K.G.		DRG.NO V001-001-R0 — SHEET 03 OF 05

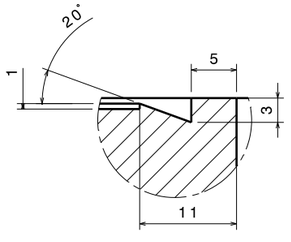












CUSTOM CF BLANK FLANGE (16 1/2")

DETAIL VIEW-V
SCALE-3:1

DETAIL VIEW-AA
SCALE-3:1

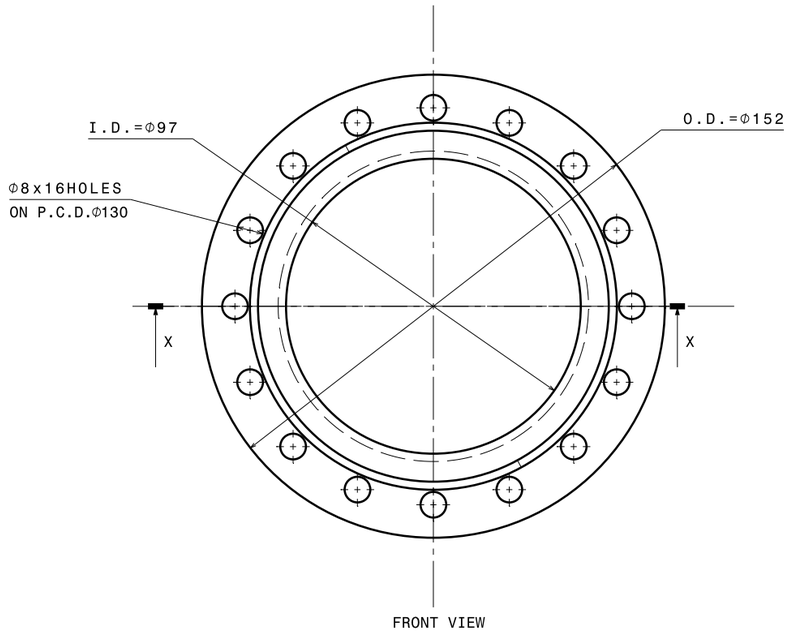
CUSTOM CF COVER FLANGE (16 1/2")

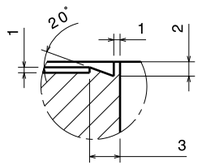
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS				

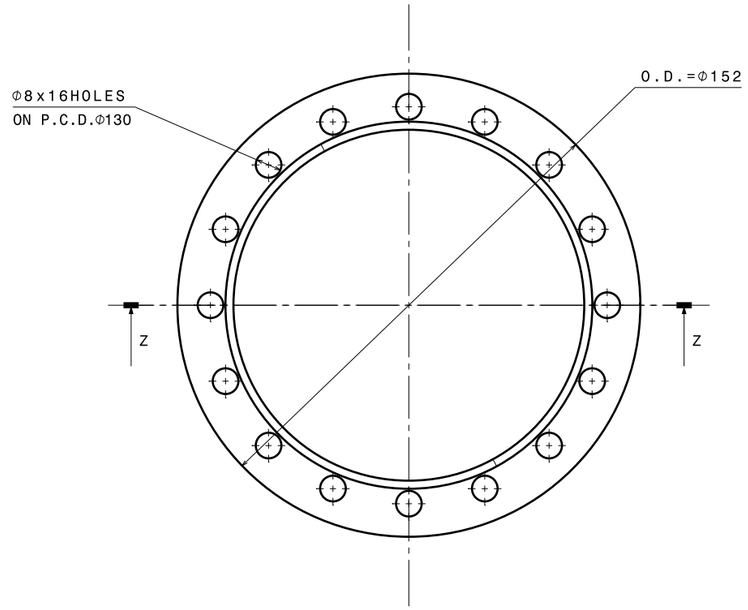
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

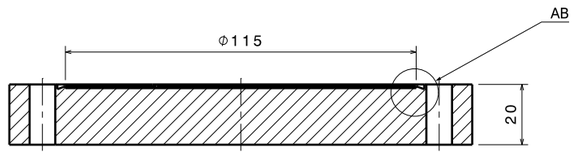
REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

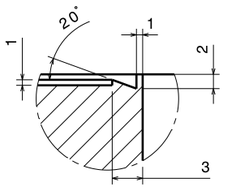
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.	
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED				
SCALE	1:2	DATE	THIRD ANGLE PROJECTION	TITLE STANDARD FLANGES
DRAWN	A.N.N.	04/06/2014		
CHECKED	R.K.		REF DRG NO: **NA**	REV R0
APPROVED	M.K.G.		DRG.NO V001-001-R0	SHEET 04 OF 05











DN 100CF BLANK FLANGE

DN 100CF COVER FLANGE

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES			
UPTO 10	10-50	50-120	OVER 120-400
±1°	±0°-30'	±0°-20'	±0°-10'

LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
	±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

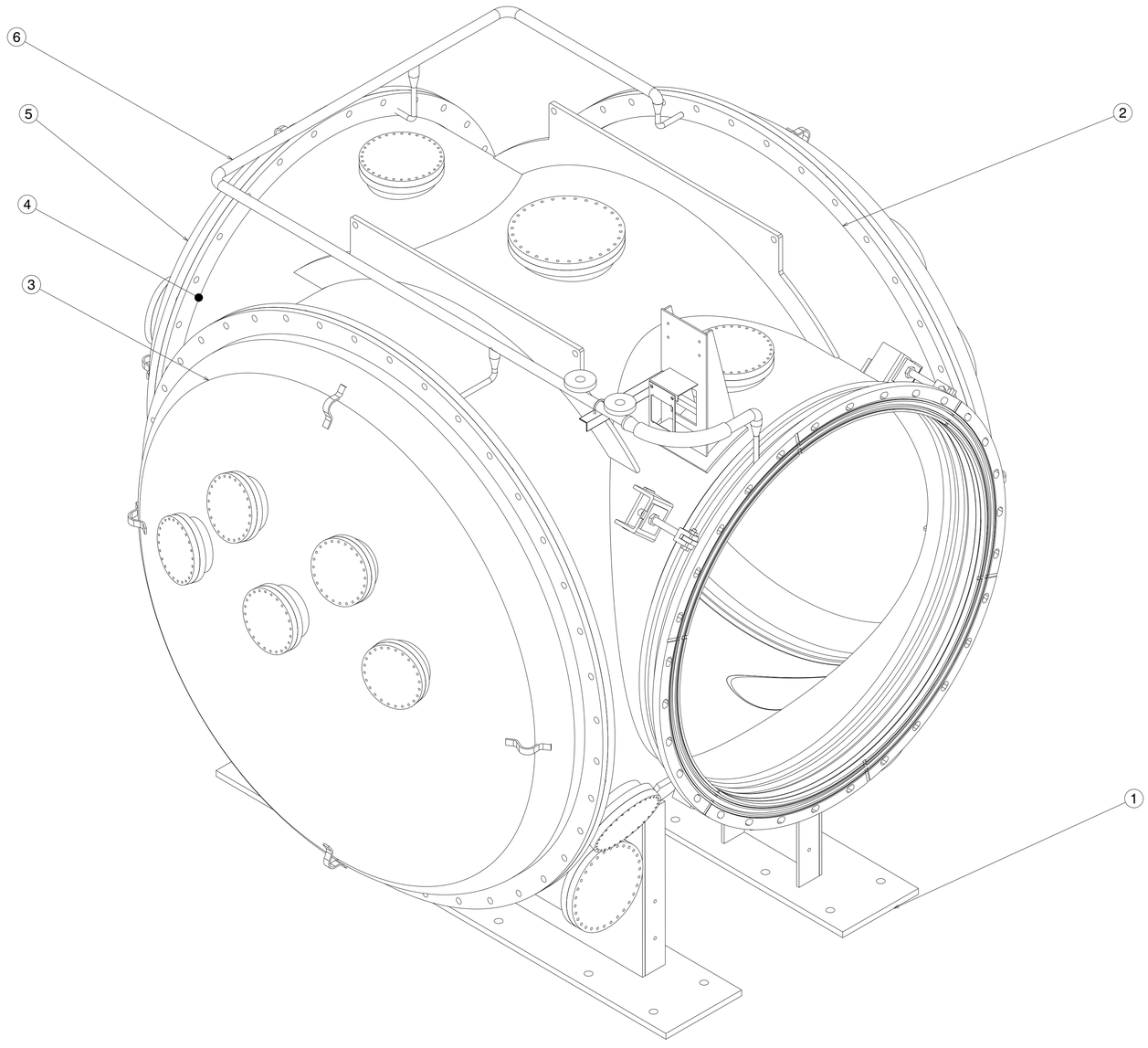
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:1	DATE
DRAWN	A.N.N.	04/06/2014
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

THIRD ANGLE PROJECTION

TITLE
STANDARD FLANGES

REF DRG NO: **NA**	REV R0
DRG.NO V001-001-R0	SHEET 05 OF 05



HORIZONTAL ACCESS MODULE

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
6	01	ANNULUS TUBING ASSEMBLY	SS304L	VH01-007-R1	-
5	01	END COVER SMALL	SS304L	VH01-006-R1	-
4	01	CYLINDRICAL PART (DIA 60.5"ID)	SS304L	VH01-005-R1	-
3	02	END COVER BIG	SS304L	VH01-004-R1	-
2	01	CYLINDRICAL PART (DIA 84.25"ID)	SS304L	VH01-003-R1	-
1	02	VESSEL SUPPORT	CARBON STEEL	VH01-002-R1	-

MATERIAL: ▽ 8-25 | ▽▽ 1.6-8 | ▽▽▽ 0.025-1.6 | ▽▽▽▽ < 0.025

CO-ORDINATED BY

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED | SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

SCALE 1:10 | DATE

THIRD ANGLE PROJECTION

TITLE: HORIZONTAL ACCESS MODULE

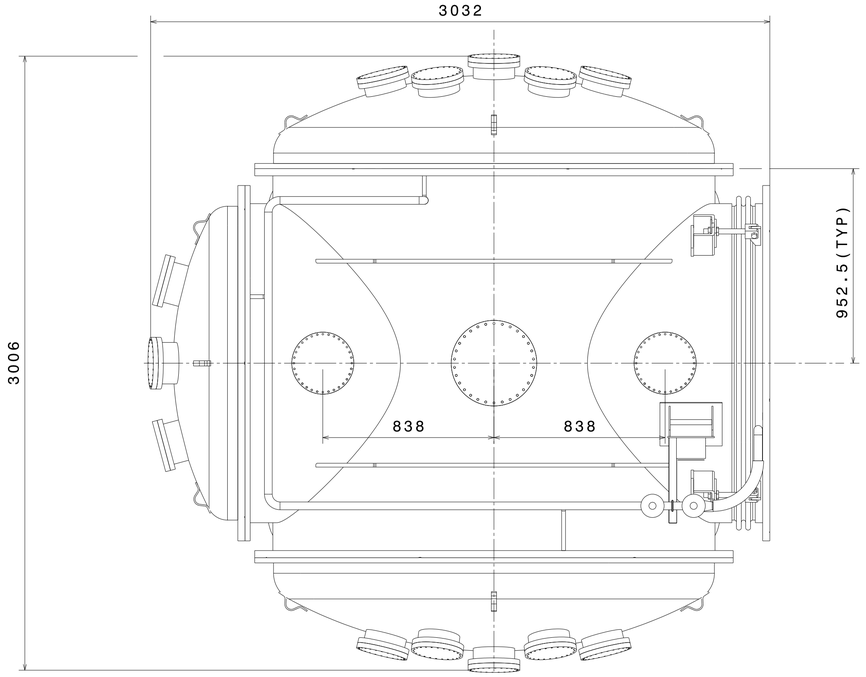
DRAWN A.N.N. 26/07/2015

CHECKED R.K.

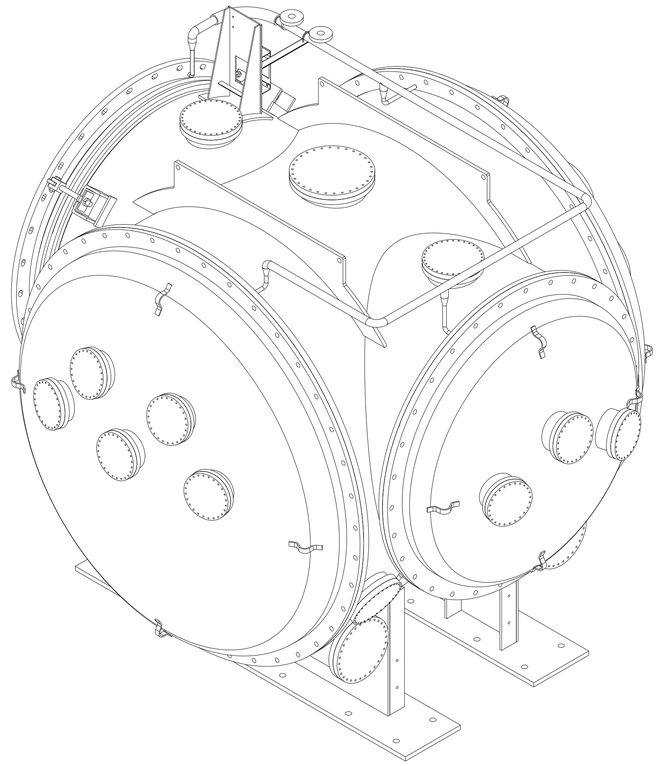
APPROVED M.K.G.

REF DRG NO: NA | REV R1

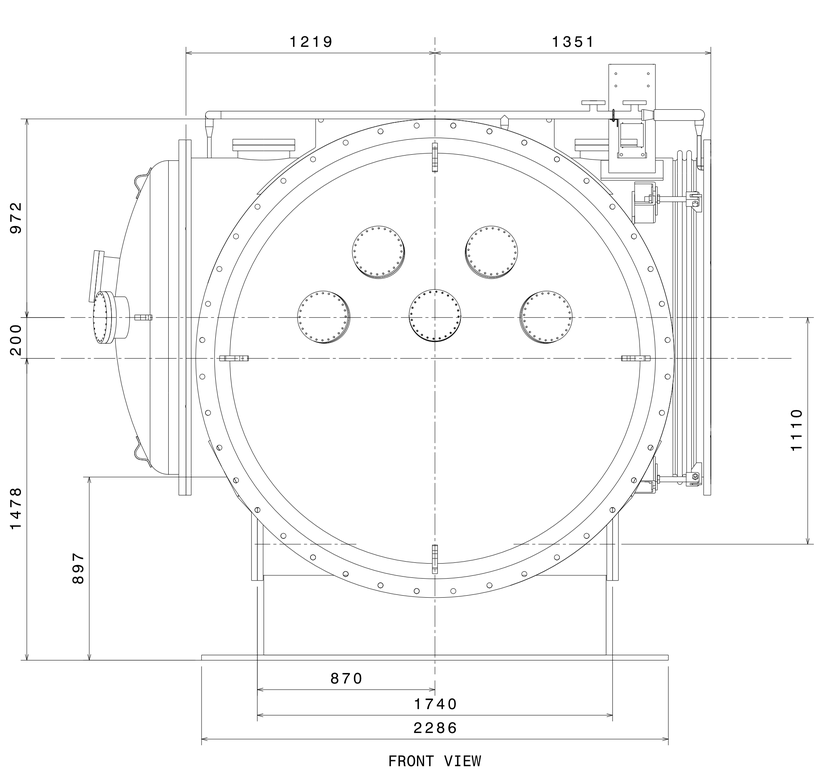
DRG.NO VH01-001-R1 | SHEET 01 OF 03



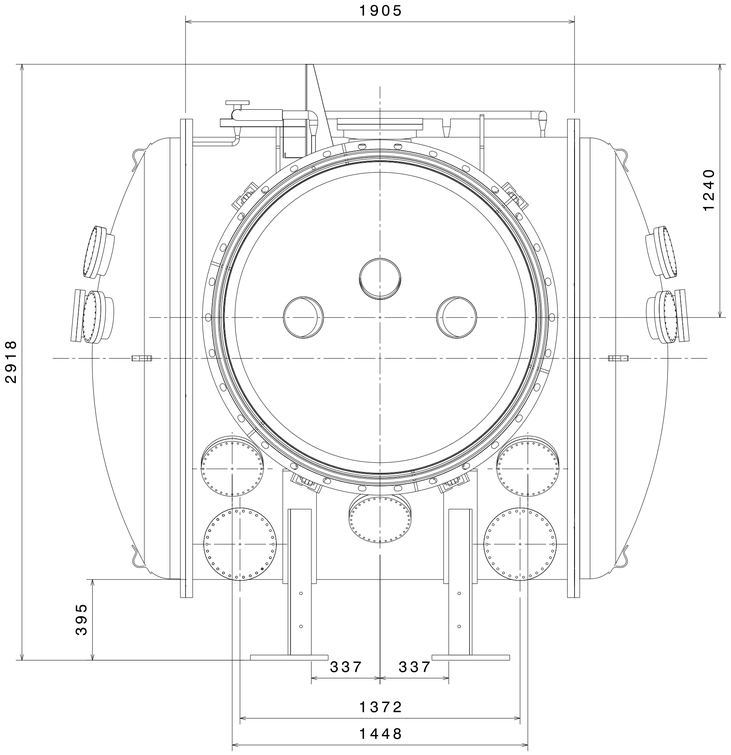
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

HORIZONTAL ACCESS MODULE

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1'	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN						
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

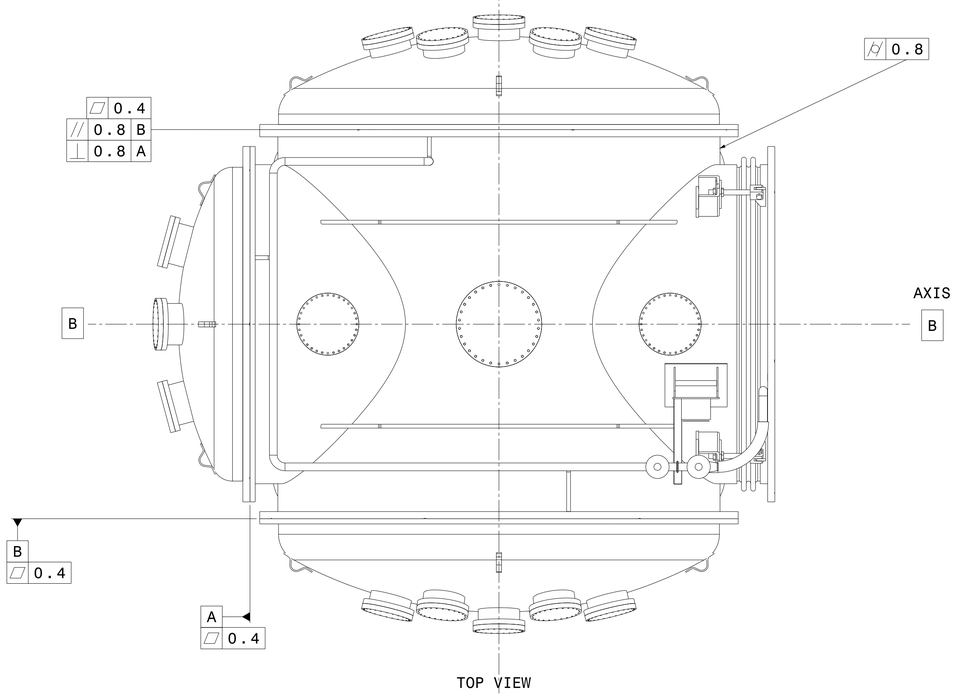
MED		SIZE	A1
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:15	DATE	
DRAWN	A.N.N.	26/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

THIRD ANGLE PROJECTION

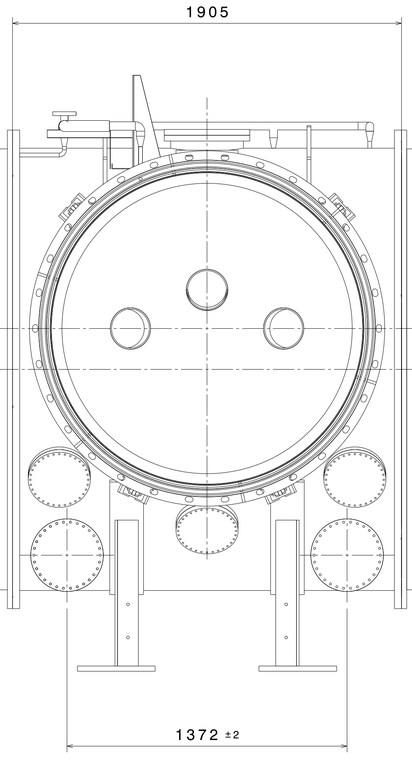
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

TITLE
HORIZONTAL ACCESS MODULE

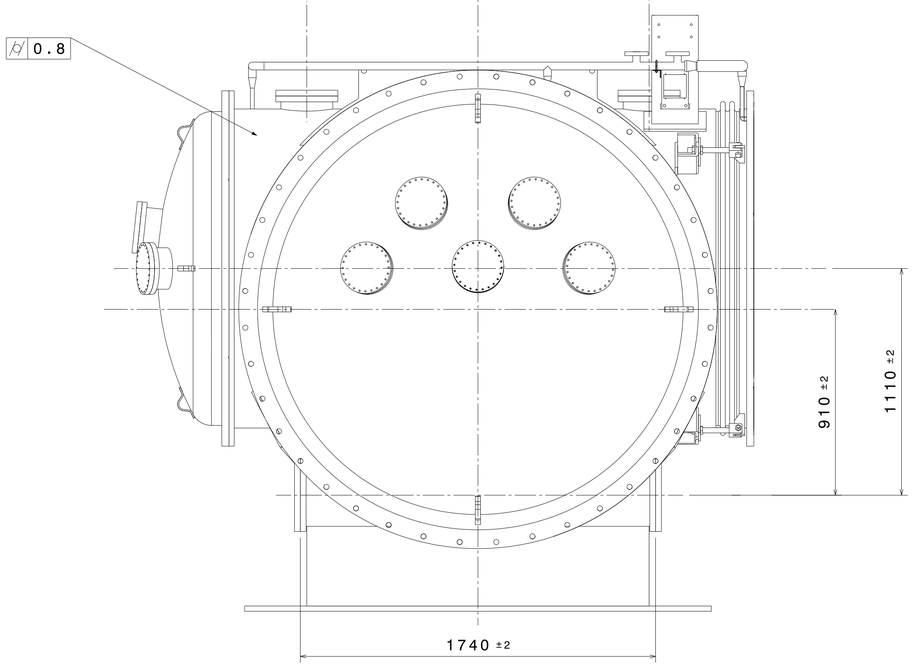
REF DRG NO:	NA	REV	R1
DRG.NO	VH01-001-R1	SHEET	02 OF 03



TOP VIEW



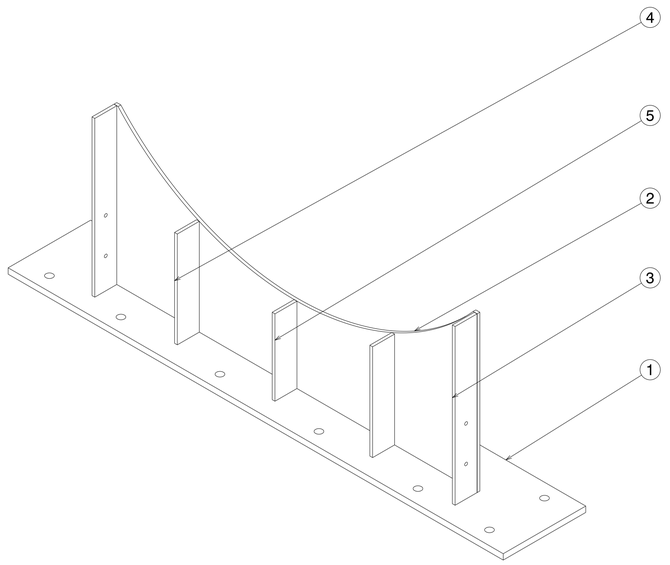
SIDE VIEW



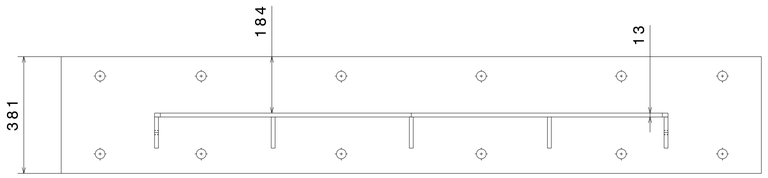
FRONT VIEW

HORIZONTAL ACCESS MODULE

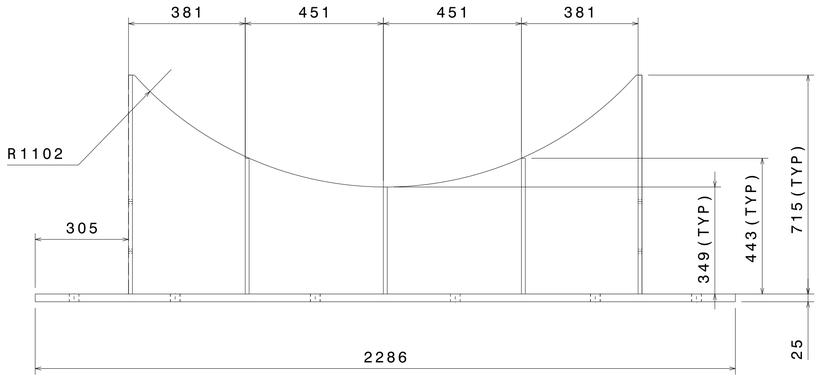
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025	REVISION COLUMN						MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.						
CO-ORDINATED BY					REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED						
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS											SCALE	1:10	DATE		TITLE		
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315			DRAWN	A.N.N.	26/07/2015	THIRD ANGLE PROJECTION	HORIZONTAL ACCESS MODULE		
UPTO 10	10-50	50-120	OVER 120-400								CHECKED	R.K.					
±1'	±0'-30'	±0'-20'	±0'-10'		±0.1	±0.2	±0.3	±0.5			APPROVED	M.K.G.			REF DRG NO: NA		REV R1
															DRG.NO	VH01-001-R1	SHEET 03 OF 03



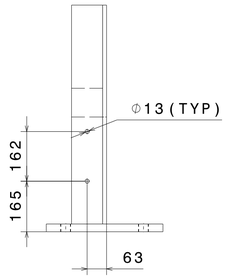
ISOMETRIC VIEW



TOP VIEW



FRONT VIEW



SIDE VIEW

① VESSEL SUPPORT

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
5	01	RECTANGULAR PLATE-3	CARBON STEEL	VH01-002-R1/SHEET 02	-
4	02	RECTANGULAR PLATE-2	CARBON STEEL	VH01-002-R1/SHEET 02	-
3	02	RECTANGULAR PLATE-1	CARBON STEEL	VH01-002-R1/SHEET 02	-
2	01	RECTANGULAR PLATE (CIRCULAR CUTTED SECTION)	CARBON STEEL	VH01-002-R1/SHEET 02	-
1	01	BASE PLATE	CARBON STEEL	VH01-002-R1/SHEET 02	-

MATERIAL: ▽ 8-25 | ▽▽ 1.6-8 | ▽▽▽ 0.025-1.6 | ▽▽▽▽ < 0.025

CO-ORDINATED BY

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN						MED	SIZE A1
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED	
						SCALE 1:10	DATE
						DRAWN A.N.N.	26/07/2015
						CHECKED R.K.	
						APPROVED M.K.G.	

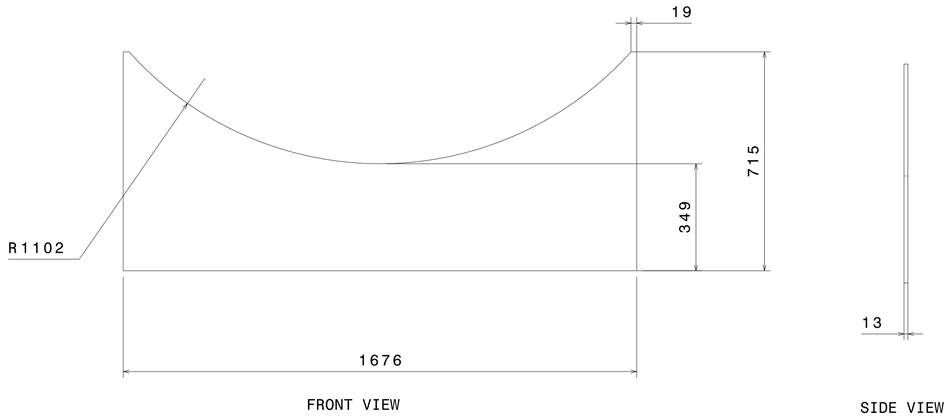
THIRD ANGLE PROJECTION

INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

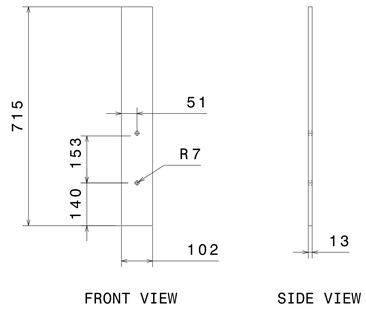
TITLE: VESSEL SUPPORT

REF DRG NO: VH01-001-R1 REV R1

DRG.NO VH01-002-R1 SHEET 01 OF 02



(2) RECTANGULAR PLATE (CIRCULAR CUTTED SECTION)
SCALE-1:10



(3) RECTANGULAR PLATE-1
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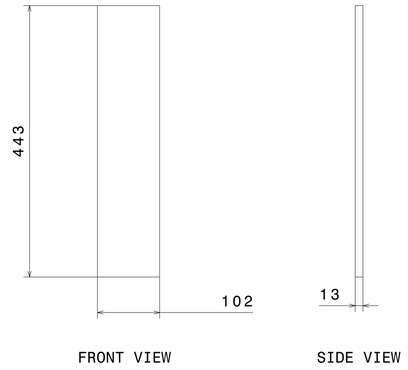
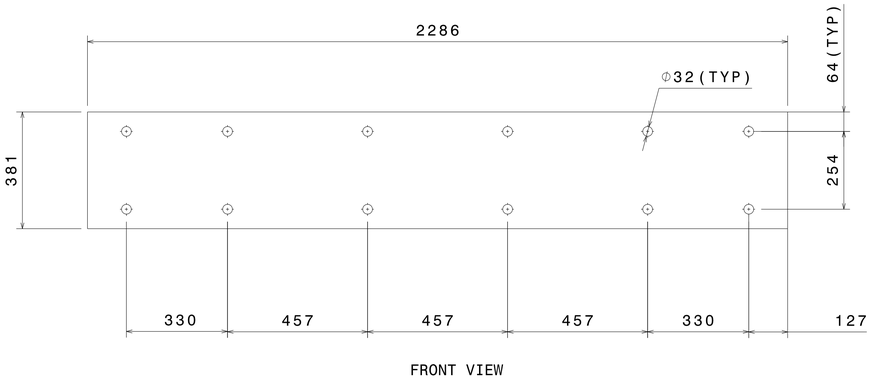
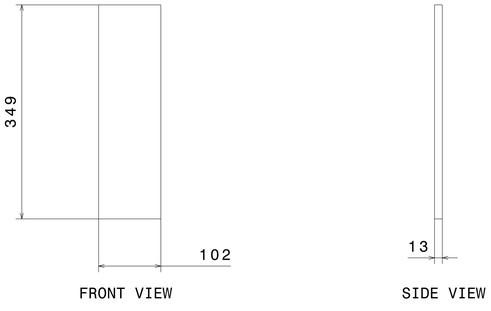


(4) RECTANGULAR PLATE-2
SCALE-1:5

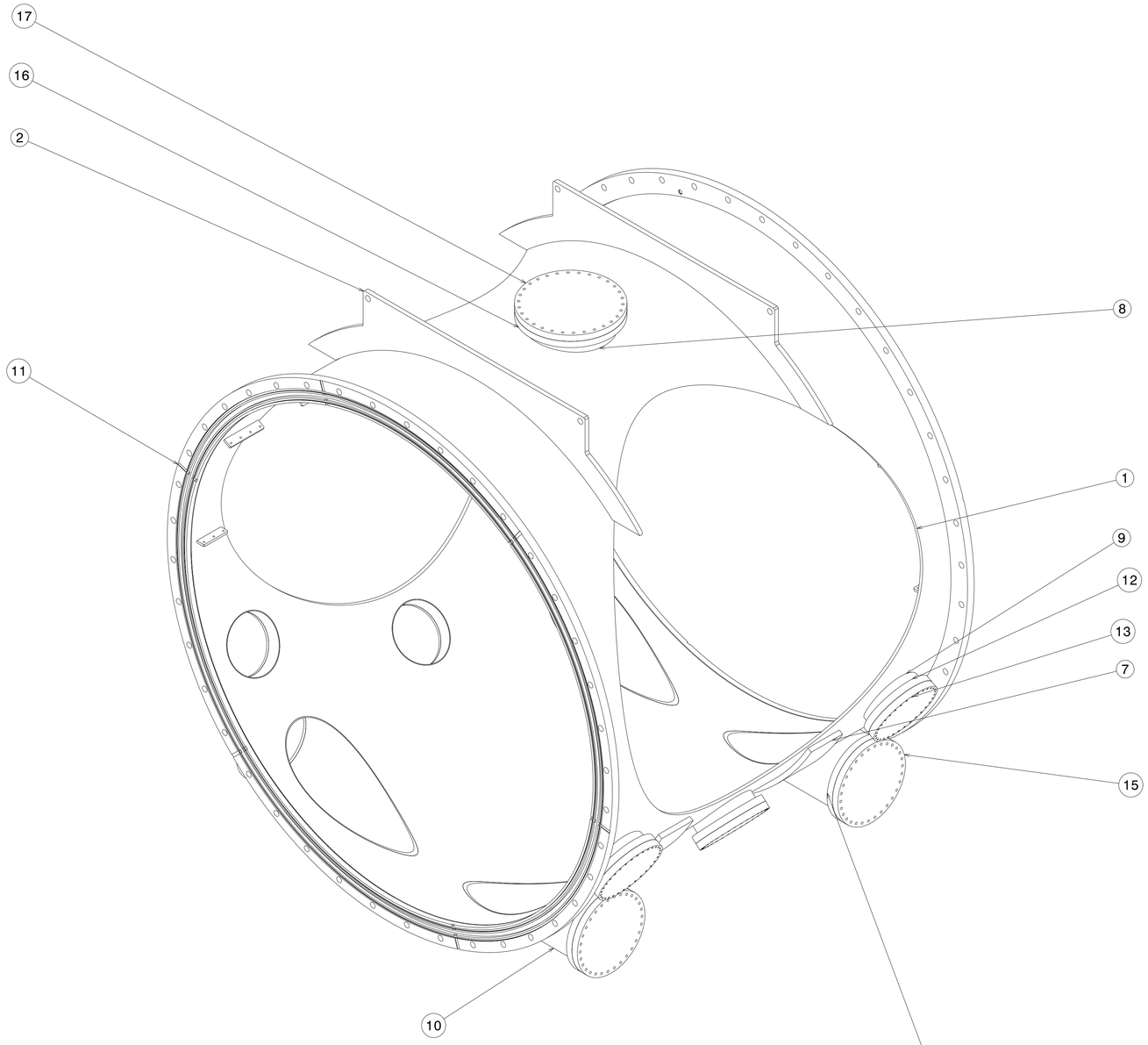


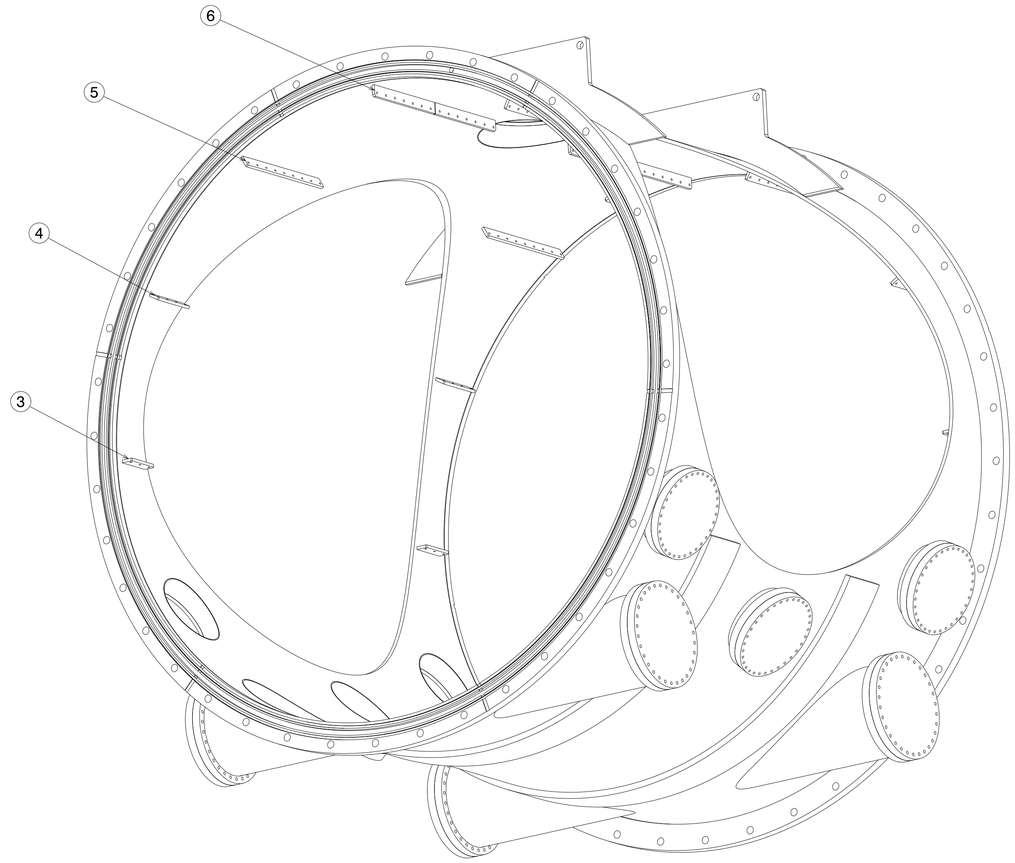
(1) BASE PLATE
SCALE-1:10



(5) RECTANGULAR PLATE-3
SCALE-1:5

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025				REVISION COLUMN							MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.		
CO-ORDINATED BY						REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED							
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS												SCALE	AS NOTED	DATE		TITLE	VESSEL SUPPORT		
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315				DRAWN	A.N.N.	26/07/2015	THIRD ANGLE PROJECTION				
UPTO 10	10-50	50-120	OVER 120-400									CHECKED	R.K.			REF DRG NO:	VH01-001-R1	REV	R1
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5				APPROVED	M.K.G.			DRG.NO	VH01-002-R1	SHEET	02 OF 02





2 CYLINDRICAL PART (DIA 84.25")

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
17	01	CUSTOM CF COVER FLANGE (16 1/2")	SS304L	V001-001-R0/SHEET 04	-
16	01	CUSTOM CF BLANK FLANGE (16 1/2")	SS304L	V001-001-R0/SHEET 04	-
15	04	CUSTOM CF COVER FLANGE (14")	SS304L	V001-001-R0/SHEET 02	-
14	04	CUSTOM CF BLANK FLANGE (14")	SS304L	V001-001-R0/SHEET 02	-
13	06	DN 250CF COVER FLANGE	SS304L	V001-001-R0/SHEET 04	-
12	06	DN 250CF BLANK FLANGE	SS304L	V001-001-R0/SHEET 04	-
11	02	FLANGE GROOVED (84.25"ID)	SS304L	VH01-003-R1/SHEET 06	-
10	04	PORT E NOZZLE	SS304L	VH01-003-R1/SHEET 05	-
9	06	PORT D NOZZLE	SS304L	VH01-003-R1/SHEET 05	-
8	01	PORT C NOZZLE	SS304L	VH01-003-R1/SHEET 05	-
7	02	SADDLE ATTACHMENT	SS304L	VH01-003-R1/SHEET 05	-
6	02	INTERNAL ATTACHMENT BRACKET 13D	SS304L	VH01-003-R1/SHEET 04	-
5	04	INTERNAL ATTACHMENT BRACKET 13C	SS304L	VH01-003-R1/SHEET 04	-
4	04	INTERNAL ATTACHMENT BRACKET 13B	SS304L	VH01-003-R1/SHEET 04	-
3	04	INTERNAL ATTACHMENT BRACKET 13A	SS304L	VH01-003-R1/SHEET 04	-
2	02	LIFTING RING & LUGS	SS304L	VH01-003-R1/SHEET 04	-
1	01	CYLINDRICAL SHELL	SS304L	VH01-003-R1/SHEET 03	-

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1'	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

REVISION COLUMN

MED — SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

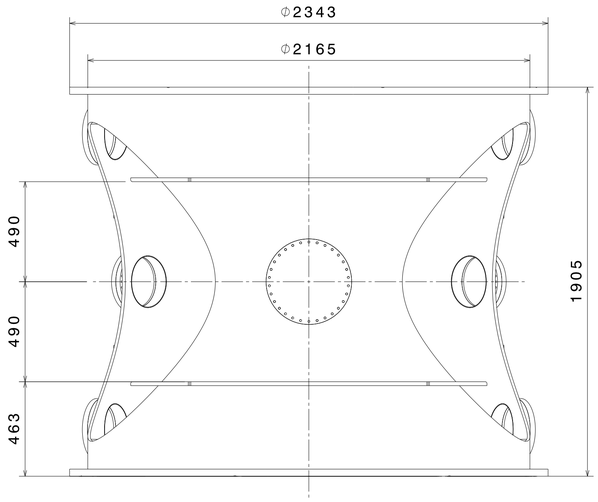
SCALE	1:10	DATE	
DRAWN	A.N.N.	28/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

THIRD ANGLE PROJECTION

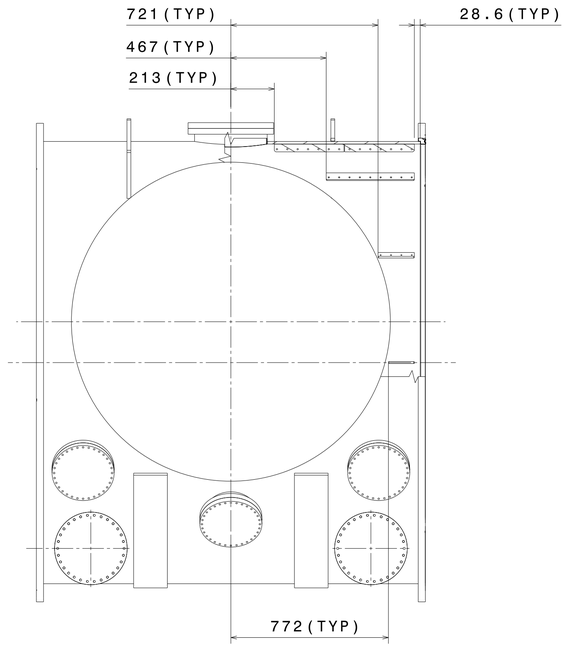
TITLE: CYLINDRICAL PART (DIA 84.25")

REF DRG NO: VH01-001-R1 — REV R1

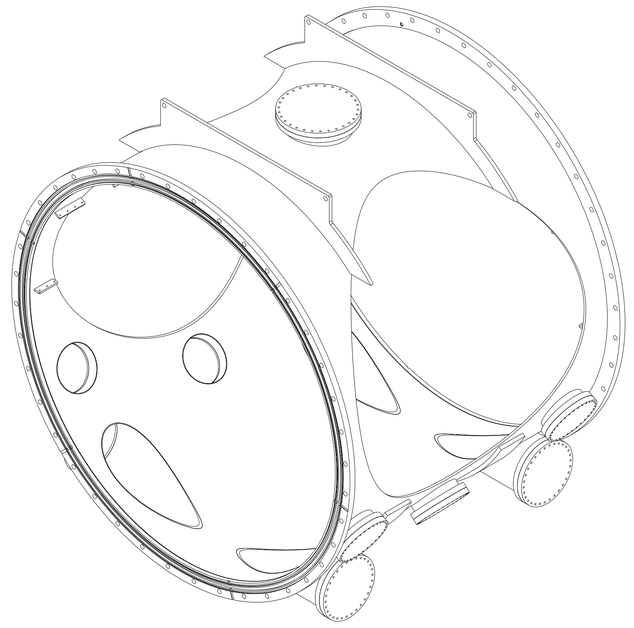
DRG.NO: VH01-003-R1 — SHEET 01 OF 06



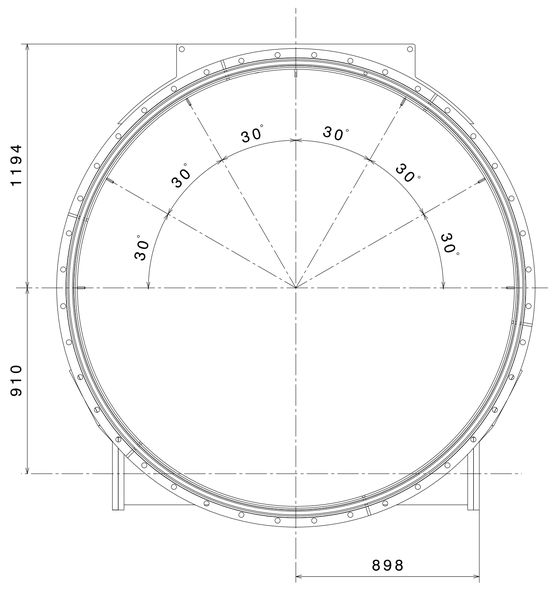
TOP VIEW



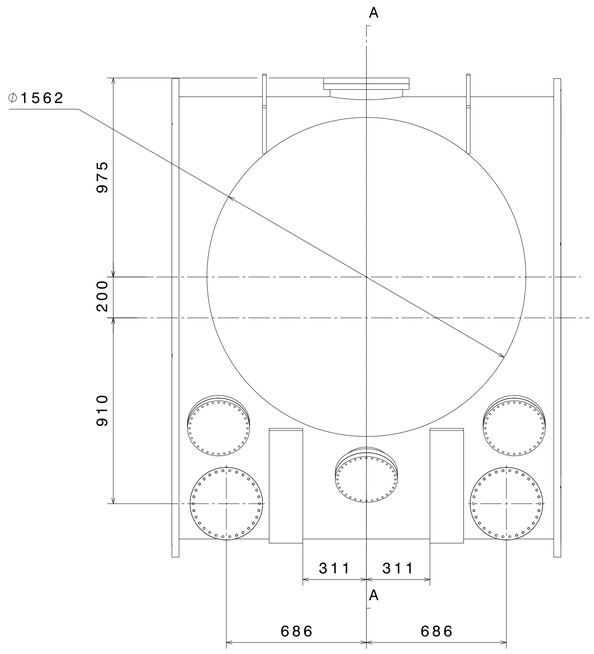
SIDE BREAKOUT VIEW



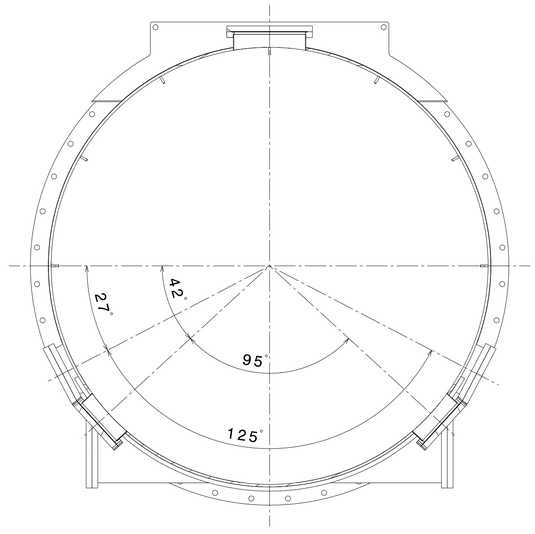
ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW



SECTION A-A

2 CYLINDRICAL PART (DIA 84.25")

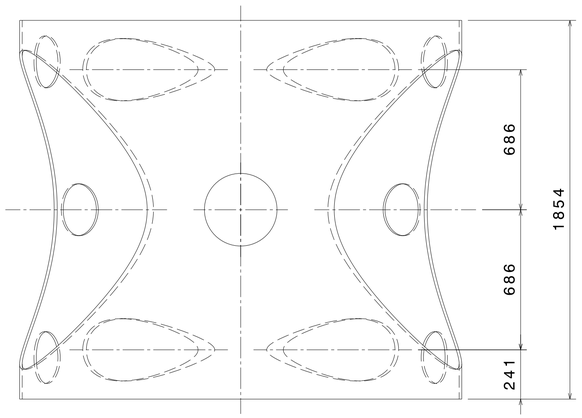
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

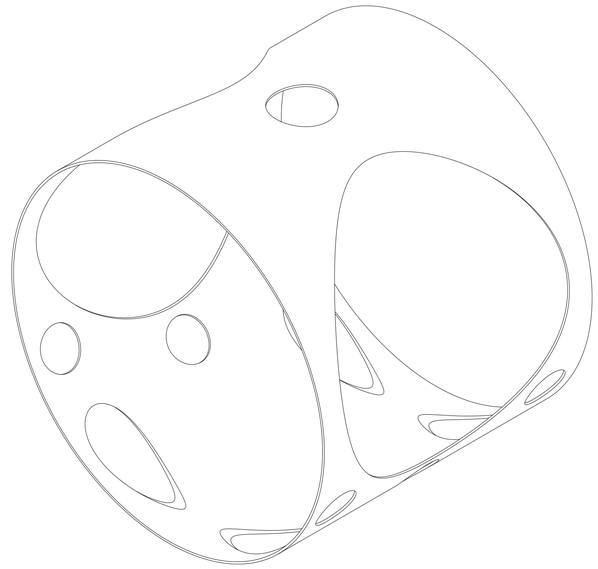
LENGTH in mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

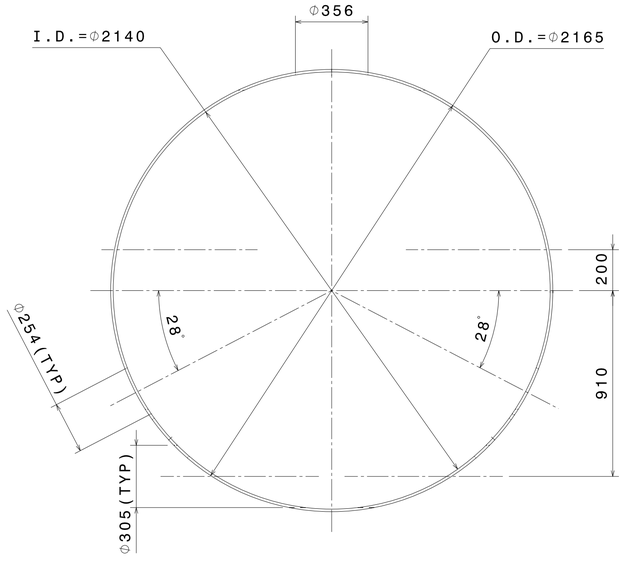
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:15	DATE	TITLE: CYLINDRICAL PART (DIA 84.25")
DRAWN	A.N.N.	28/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		REF DRG NO: VH01-001-R1 — REV R1
APPROVED	M.K.G.		DRG.NO VH01-003-R1 — SHEET 02 OF 06



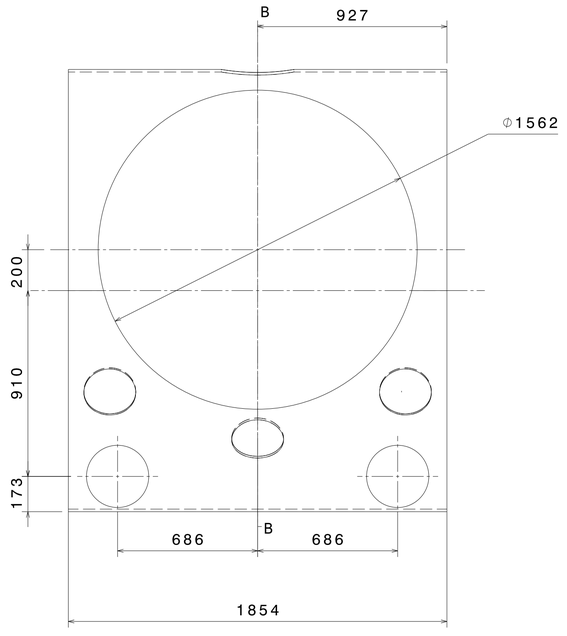
TOP VIEW



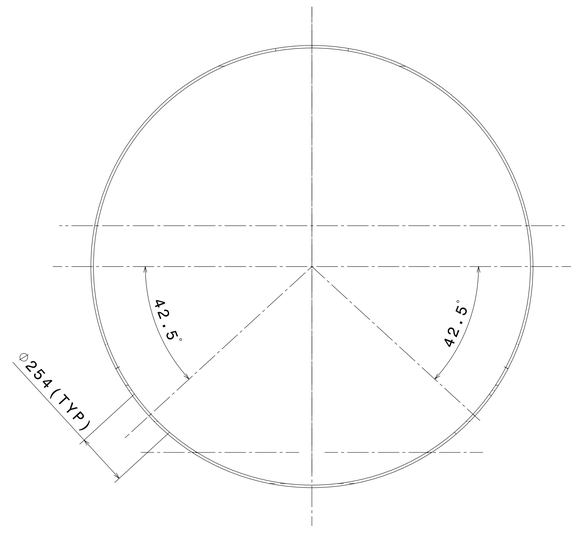
ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW



SECTION B-B

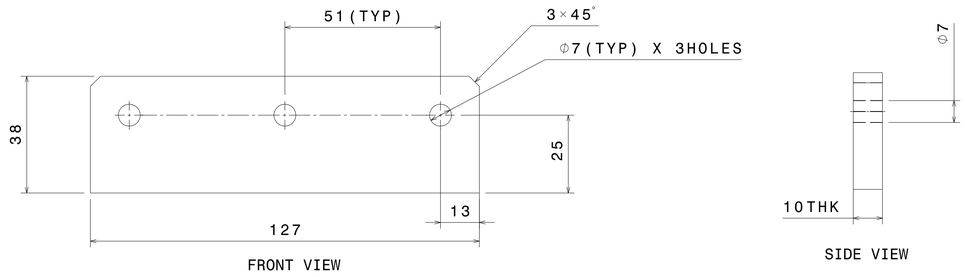
① CYLINDRICAL SHELL

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

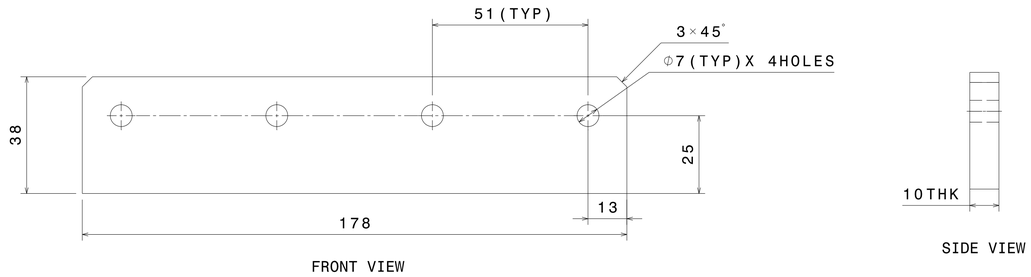
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS									
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN						
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

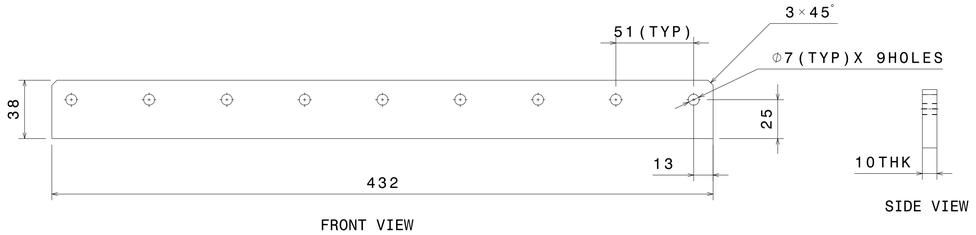
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.		
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED					
SCALE	1:15	DATE	TITLE		
DRAWN	A.N.N.	28/07/2015	CYLINDRICAL PART (DIA 84.25")		
CHECKED	R.K.		REF DRG NO: VH01-001-R1		REV R1
APPROVED	M.K.G.		DRG.NO	VH01-003-R1	SHEET 03 OF 06



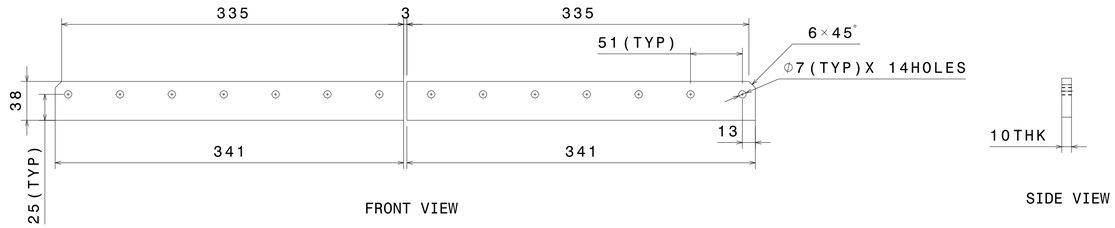
3 INTERNAL ATTACHMENT BRACKET 13A
SCALE-1:1



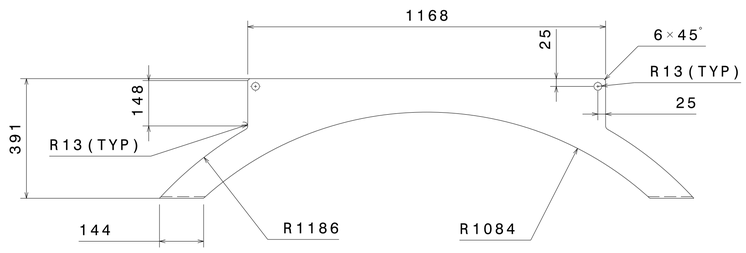
4 INTERNAL ATTACHMENT BRACKET 13B
SCALE-1:1



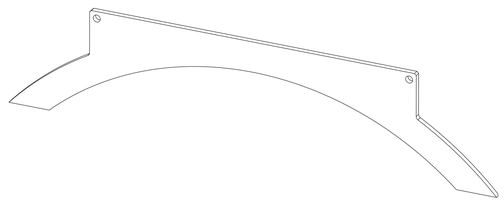
5 INTERNAL ATTACHMENT BRACKET 13C
SCALE-1:2



6 INTERNAL ATTACHMENT BRACKET 13D
SCALE-1:3



2 LIFTING RING & LUGS
SCALE-1:10



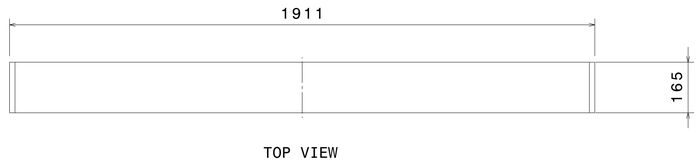
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

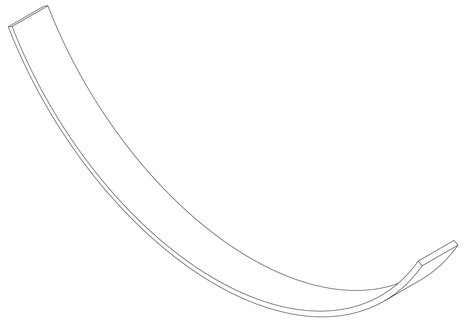
REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	TITLE: CYLINDRICAL PART (DIA 84.25")
DRAWN	A.N.N.	28/07/2015	
CHECKED	R.K.		REF DRG NO: VH01-001-R1 REV R1
APPROVED	M.K.G.		DRG.NO VH01-003-R1 SHEET 04 OF 06



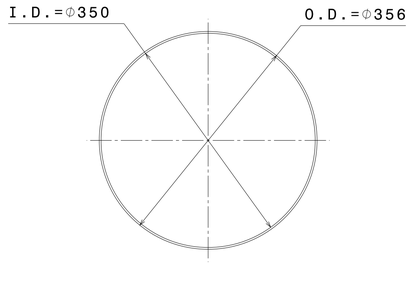
TOP VIEW

FRONT VIEW

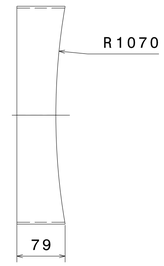


ISOMETRIC VIEW

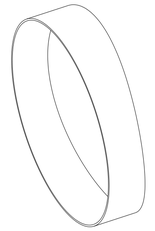
7 SADDLE ATTACHMENT
SCALE-1:10



FRONT VIEW

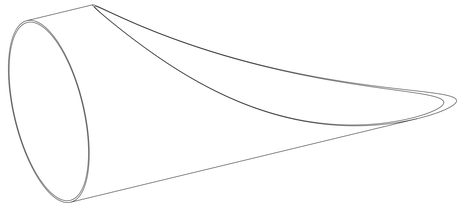


SIDE VIEW

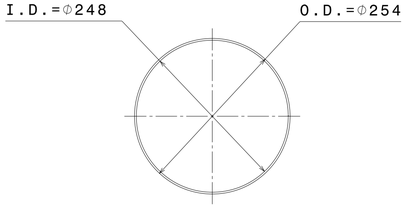


ISOMETRIC VIEW

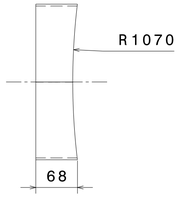
8 PORT C NOZZLE
SCALE-1:5



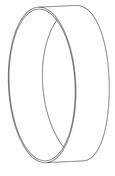
ISOMETRIC VIEW



FRONT VIEW

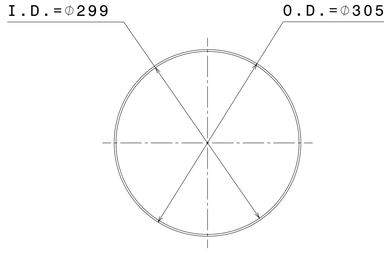


SIDE VIEW

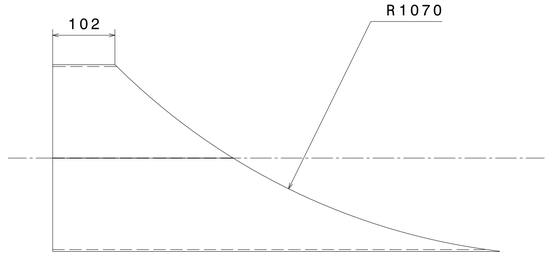


ISOMETRIC VIEW

9 PORT D NOZZLE
SCALE-1:5



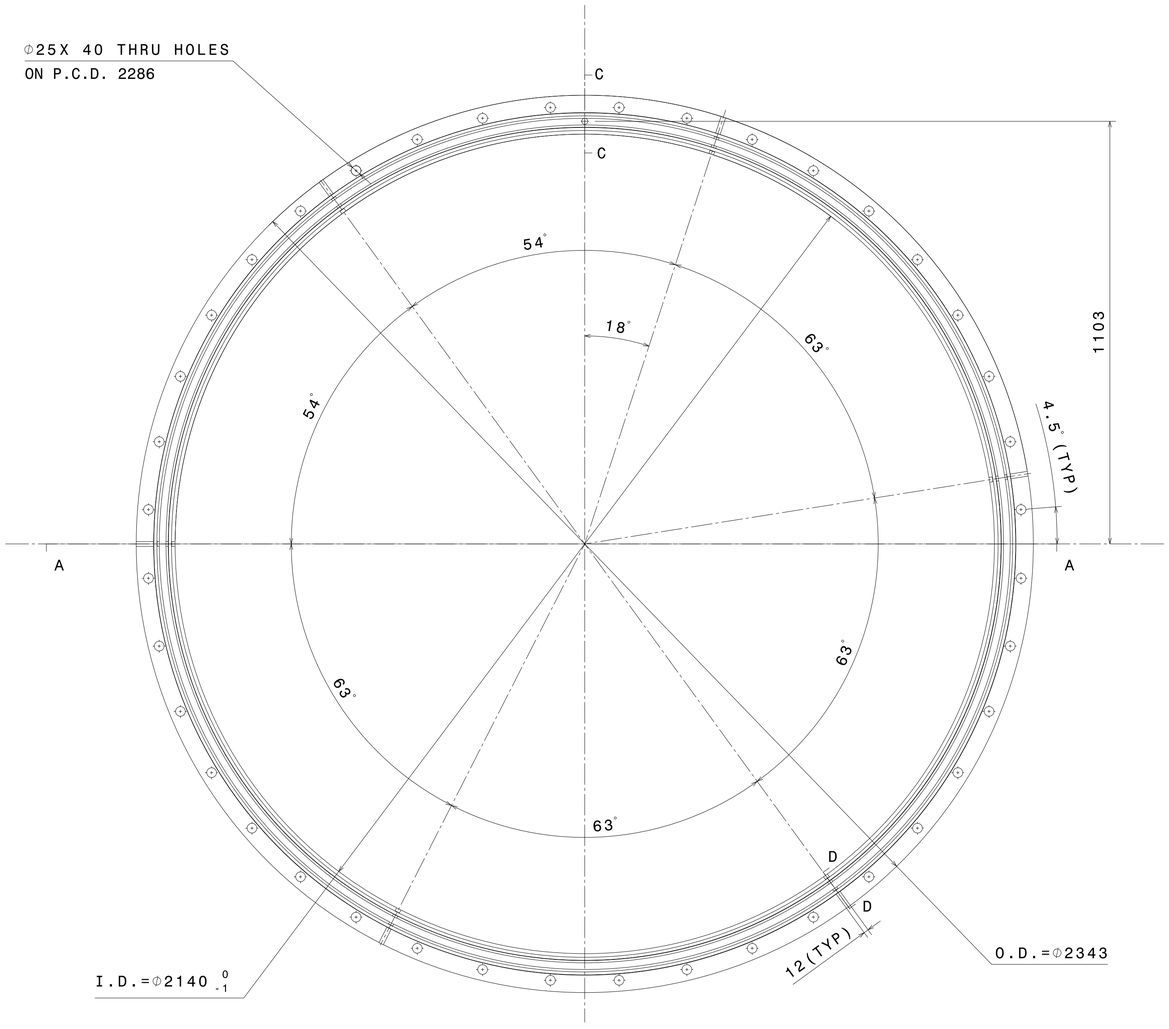
FRONT VIEW



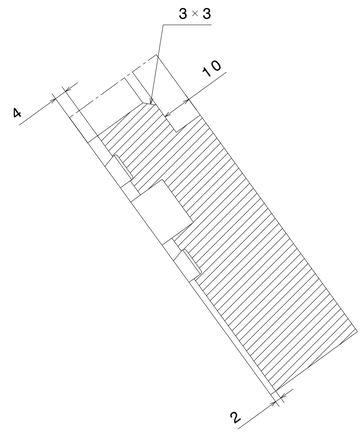
SIDE VIEW

10 PORT E NOZZLE
SCALE-1:5

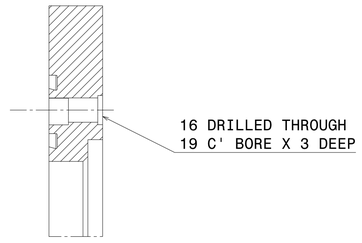
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025	REVISION COLUMN						MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.						
CO-ORDINATED BY					REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED						
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS											SCALE	AS NOTED	DATE	TITLE			
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315			DRAWN	A.N.N.	28/07/2015	THIRD ANGLE PROJECTION	CYLINDRICAL PART (DIA 84.25")		
UPTO 10	10-50	50-120	OVER 120-400								CHECKED	R.K.		REF DRG NO:	VH01-001-R1		REV R1
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5			APPROVED	M.K.G.		DRG.NO	VH01-003-R1		SHEET 05 OF 06



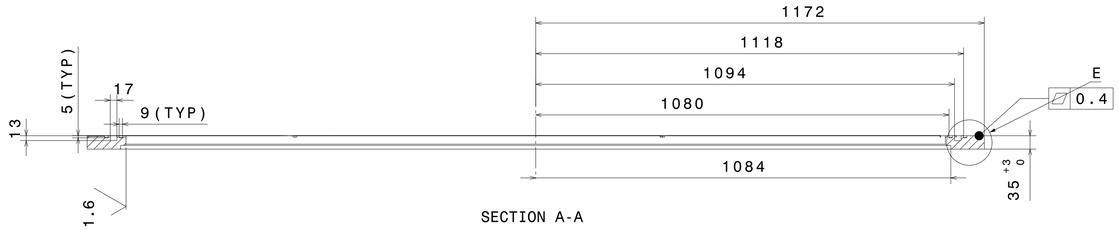
FRONT VIEW



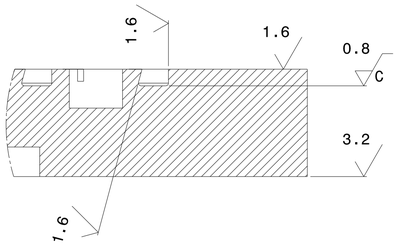
SECTION D-D
SCALE-1:1



SECTION C-C
SCALE-1:2



SECTION A-A



SURFACE ROUGHNESS VALUE

ALL SURFACE ROUGHNESS VALUES
ARE IN RA MICRIMETER

(11) FLANGE GROOVED (84.25"ID)
SCALE-1:8

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

REVISION COLUMN

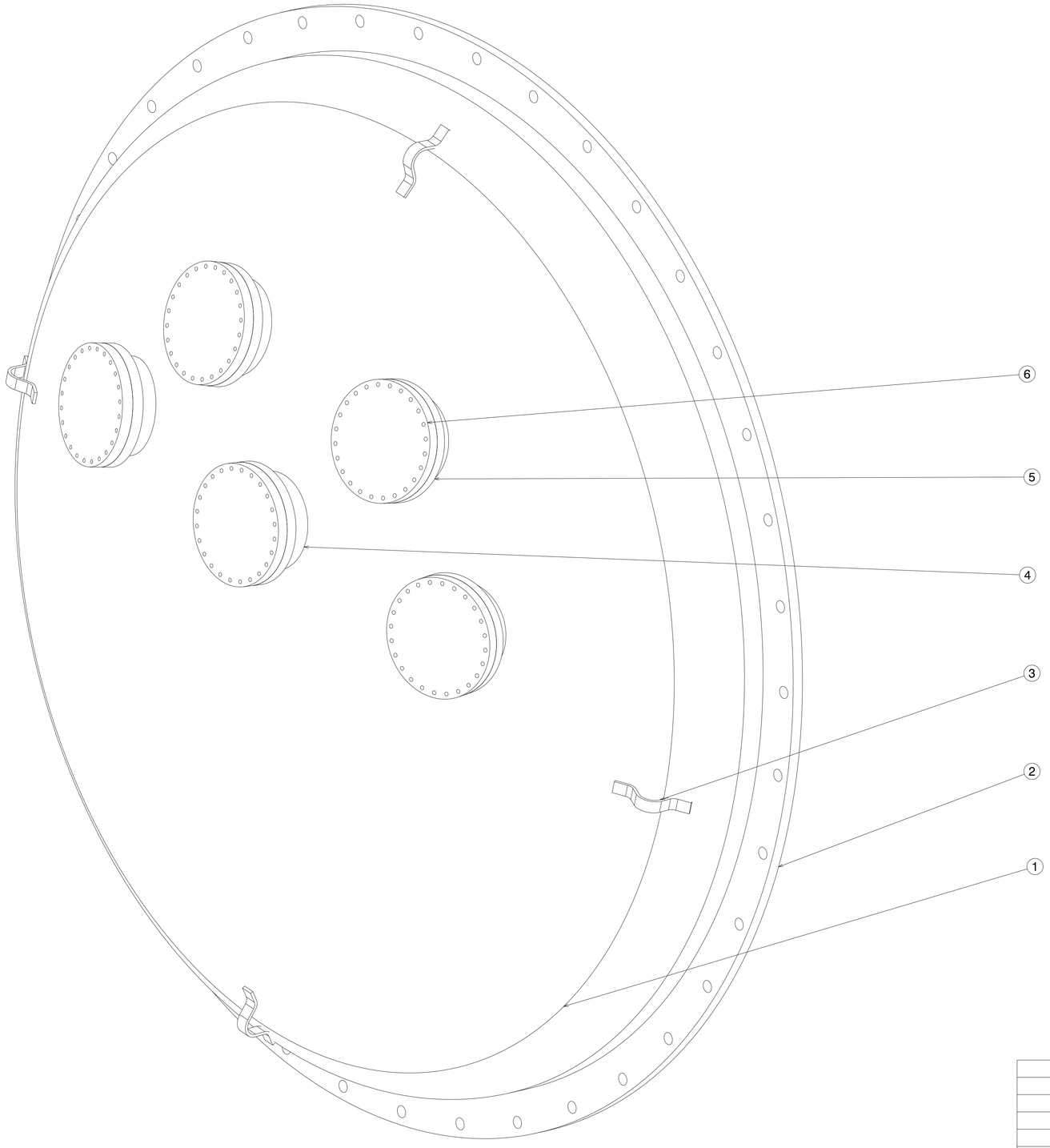
MED		SIZE	A1
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	
DRAWN	A.N.N.	28/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

THIRD ANGLE PROJECTION

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

TITLE
CYLINDRICAL PART (DIA 84.25")

REF DRG NO:	VH01-001-R1	REV R1
DRG.NO	VH01-003-R1	SHEET 06 OF 06



PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
6	05	DN 200CF COVER FLANGE	SS304L	VO01-001-R0/SHEET 01	-
5	05	DN 200CF BLANK FLANGE	SS304L	VO01-001-R0/SHEET 01	-
4	05	PORT NOZZLE	SS304L	VH01-004-R1/SHEET 04	-
3	04	LIFTING LUG	SS304L	VH01-004-R1/SHEET 04	-
2	01	FLANGE FLAT (84.25"ID)	SS304L	VH01-004-R1/SHEET 04	-
1	01	F & D HEAD	SS304L	VH01-004-R1/SHEET 03	-

3 END COVER BIG

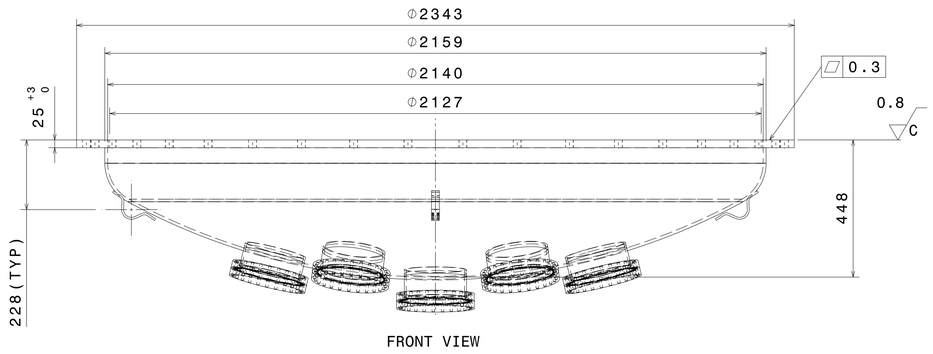
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

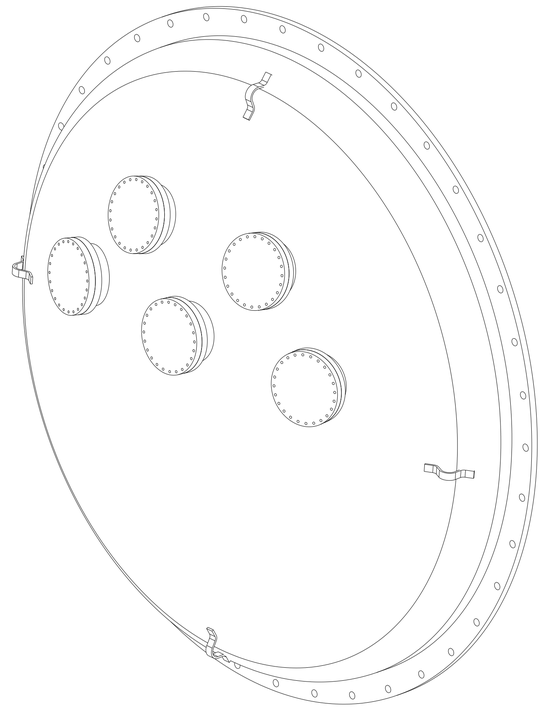
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

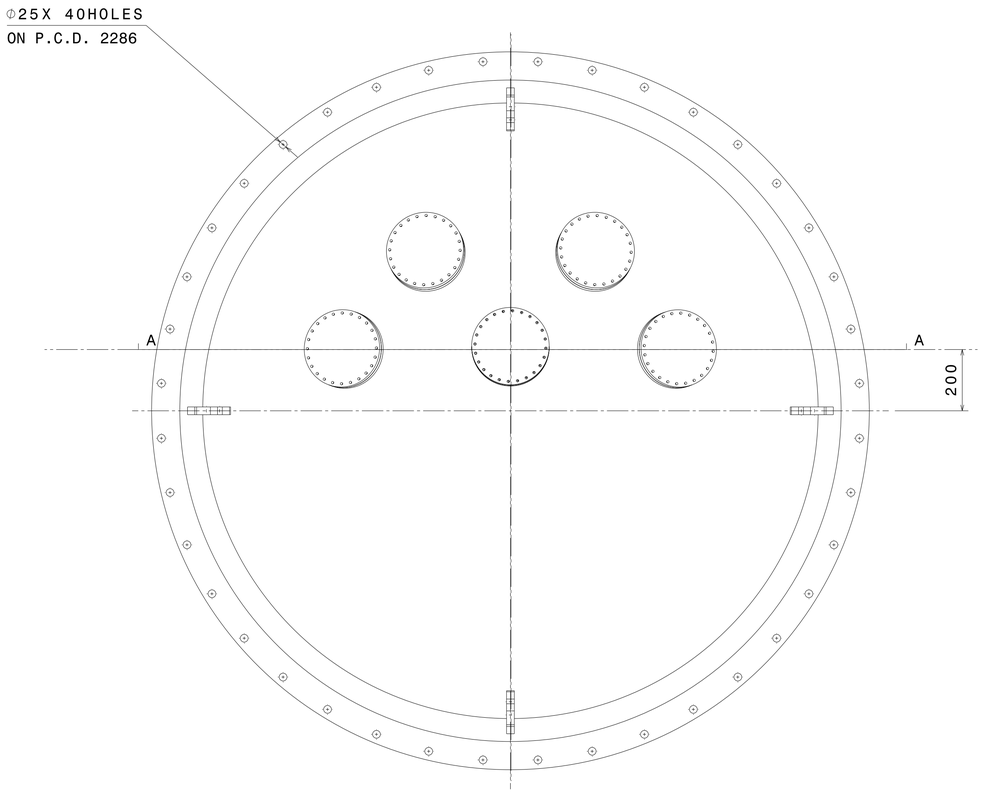
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:5	DATE	TITLE: END COVER BIG
DRAWN	A.N.N.	29/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		REF DRG NO: VH01-001-R1 REV R1
APPROVED	M.K.G.		DRG.NO VH01-004-R1 SHEET 01 OF 04



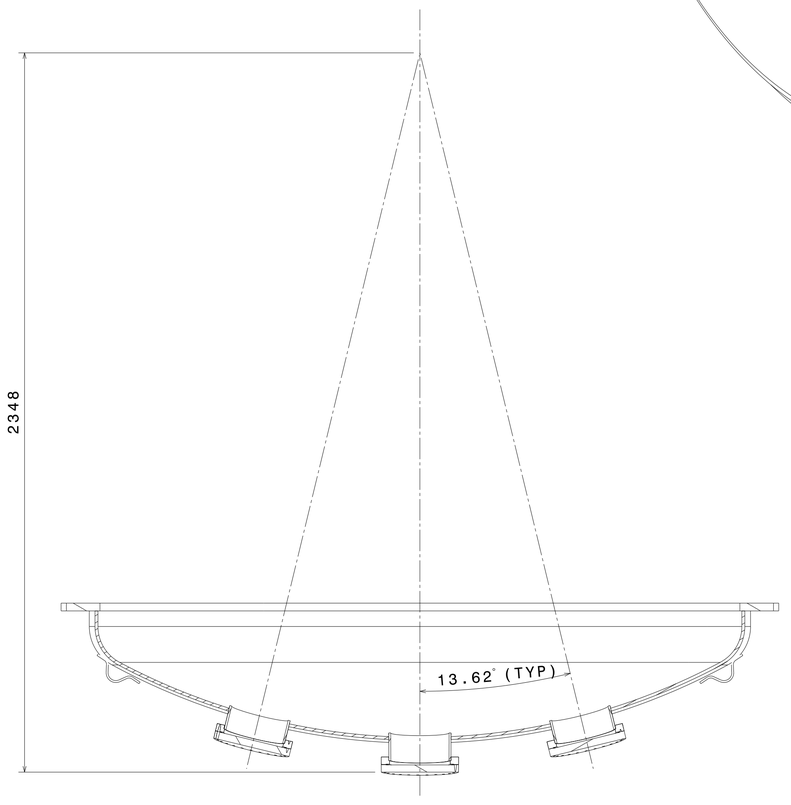
FRONT VIEW



ISOMETRIC VIEW



BOTTOM VIEW



SECTION A-A

③ END COVER BIG

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025				
CO-ORDINATED BY								
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

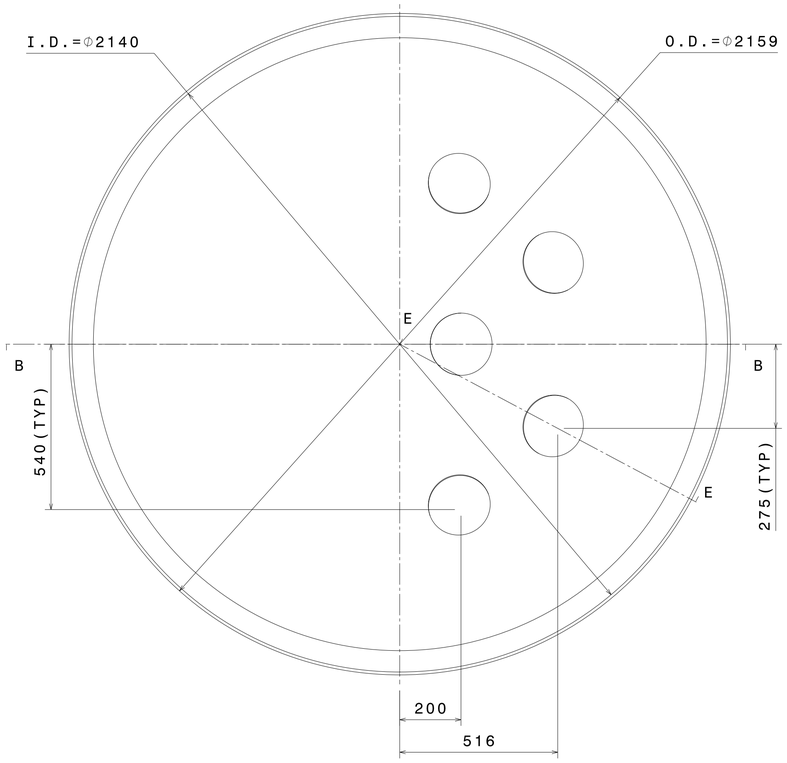
MED			SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED			
SCALE	1:10	DATE	
DRAWN	A.N.N.	29/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

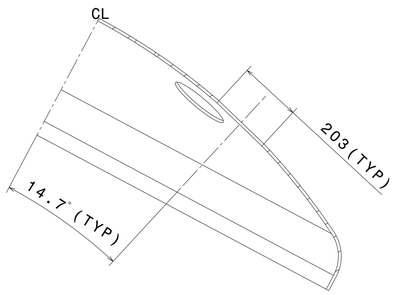
THIRD ANGLE PROJECTION

TITLE
END COVER BIG

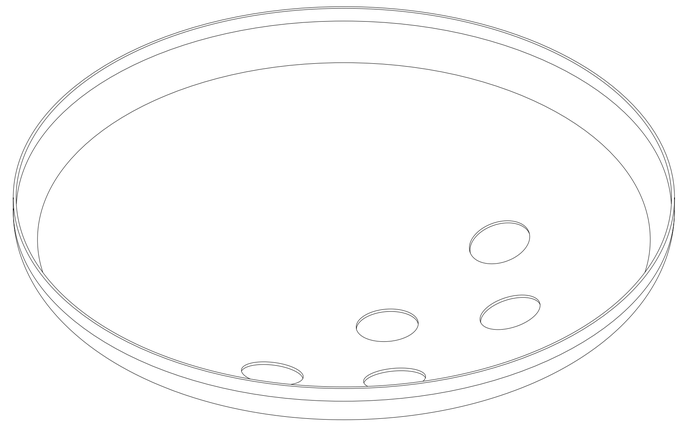
REF DRG NO: VH01-001-R1		REV R1
DRG.NO	VH01-004-R1	SHEET 02 OF 04



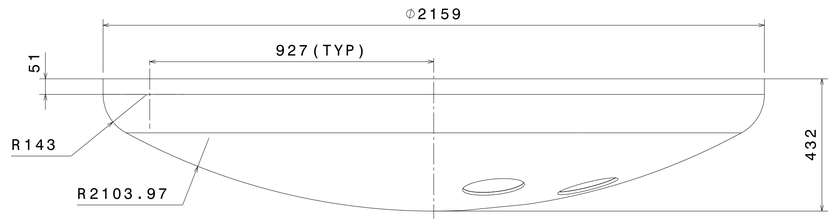
TOP VIEW



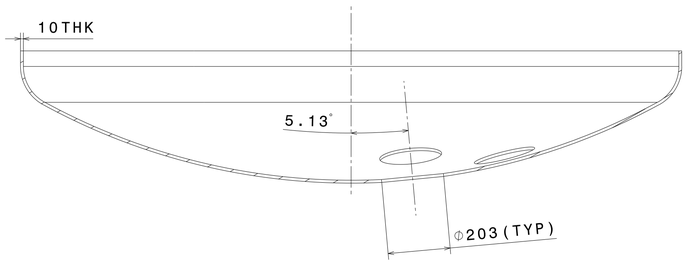
SECTION E-E



ISOMETRIC VIEW



FRONT VIEW



SECTION B-B

① F & D HEAD

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

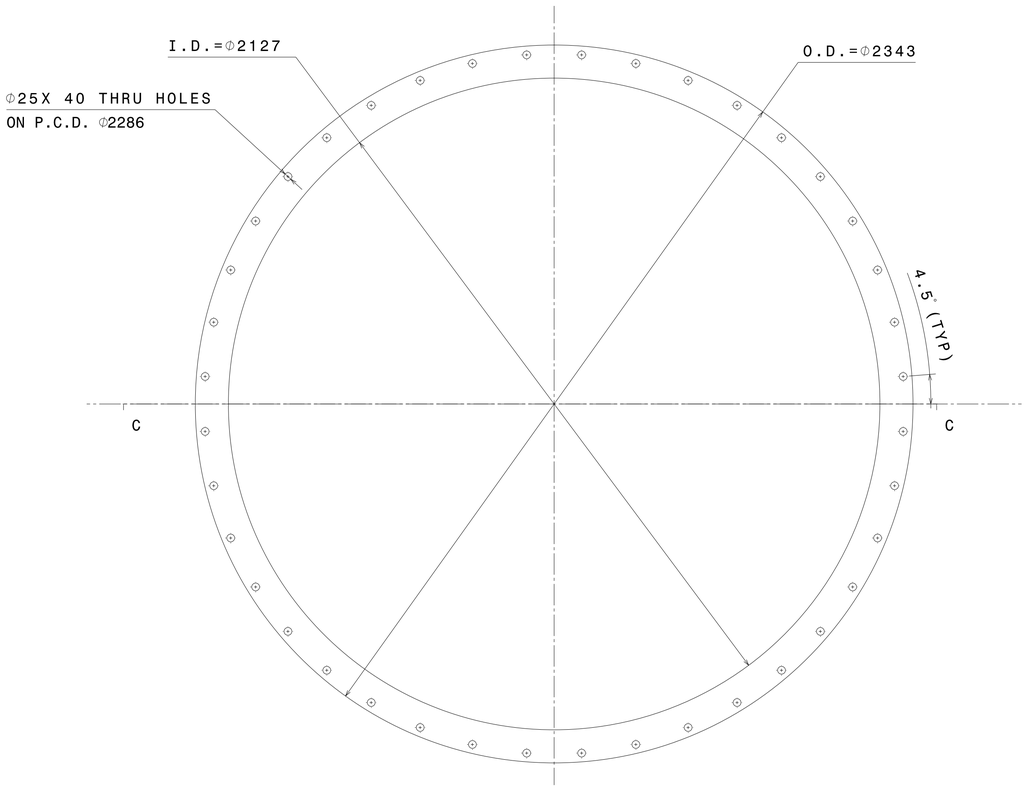
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:10	DATE
DRAWN	A.N.N.	29/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

THIRD ANGLE PROJECTION

TITLE
END COVER BIG

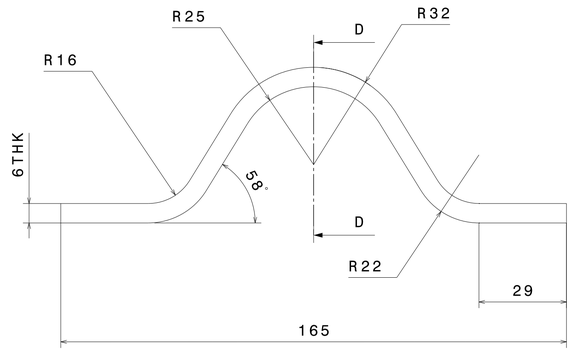
REF DRG NO:	VH01-001-R1	REV R1
DRG.NO	VH01-004-R1	SHEET 03 OF 04



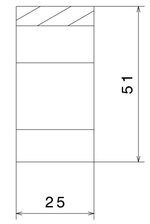
FRONT VIEW

SECTION C-C

② FLANGE FLAT (84.25"ID)
SCALE-1:10



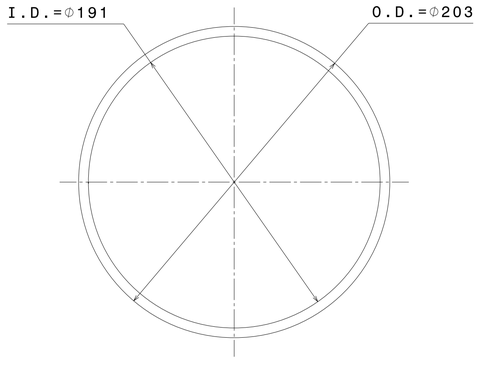
FRONT VIEW



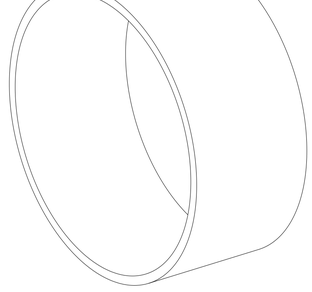
SECTION D-D

③ LIFTING LUG
SCALE-1:1

TOP VIEW



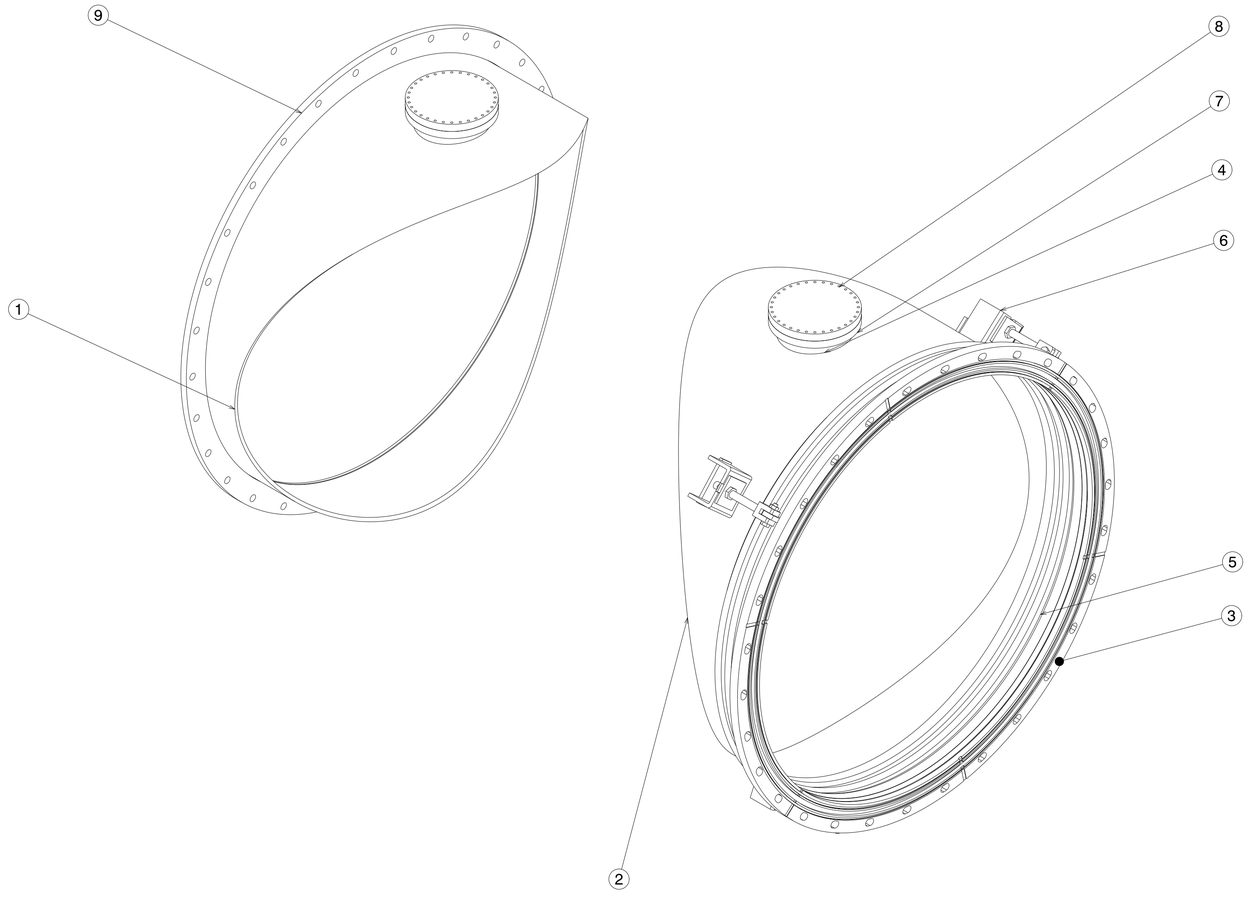
FRONT VIEW



ISOMETRIC VIEW

④ PORT NOZZLE
SCALE-1:2

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025					REVISION COLUMN						MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.		
CO-ORDINATED BY									REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED				
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS															SCALE	AS NOTED	DATE	TITLE	END COVER BIG
LENGTH IN mm OF SHORTER SIDE OF ANGLES					LENGTH OR DIA	UPTO 6	6-30	30-120	120-315						DRAWN	A.N.N.	29/07/2015	THIRD ANGLE PROJECTION	
UPTO 10	10-50	50-120	OVER 120-400												CHECKED	R.K.		REF DRG NO: VH01-001-R1	REV R1
±1°	±0°-30'	±0°-20'	±0°-10'			±0.1	±0.2	±0.3	±0.5						APPROVED	M.K.G.		DRG.NO VH01-004-R1	SHEET 04 OF 04



4 CYLINDRICAL PART (DIA 60.5"ID)

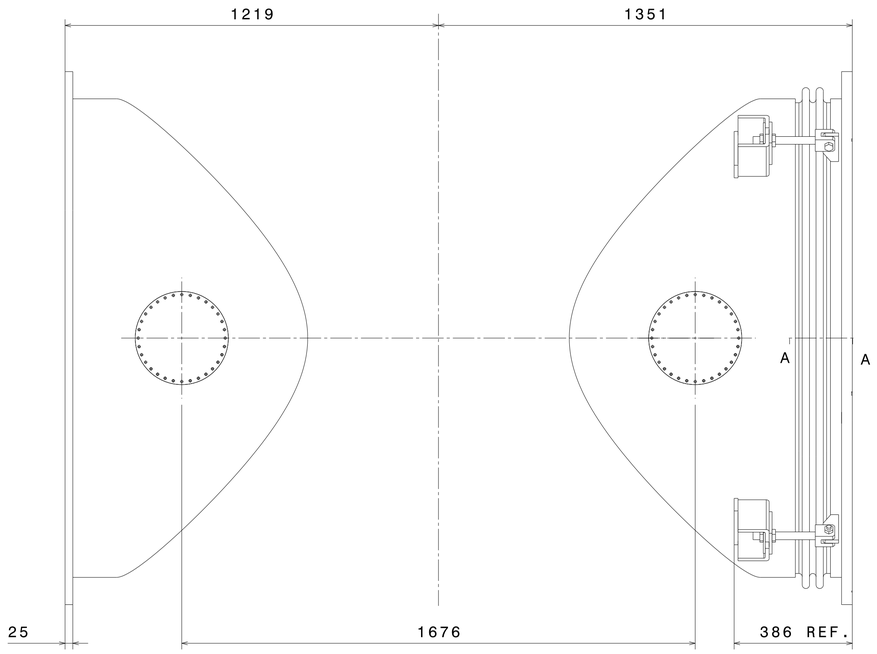
PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
9	1	FLANGE FLAT (60.5"ID)	SS304L	VO01-005-R0/SHEET 08	-
8	2	DN 250CF COVER FLANGE	SS304L	VO01-001-R0/SHEET 03	-
7	2	DN 250CF BLANK FLANGE	SS304L	VO01-001-R0/SHEET 03	-
6	4	BELLOW TIE ROD ASSEMBLY	SS304L	VH01-005-R1/SHEET 06	-
5	1	BELLOW	SS304L	VH01-005-R1/SHEET 05	-
4	2	PORT D NOZZLE	SS304L	VH01-005-R1/SHEET 05	-
3	1	FLANGE GROOVED (60.5"ID)	SS304L	VH01-005-R1/SHEET 04	-
2	1	CYLINDRICAL SHELL-2	SS304L	VH01-005-R1/SHEET 03	-
1	1	CYLINDRICAL SHELL-1	SS304L	VH01-005-R1/SHEET 03	-

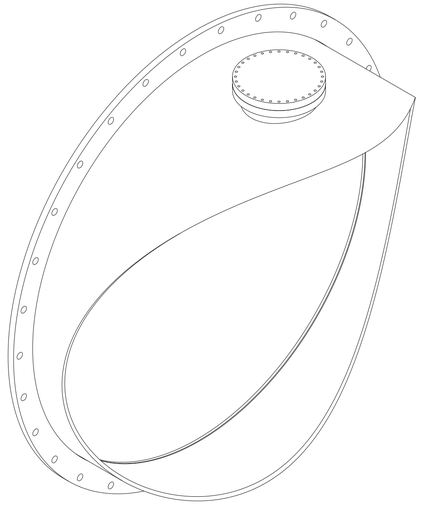
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

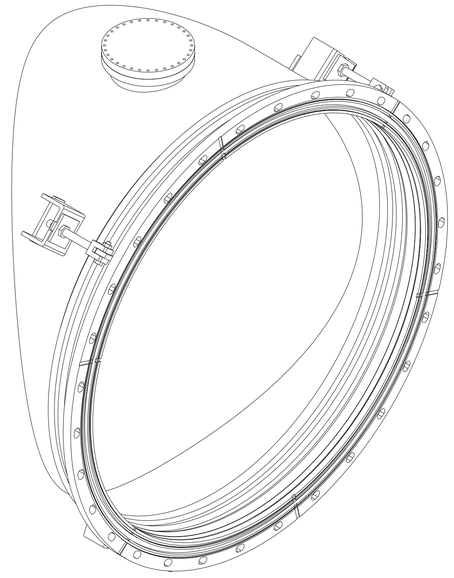
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

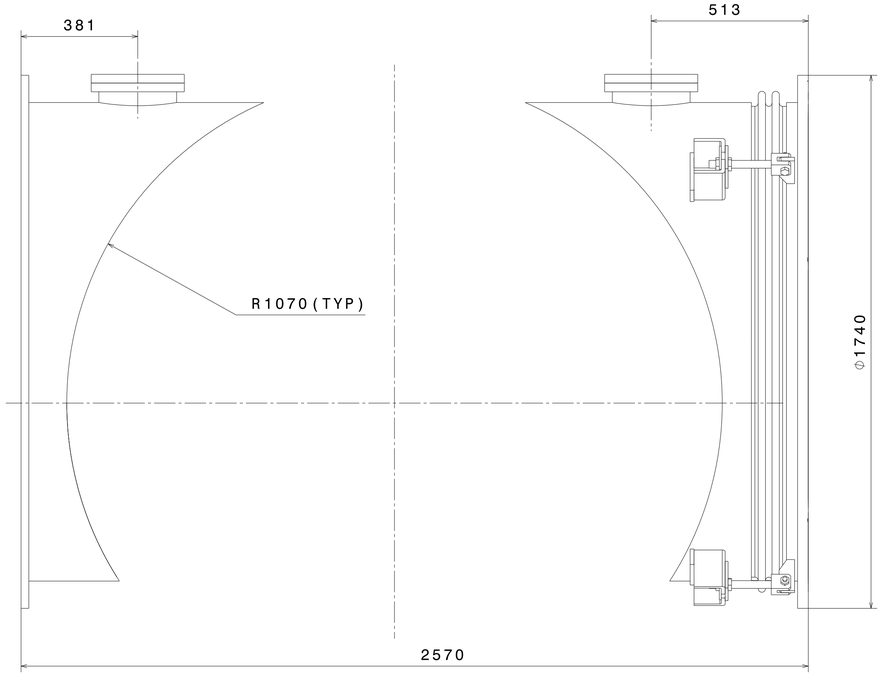
REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

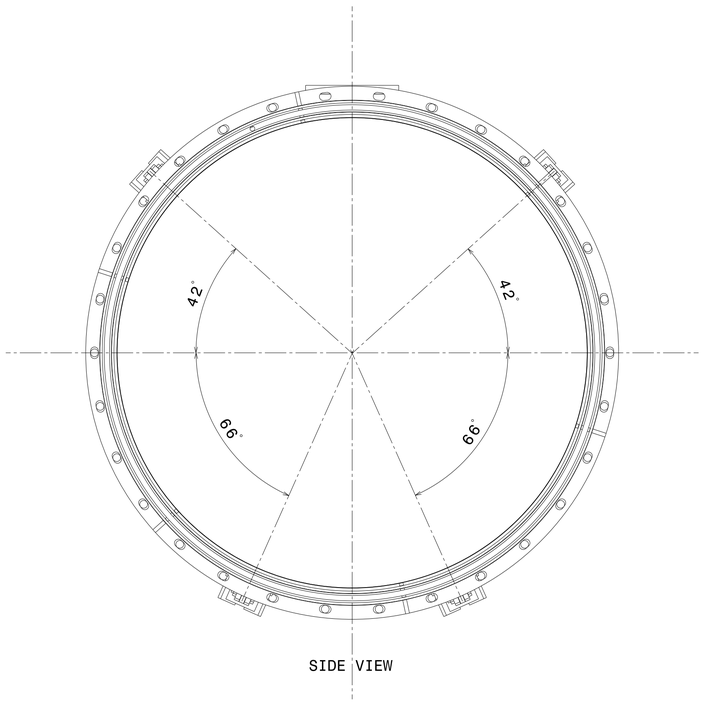
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.	
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED				
SCALE	1:10	DATE	THIRD ANGLE PROJECTION	TITLE: CYLINDRICAL PART (DIA 60.5"ID)
DRAWN	A.N.N.	30/07/2015		
CHECKED	R.K.		REF DRG NO: VH01-001-R1	REV R1
APPROVED	M.K.G.		DRG.NO VH01-005-R1	SHEET 01 OF 08

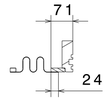












TOP VIEW

ISOMETRIC VIEW

FRONT VIEW

SIDE VIEW

SECTION A-A

④ CYLINDRICAL PART DIA (60.5"ID)

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		+0.1	+0.2	+0.3	+0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

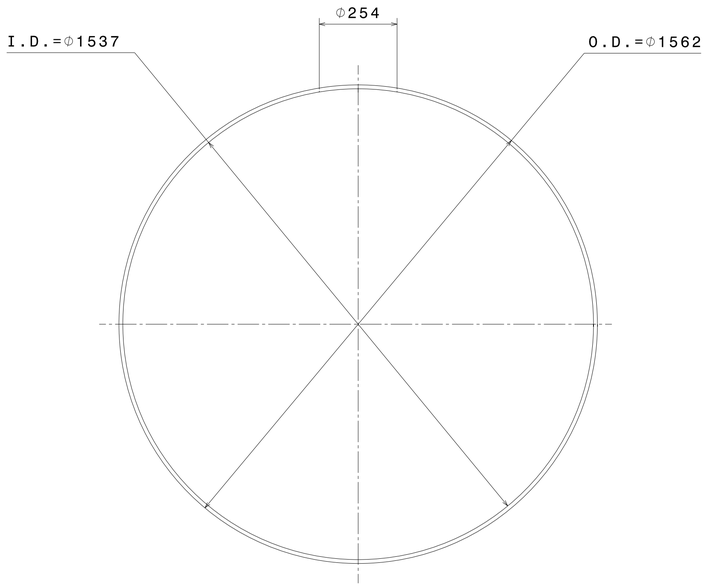
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:10	DATE
DRAWN	A.N.N.	30/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

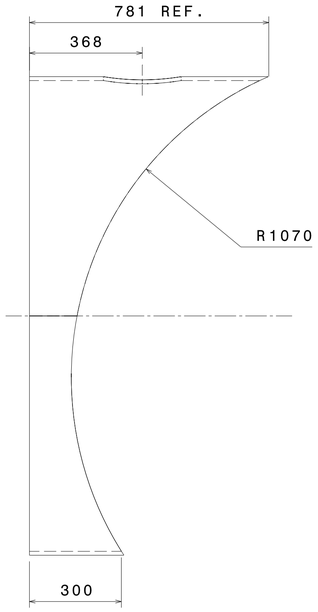
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

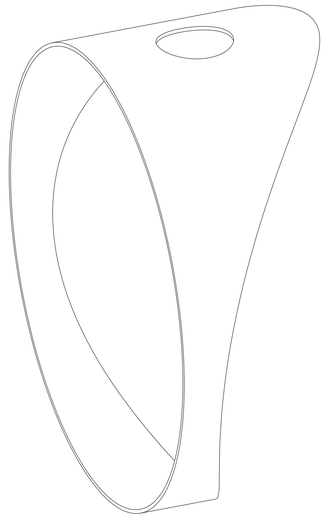
THIRD ANGLE PROJECTION

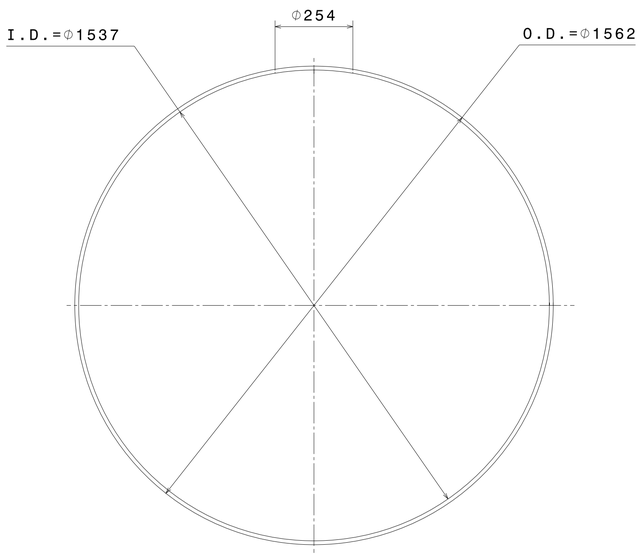
TITLE
CYLINDRICAL PART (DIA 60.5"ID)

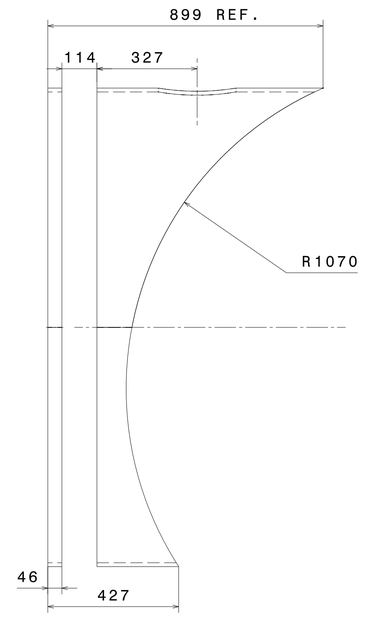
REF DRG NO:	VH01-001-R1	REV R1
DRG.NO	VH01-005-R1	SHEET 02 OF 08

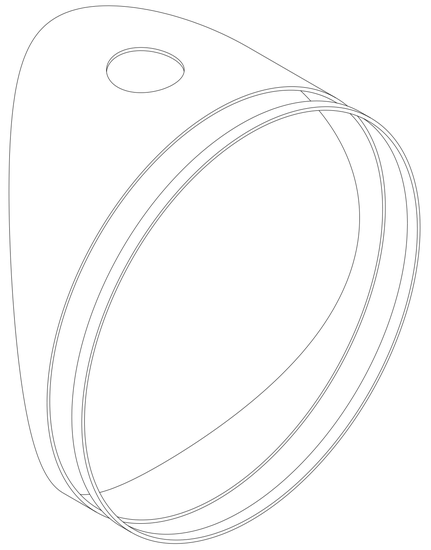












FRONT VIEW

SIDE VIEW

ISOMETRIC VIEW

① CYLINDRICAL SHELL-1

FRONT VIEW

SIDE VIEW

ISOMETRIC VIEW

② CYLINDRICAL SHELL-2

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES			
UPTO 10	10-50	50-120	OVER 120-400
±1°	±0°-30'	±0°-20'	±0°-10'

LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
	±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

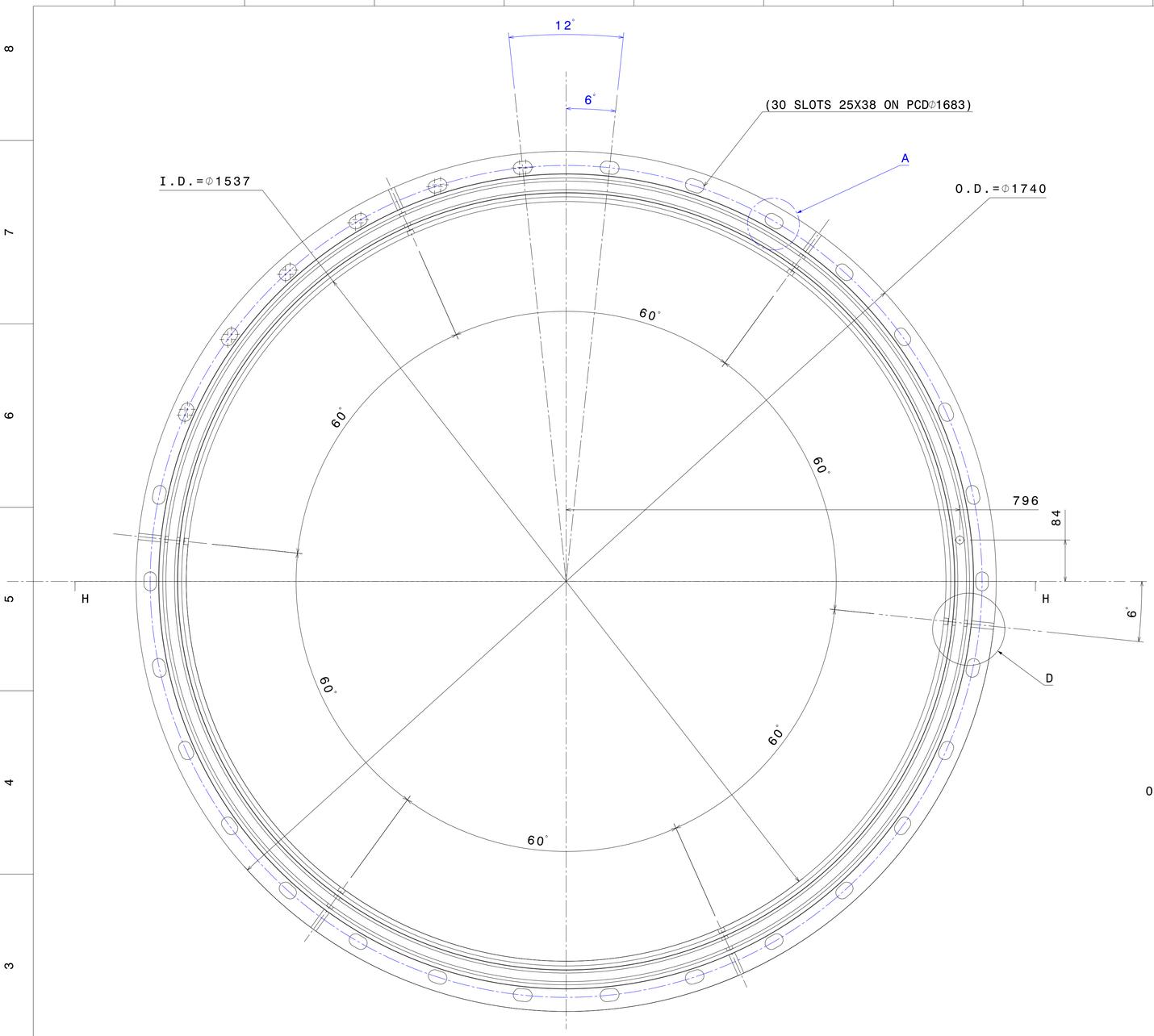
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:10	DATE
DRAWN	A.N.N.	30/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

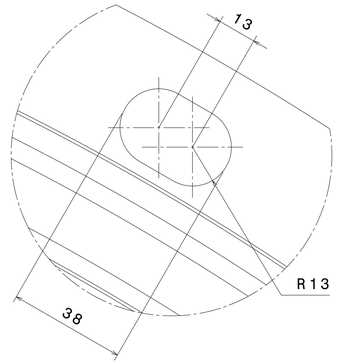
THIRD ANGLE PROJECTION

TITLE
CYLINDRICAL PART (DIA 60.5"ID)

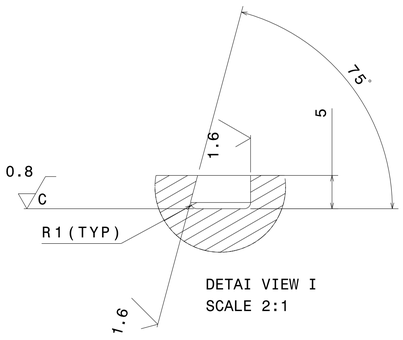
REF DRG NO:	VH01-001-R1	REV R1
DRG.NO	VH01-005-R1	SHEET 03 OF 08



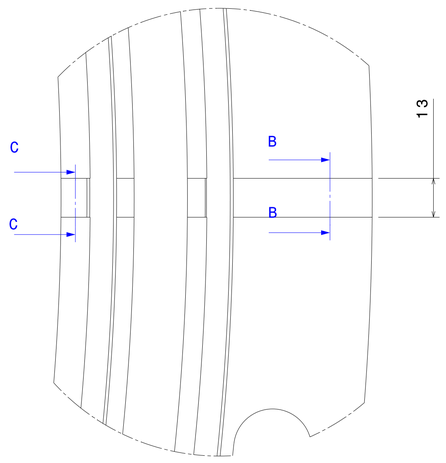
FRONT VIEW



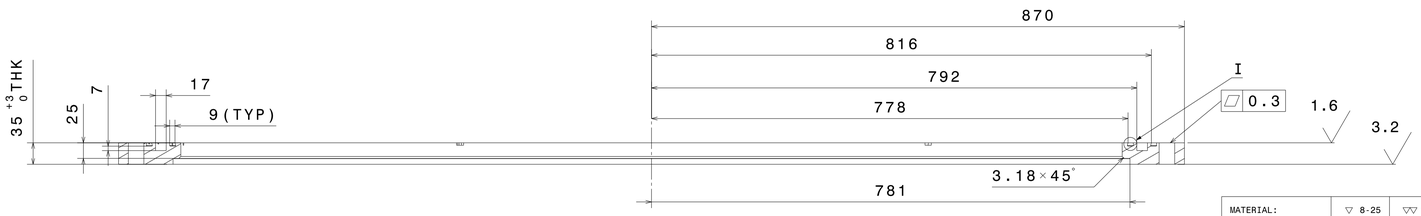
DETAIL VIEW A
SCALE 1:1



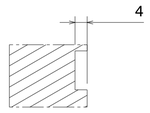
DETAI VIEW I
SCALE 2:1



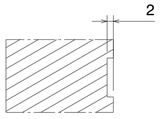
SECTION D-D
SCALE 1:1



SECTION H-H



SECTION C-C
SCALE 1:1



SECTION B-B
SCALE 1:1

③ FLANGE GROOVED (60.5"ID)
SCALE-1:5

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

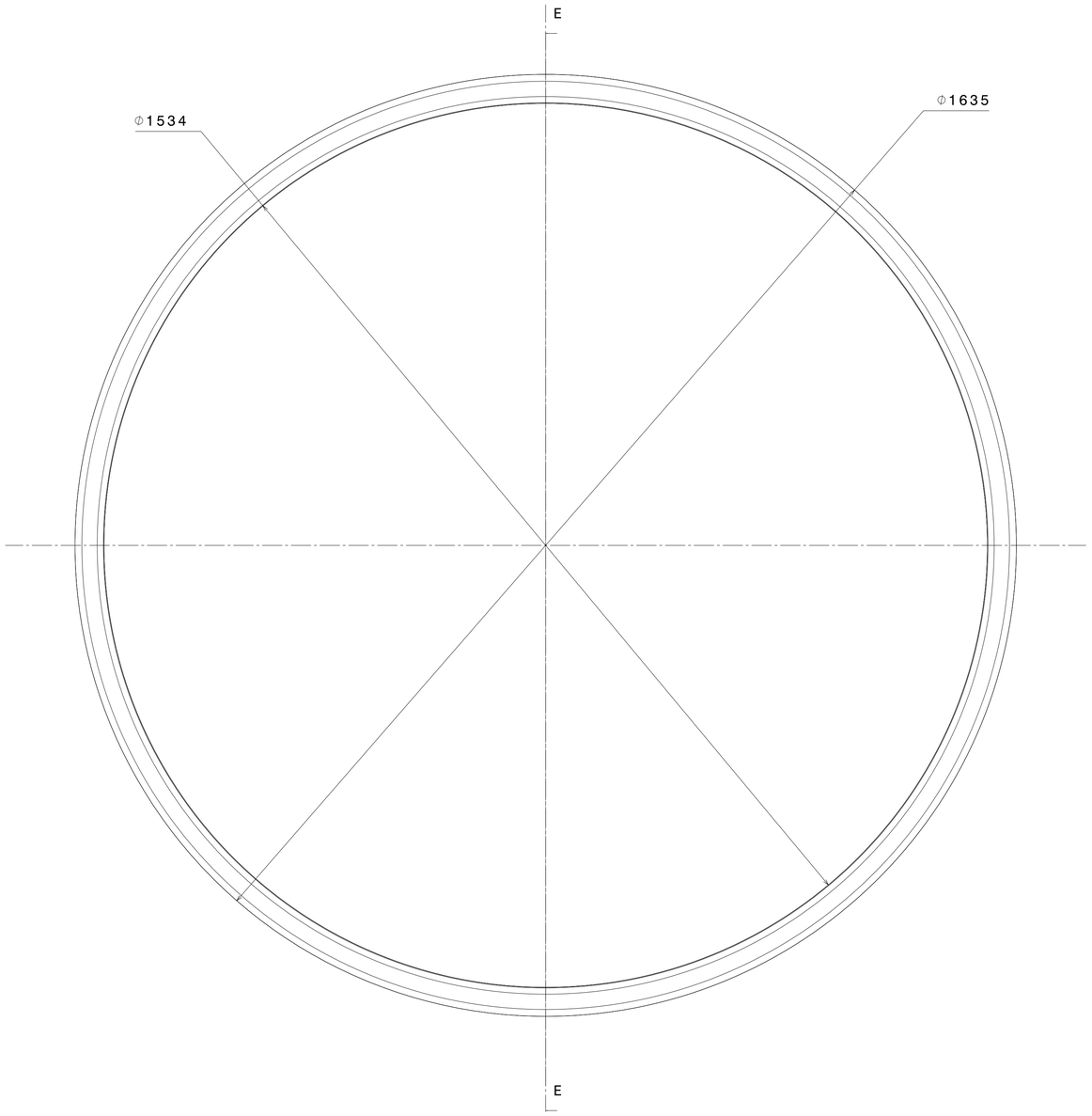
MED		SIZE A1	
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	
DRAWN	A.N.N.	30/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

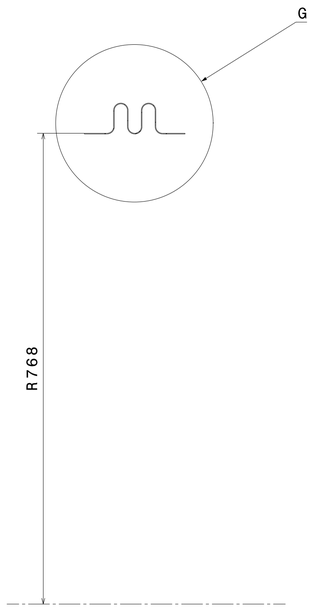
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

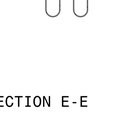
TITLE
CYLINDRICAL PART (DIA 60.5"ID)

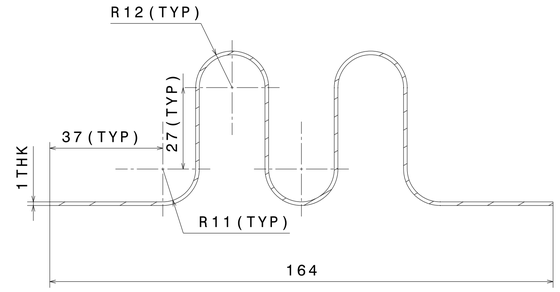
THIRD ANGLE PROJECTION

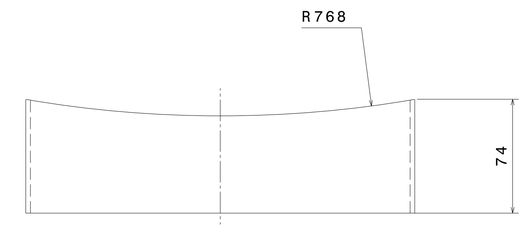
REF DRG NO:	VH01-001-R1	REV	R1
DRG.NO	VH01-005-R1	SHEET	04 OF 08

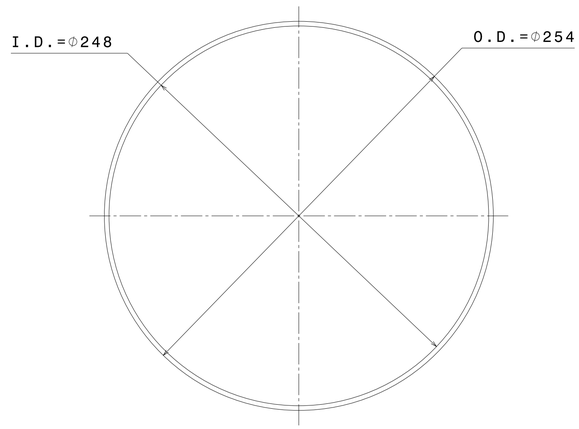












FRONT VIEW

SECTION E-E

DETAIL VIEW-G
SCALE-1:1

⑤ BELLOW
SCALE-1:5

TOP VIEW

FRONT VIEW

④ PORT D NOZZLE
SCALE-1:2

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES			
UPTO 10	10-50	50-120	OVER 120-400
±1°	±0°-30'	±0°-20'	±0°-10'

LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
	±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

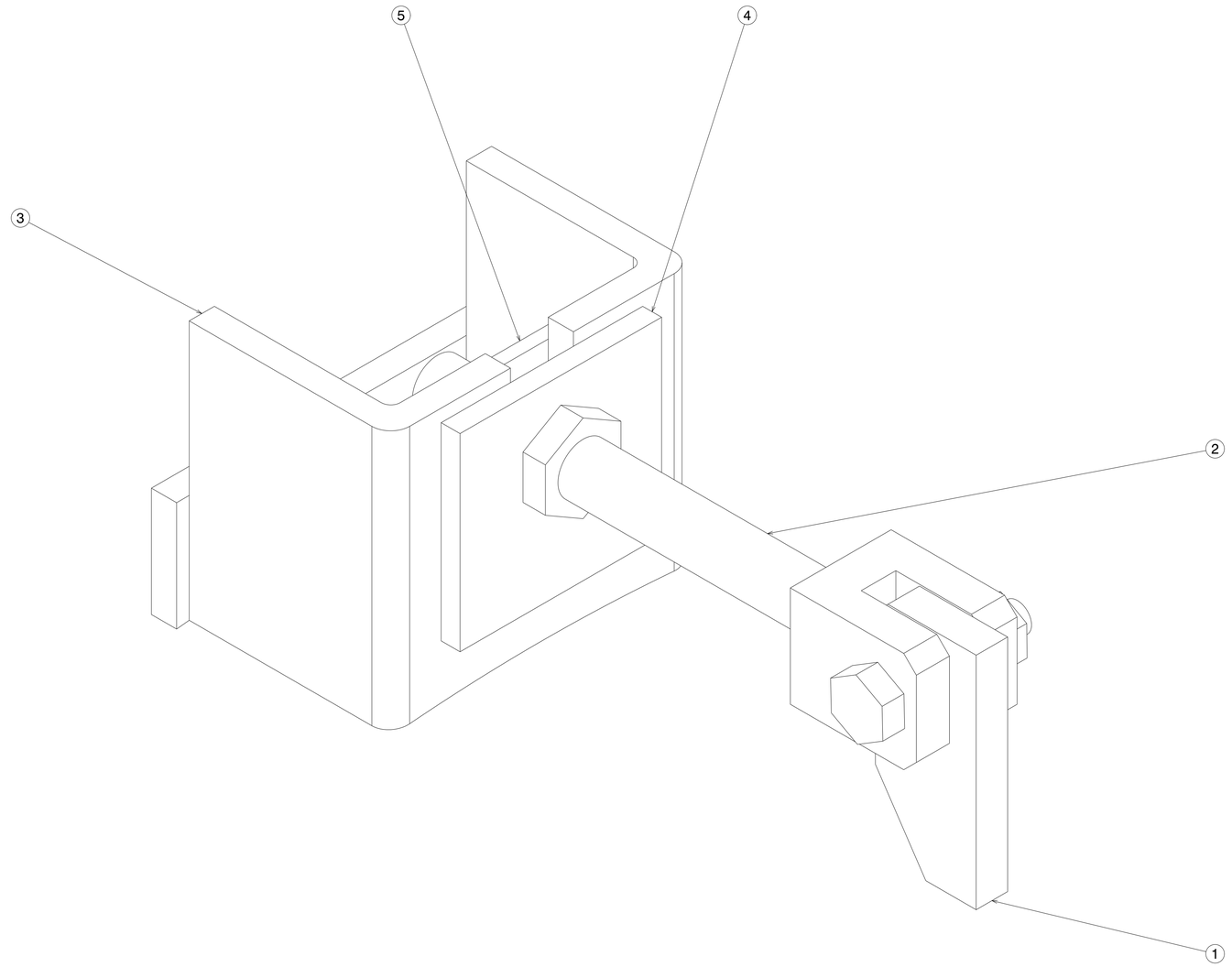
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	AS NOTED	DATE
DRAWN	A.N.N.	30/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

THIRD ANGLE PROJECTION

TITLE
CYLINDRICAL PART (DIA 60.5"ID)

REF DRG NO:	VH01-001-R1	REV R1
DRG.NO	VH01-005-R1	SHEET 05 OF 08



6 BELLOW TIE ROD ASSEMBLY

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
5	01	PLATE-3	SS304L	VH01-005-R1/SHEET 07	-
4	01	PLATE-2	SS304L	VH01-005-R1/SHEET 07	-
3	01	BRACKET	SS304L	VH01-005-R1/SHEET 07	-
2	01	ROD	SS304L	VH01-005-R1/SHEET 07	-
1	01	PLATE-1	SS304L	VH01-005-R1/SHEET 07	-

MATERIAL: ▽ 8-25 | ▽▽ 1.6-8 | ▽▽▽ 0.025-1.6 | ▽▽▽▽ < 0.025

CO-ORDINATED BY

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED | SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

SCALE 1:1 | DATE

THIRD ANGLE PROJECTION

TITLE: CYLINDRICAL PART (DIA 60.5"ID)

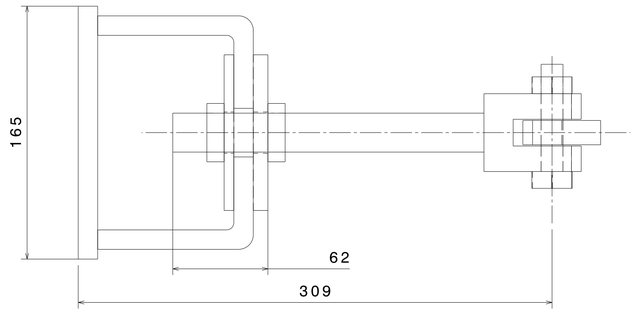
DRAWN A.N.N. 30/07/2015

CHECKED R.K.

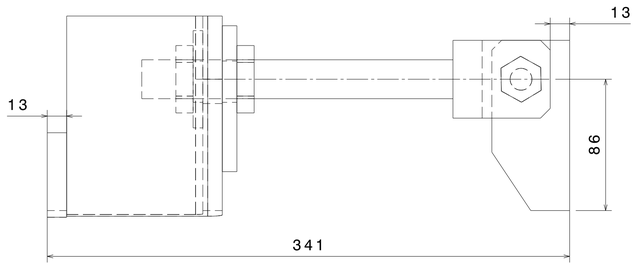
APPROVED M.K.G.

REF DRG NO: VH01-001-R1 | REV R1

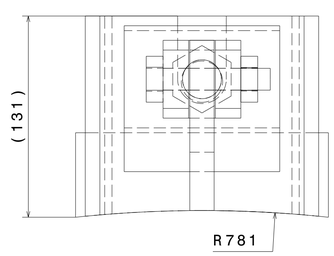
DRG.NO VH01-005-R1 | SHEET 06 OF 08



TOP VIEW

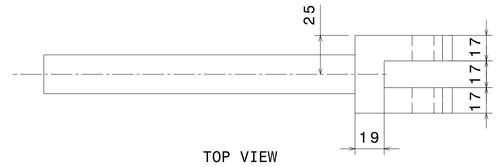


FRONT VIEW

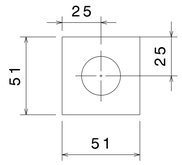


SIDE VIEW

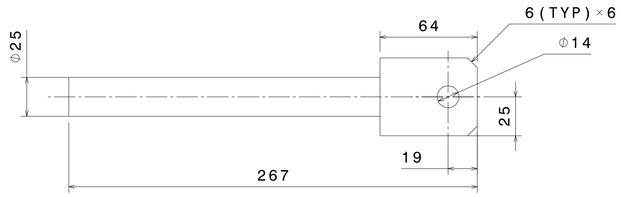
ASSEMBLY DIMENSIONS
SCALE-1:2



TOP VIEW

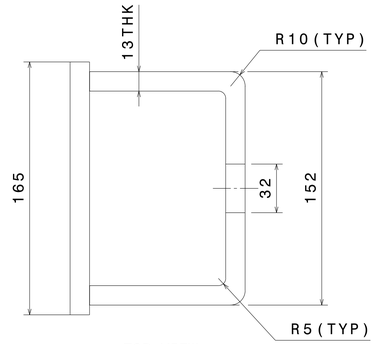


SIDE VIEW

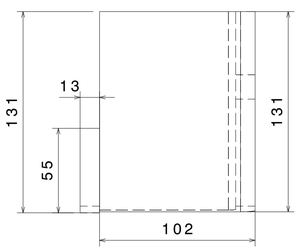


FRONT VIEW

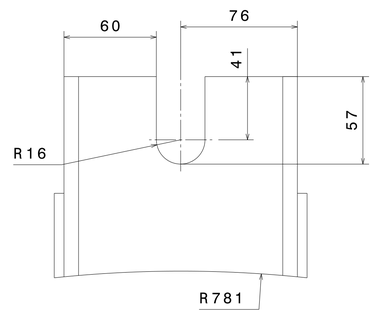
(2) ROD
SCALE-1:2



TOP VIEW

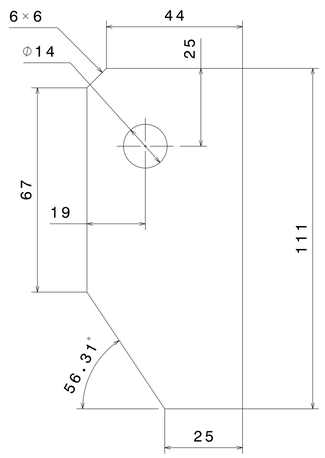


FRONT VIEW

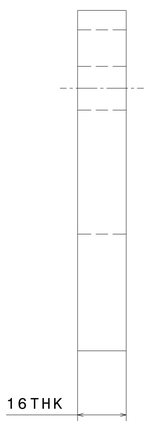


SIDE VIEW

(3) BRACKET
SCALE-1:2

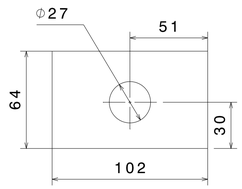


FRONT VIEW

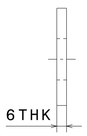


SIDE VIEW

(1) PLATE-1
SCALE-1:1

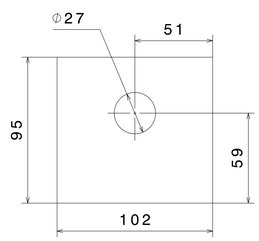


FRONT VIEW

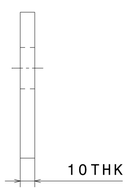


SIDE VIEW

(5) PLATE-3
SCALE-1:2



FRONT VIEW



SIDE VIEW

(4) PLATE-2
SCALE-1:2

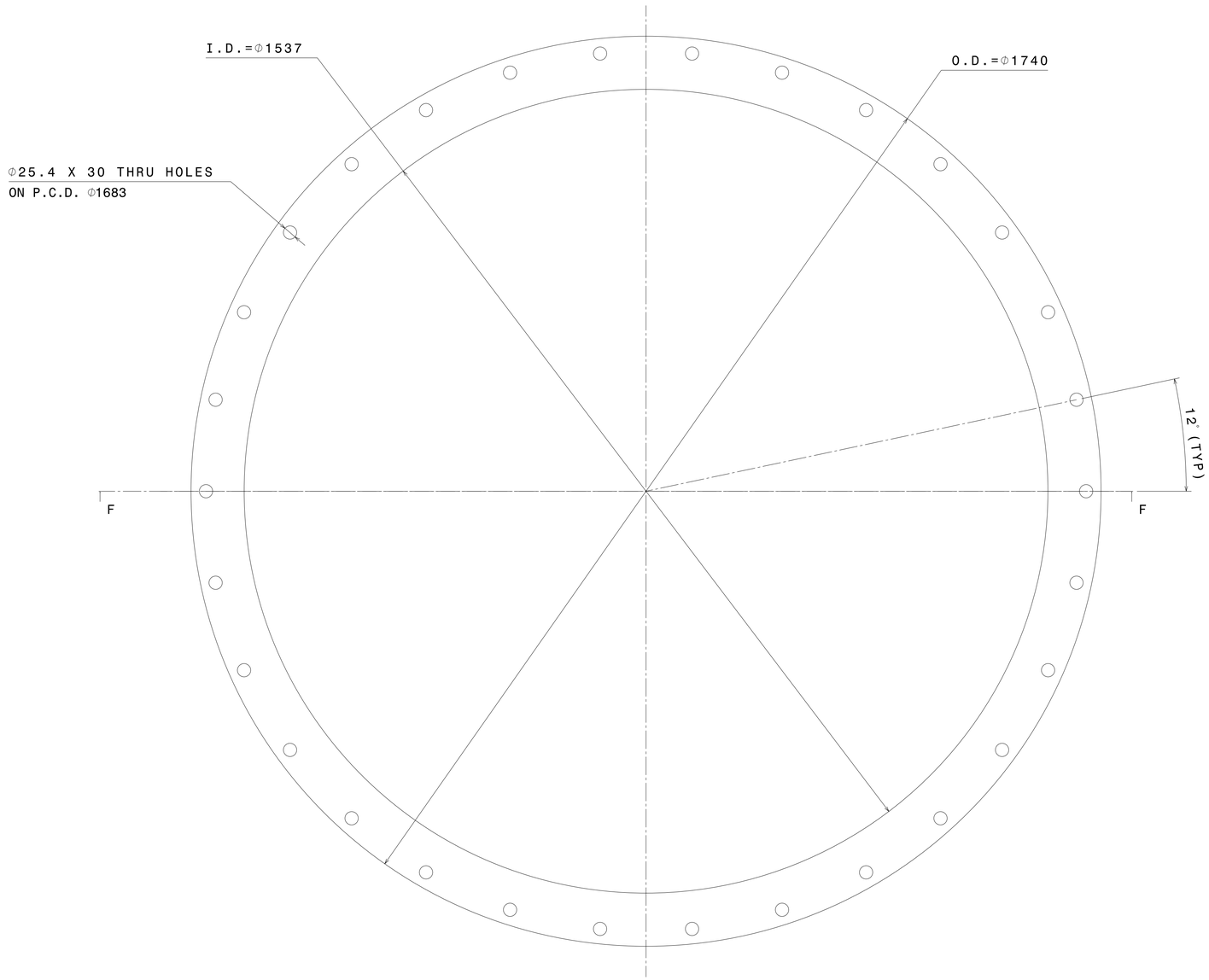
MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025					REVISION COLUMN						MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
CO-ORDINATED BY									REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED		
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS															SCALE	AS NOTED	DATE
LENGTH IN mm OF SHORTER SIDE OF ANGLES					LENGTH OR DIA	UPTO 6	6-30	30-120	120-315						DRAWN	A.N.N.	30/07/2015
UPTO 10	10-50	50-120	OVER 120-400												CHECKED	R.K.	
±1°	±0°-30'	±0°-20'	±0°-10'			±0.1	±0.2	±0.3	±0.5						APPROVED	M.K.G.	

THIRD ANGLE PROJECTION

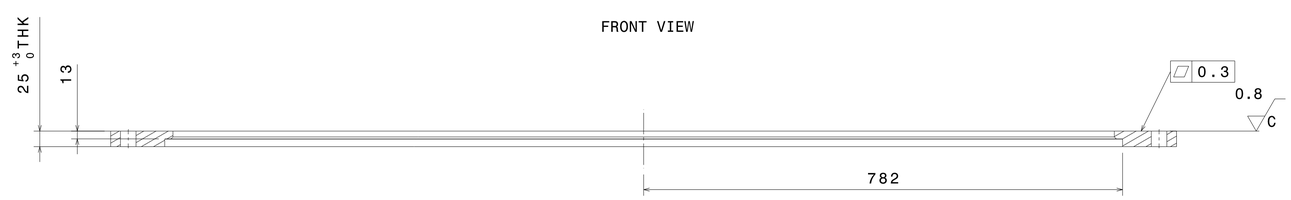
TITLE: CYLINDRICAL PART (DIA 60.5°ID)

REF DRG NO: VH01-001-R1 REV R1

DRG.NO VH01-005-R1 SHEET 07 OF 08



FRONT VIEW



SECTION F-F

⑨ FLANGE FLAT (60.5"ID)
SCALE 1:5

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS									
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1'	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

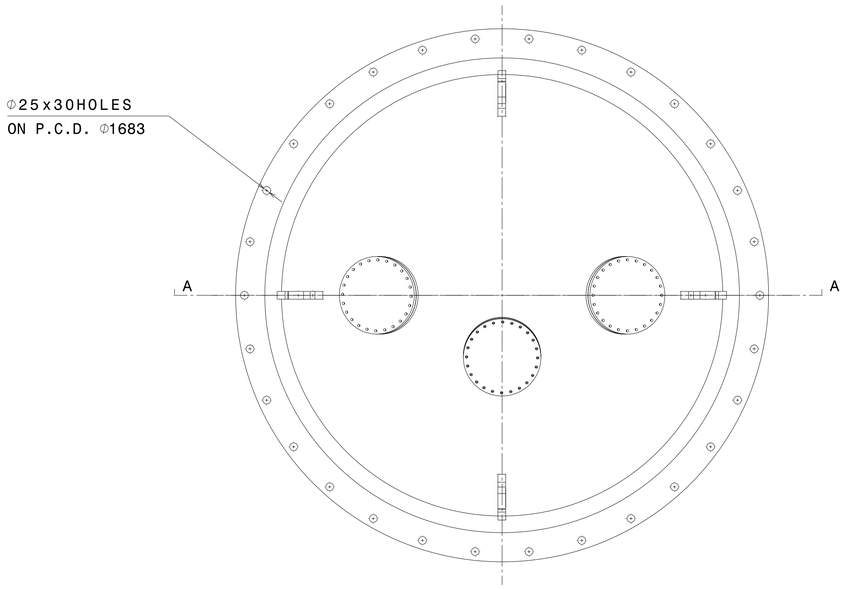
MED		SIZE	A1
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED		SCALE	1:5
		DATE	
DRAWN	A.N.N.	30/07/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

THIRD ANGLE PROJECTION

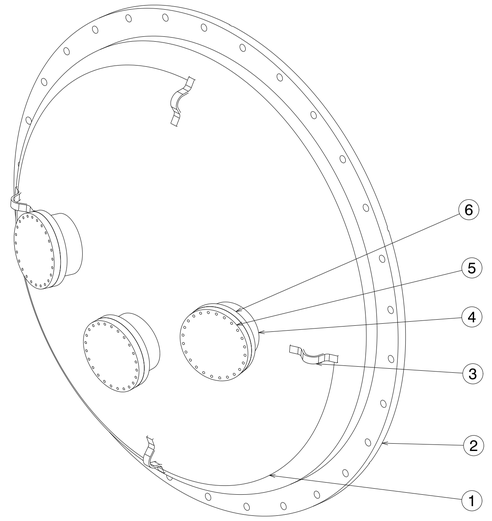
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

TITLE
CYLINDRICAL PART (DIA 60.5"ID)

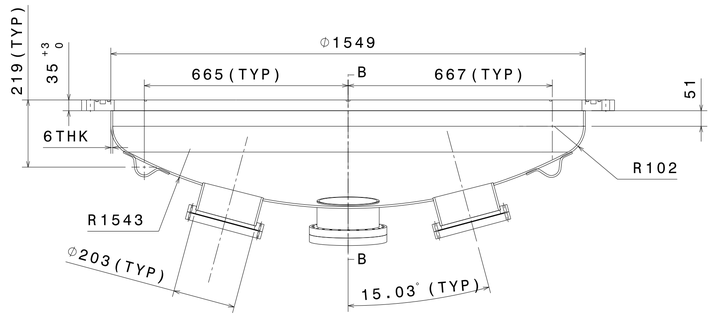
REF DRG NO:	VHO1-001-R1		REV R1
DRG.NO	VHO1-005-R1		SHEET 08 OF 08



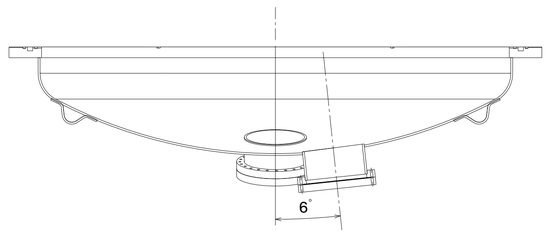
FRONT VIEW



ISOMETRIC VIEW



SECTION A-A



SECTION B-B

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
6	03	DN 200CF BLANK FLANGE	SS304L	V001-001-R0/SHEET 01	-
5	03	DN 200CF COVER FLANGE	SS304L	V001-001-R0/SHEET 01	-
4	03	PORT NOZZLE	SS304L	VH01-006-R1/SHEET 02	-
3	04	LIFTING LUG	SS304L	VH01-006-R1/SHEET 02	-
2	01	FLANGE GROOVED(60.5"ID)	SS304L	VH01-006-R1/SHEET 03	-
1	01	F & D HEAD	SS304L	VH01-006-R1/SHEET 02	

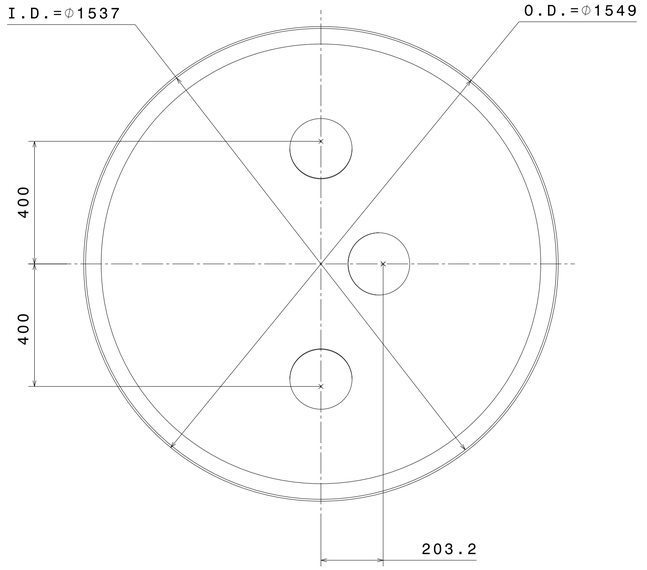
⑤ END COVER SMALL

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

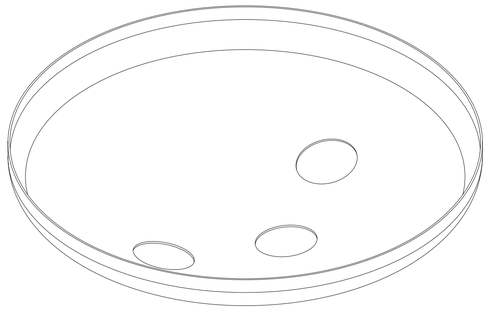
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN						
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	

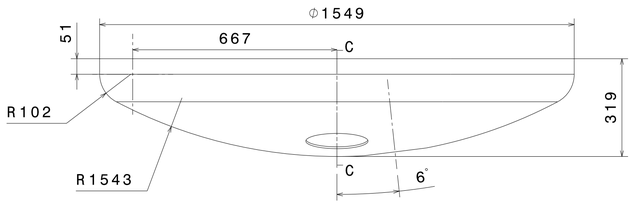
MED		SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	1:10	DATE	TITLE: END COVER SMALL
DRAWN	A.N.N.	31/07/2015	THIRD ANGLE PROJECTION
CHECKED	R.K.		REF DRG NO: VH01-001-R1 — REV R1
APPROVED	M.K.G.		DRG.NO: VH01-006-R1 — SHEET 01 OF 03



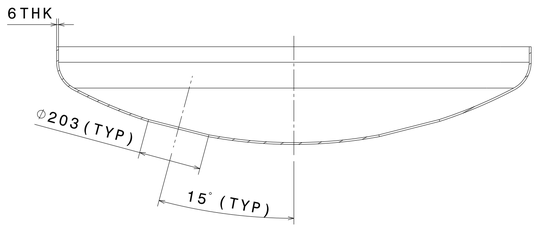
TOP VIEW



ISOMETRIC VIEW



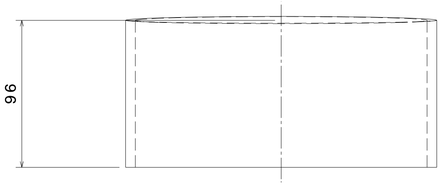
FRONT VIEW



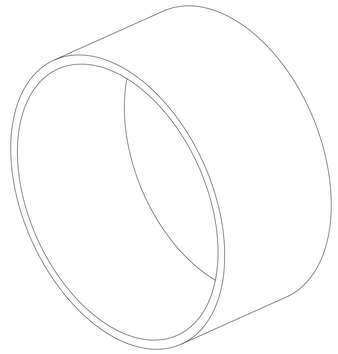
SECTION C-C

① F & D HEAD

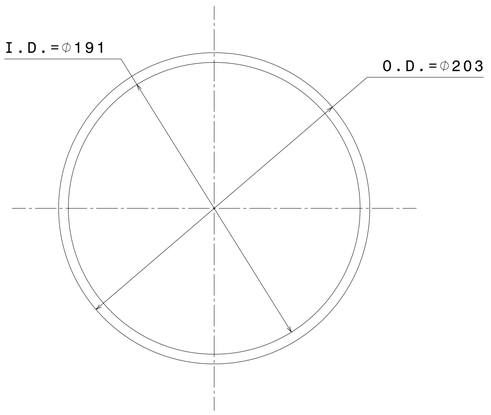
SCALE-1:10



TOP VIEW



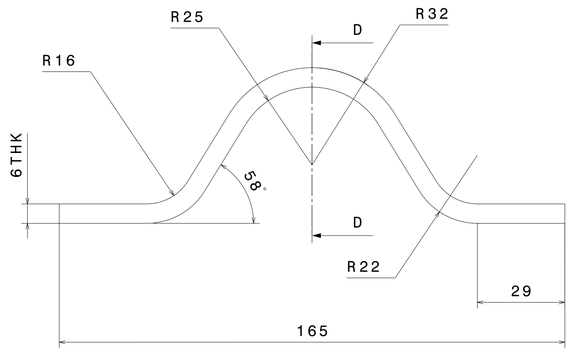
ISOMETRIC VIEW



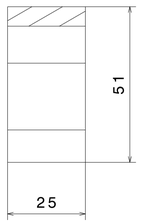
FRONT VIEW

④ PORT NOZZLE

SCALE-1:2



FRONT VIEW



SECTION D-D

③ LIFTING LUG

SCALE-1:1

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES			
UPTO 10	10-50	50-120	OVER 120-400
±1°	±0°-30'	±0°-20'	±0°-10'

LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
	±0.1	±0.2	±0.3	±0.5

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

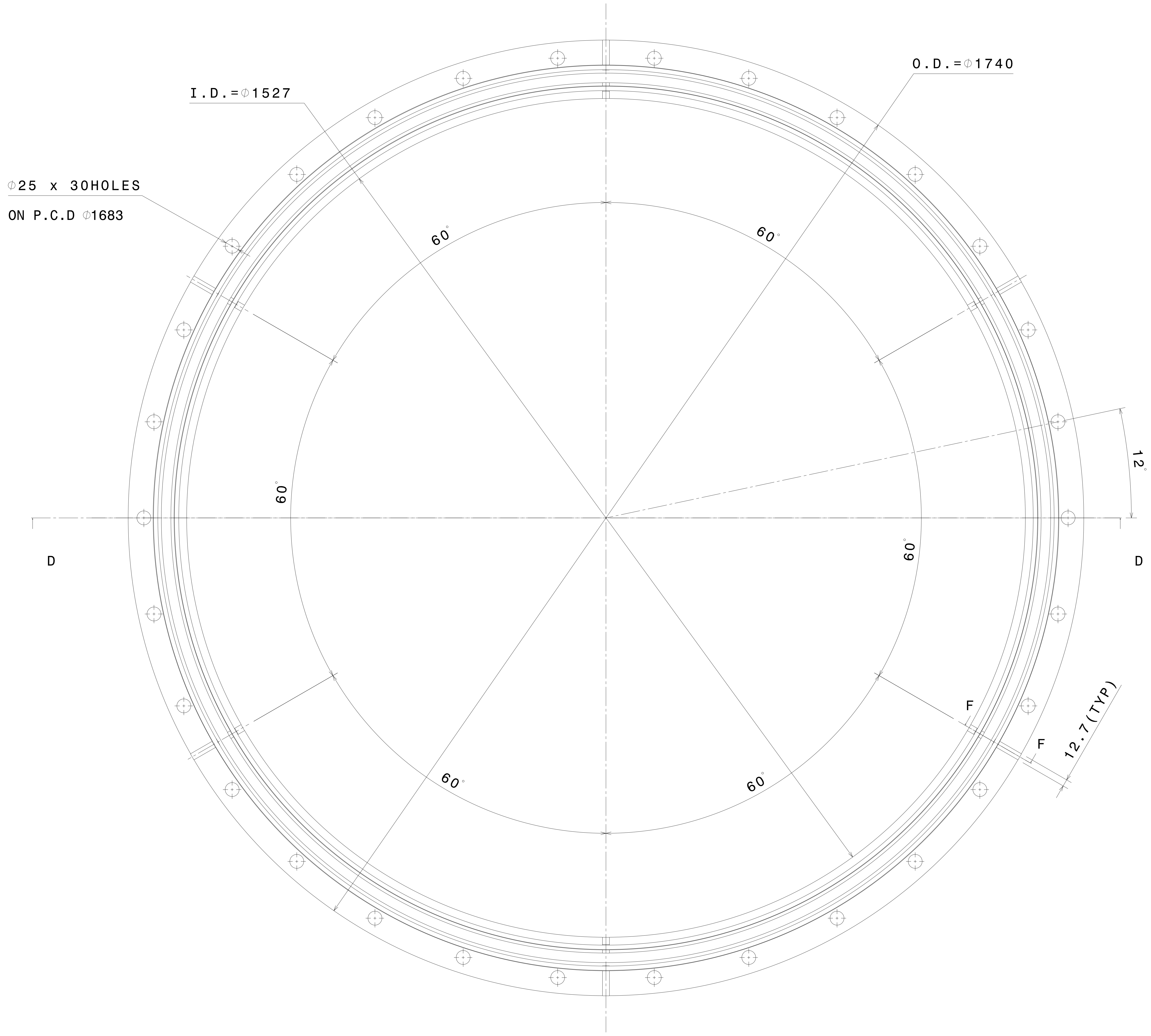
MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	AS NOTED	DATE
DRAWN	A.N.N.	31/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

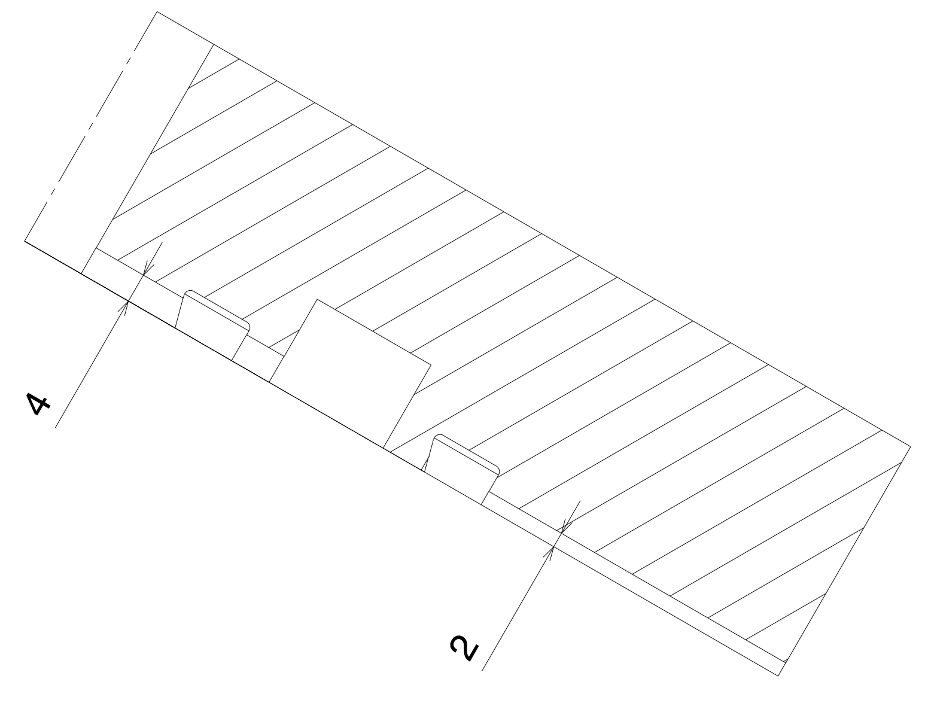
THIRD ANGLE PROJECTION

TITLE
END COVER SMALL

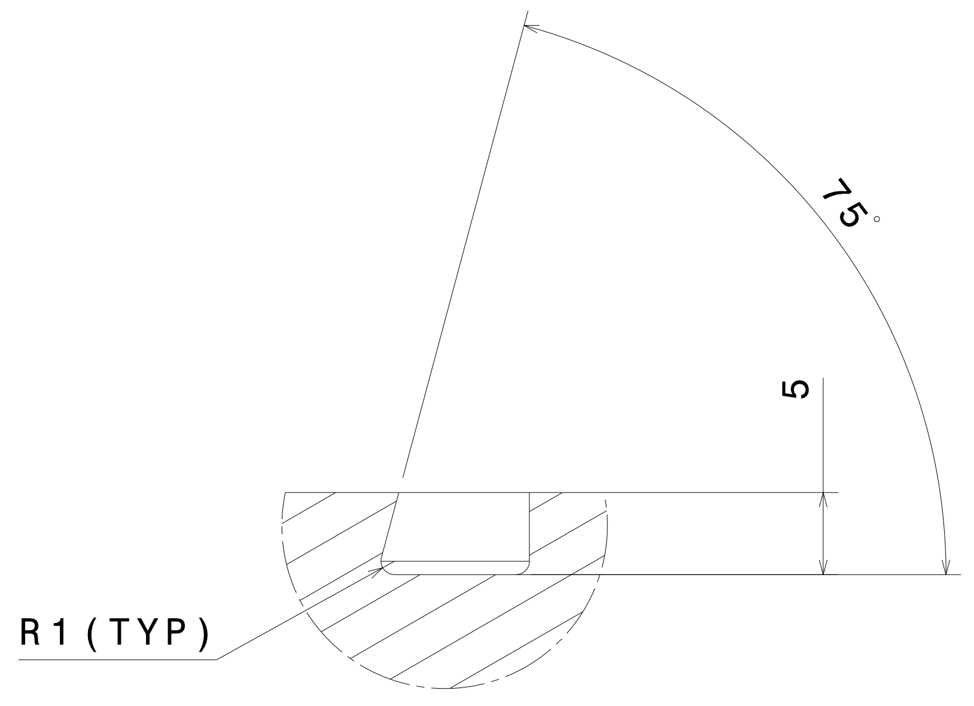
REF DRG NO: VH01-001-R1		REV R1
DRG.NO	VH01-006-R1	SHEET 02 OF 03



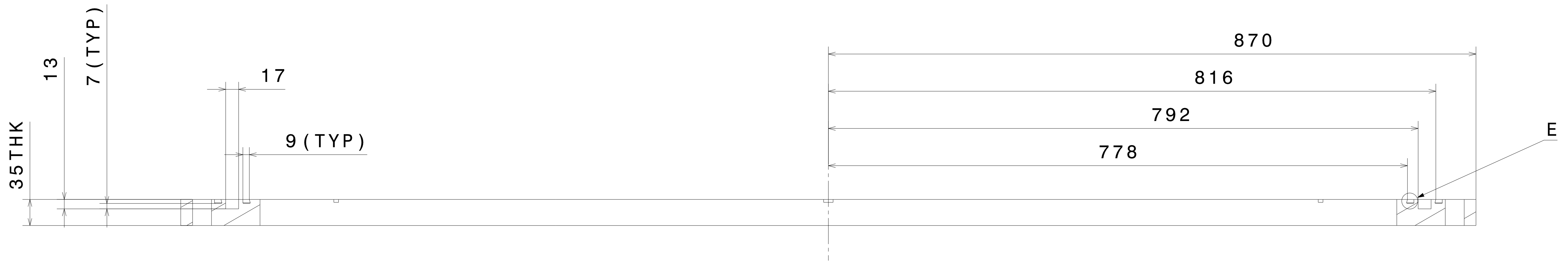
FRONT VIEW



SECTION F-F
SCALE 1:1



DETAIL VIEW-E
SCALE 2:1



SECTION D-D

ALL THE TOLERANCES AND ROUGHNESS OF THIS FLANGE ARE SIMILAR TO GROOVED FLANGE OF DRAWING NO VH01-004-R1

② FLANGE GROOVED (60.5"ID)
SCALE-1:5

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400		+0.1	+0.2	+0.3	+0.5
±1°	±0°-30'	±0°-20'	±0°-10'					

REVISION COLUMN

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED		SIZE A1
ALL DIMENSIONS ARE IN `mm' UNLESS OTHERWISE STATED		
SCALE	1:5	DATE
DRAWN	A.N.N.	31/07/2015
CHECKED	R.K.	
APPROVED	M.K.G.	

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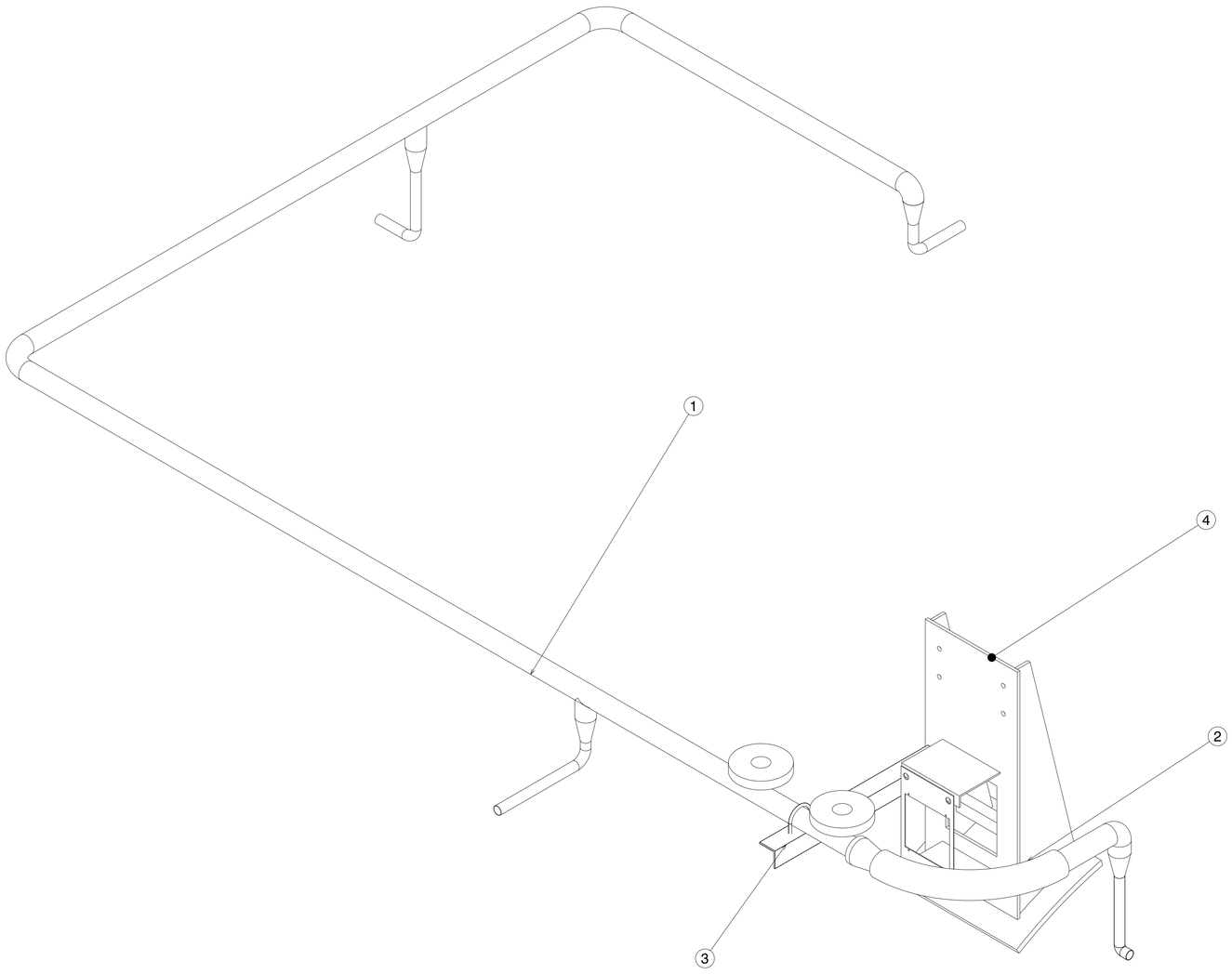
BHAT, GANDHINAGAR-382 428.

THIRD ANGLE PROJECTION

TITLE
END COVER SMALL

REF DRG NO:	VH01-001-R1	REV R1
DRG.NO	VH01-006-R1	SHEET 03 OF 03



6 ANNULUS TUBING ASSEMBLY

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
4	01	75 I/S ION PUMP SUPPORT	SS304L	VH01-007-R1/SHEET 03/04	-
3	01	ANNULUS TUBE SHIPPING SUPPORT	SS304L	VH01-007-R1/SHEET 03	-
2	01	ANNULUS FLEX HOSE	SS304L	VH01-007-R1/SHEET 02	-
1	01	TUBING ASSEMBLY	SS304L	VH01-007-R1/SHEET 02	-

MATERIAL: ▽ 8-25 | ▽▽ 1.6-8 | ▽▽▽ 0.025-1.6 | ▽▽▽▽ < 0.025

CO-ORDINATED BY

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1'	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

REVISION COLUMN

MED | SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

THIRD ANGLE PROJECTION

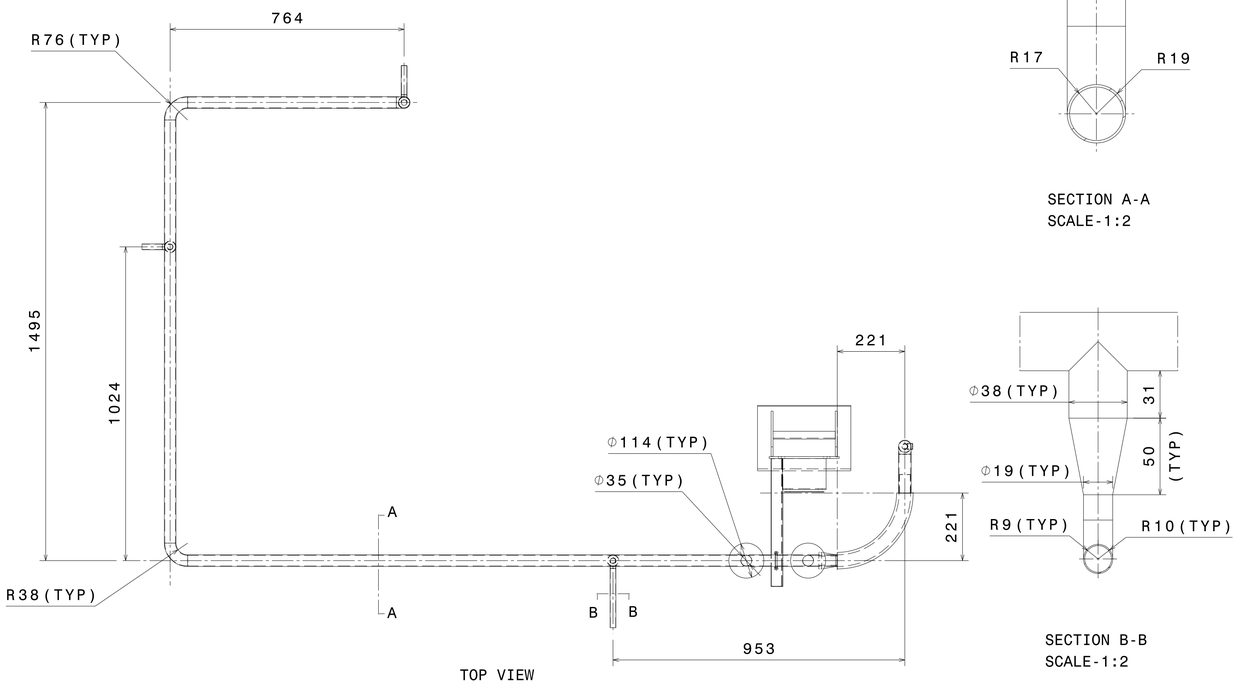
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

TITLE: ANNULUS TUBING ASSEMBLY

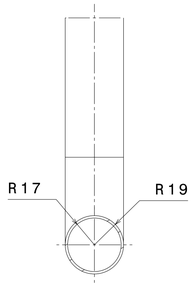
SCALE	1:10	DATE	
DRAWN	A.N.N.	01/08/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

REF DRG NO: VH01-001-R1 REV R1

DRG.NO VH01-007-R1 SHEET 01 OF 04

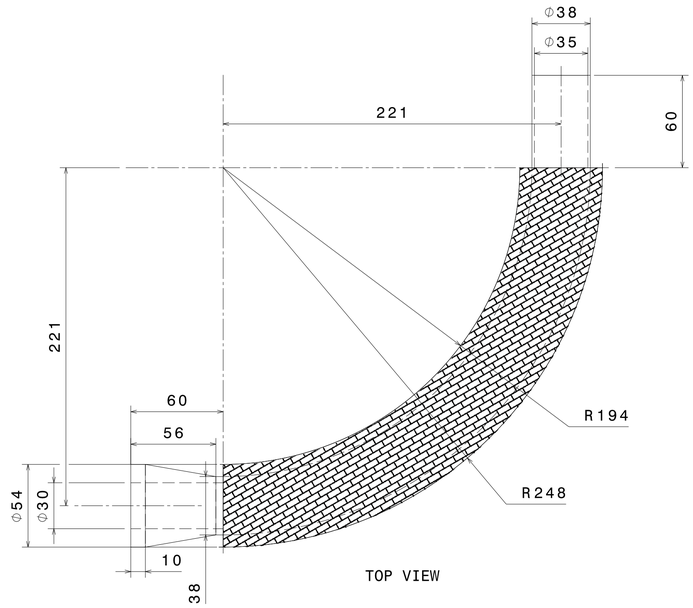


TOP VIEW



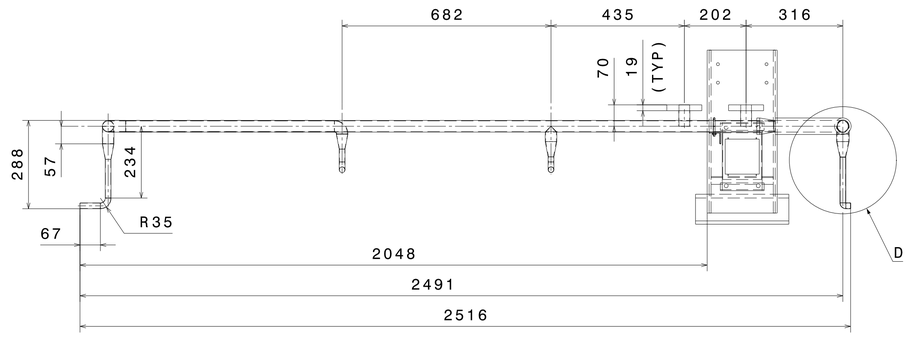
SECTION A-A
SCALE-1:2

SECTION B-B
SCALE-1:2

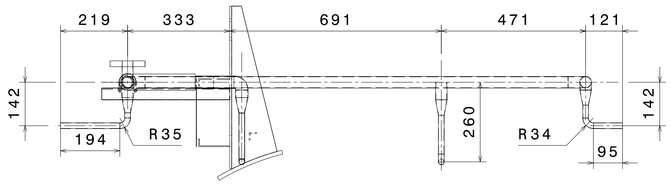


TOP VIEW

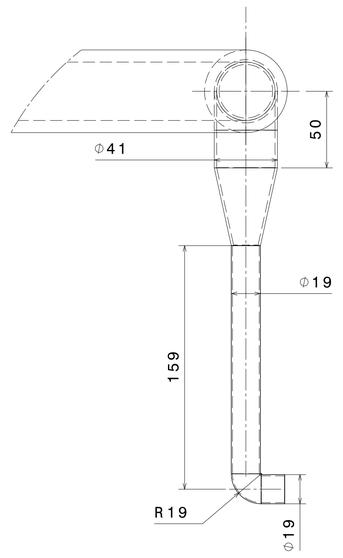
(2) ANNULUS FLEX HOSE
SCALE-1:2



FRONT VIEW



SIDE VIEW



DETAIL VIEW-D
SCALE-1:2

(1) TUBING ASSEMBLY
SCALE-1:10

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

REVISION COLUMN

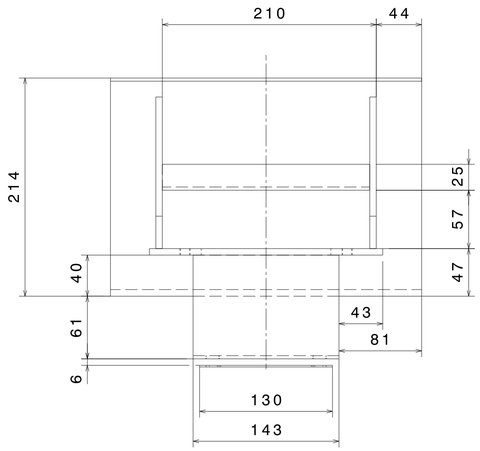
MED		SIZE	A1
ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED			
SCALE	AS NOTED	DATE	
DRAWN	A.N.N.	01/08/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

THIRD ANGLE PROJECTION

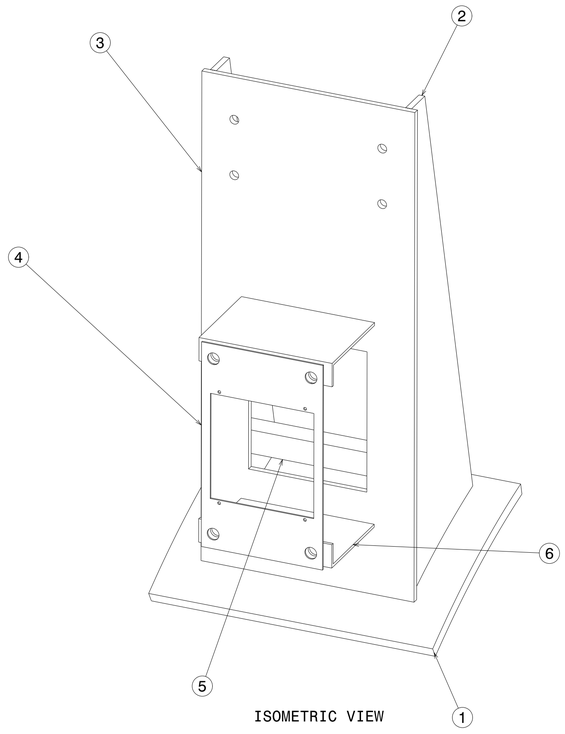
INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

TITLE
ANNULUS TUBING ASSEMBLY

REF DRG NO:	VH01-001-R1	REV	R1
DRG.NO	VH01-007-R1	SHEET	02 OF 04

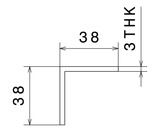


TOP VIEW

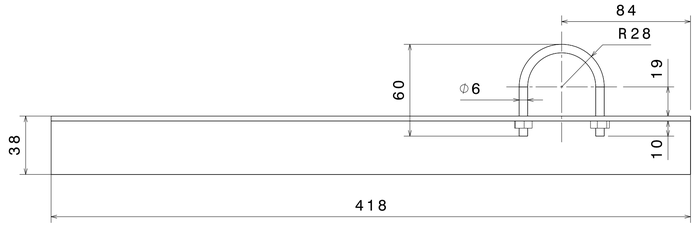


ISOMETRIC VIEW

TOP VIEW

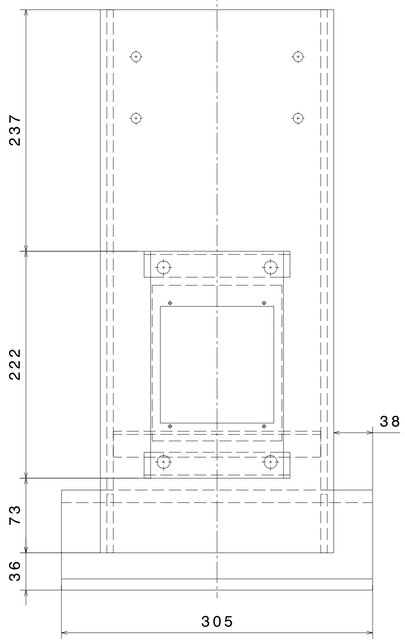


SECTION C-C

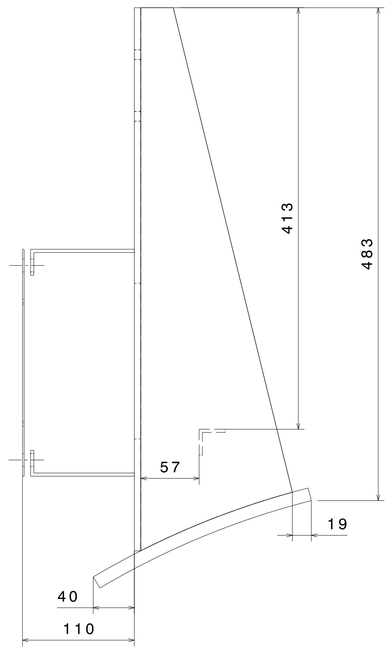


FRONT VIEW

3 ANNULUS TUBE SHIPPING SUPPORT
SCALE-1:2



FRONT VIEW



SIDE VIEW

4 75 I/S ION PUMP SUPPORT
SCALE-1:3

PART NO.	QUANTITY	PART NAME	MATERIAL	REF. DWG. NO.	REMARK
6	02	L-PLATE	SS304L	VH01-007-R1/SHEET 04	-
5	01	L-CHANNEL	SS304L	VH01-007-R1/SHEET 04	-
4	01	PLATE-4	SS304L	VH01-007-R1/SHEET 04	-
3	01	PLATE-3	SS304L	VH01-007-R1/SHEET 04	-
2	02	PLATE-2	SS304L	VH01-007-R1/SHEET 04	-
1	01	PLATE-1	SS304L	VH01-007-R1/SHEET 04	-

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
CO-ORDINATED BY				

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS								
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315
UPTO 10	10-50	50-120	OVER 120-400					
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

MED | SIZE A1

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

INSTITUTE FOR PLASMA RESEARCH
(LIGO-INDIA)
BHAT, GANDHINAGAR-382 428.

SCALE	1:5	DATE	
DRAWN	A.N.N.	01/08/2015	
CHECKED	R.K.		
APPROVED	M.K.G.		

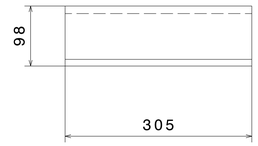
THIRD ANGLE PROJECTION

TITLE: ANNULUS TUBING ASSEMBLY

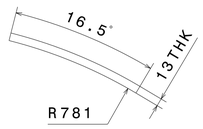
REF DRG NO: VH01-001-R1 | REV R1

DRG.NO: VH01-007-R1 | SHEET 03 OF 04

TOP VIEW

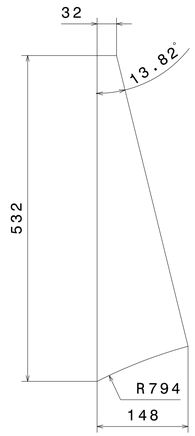


FRONT VIEW



SIDE VIEW

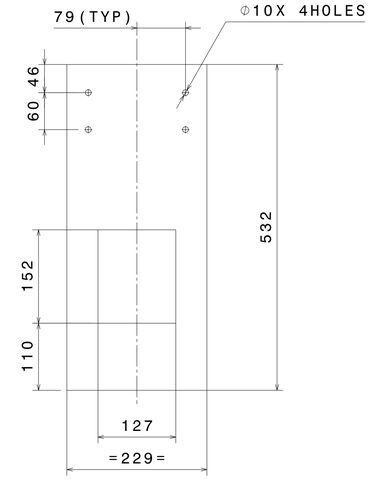
(1) PLATE-1
SCALE-1:5



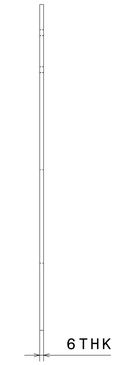
FRONT VIEW

SIDE VIEW

(2) PLATE-2
SCALE-1:5

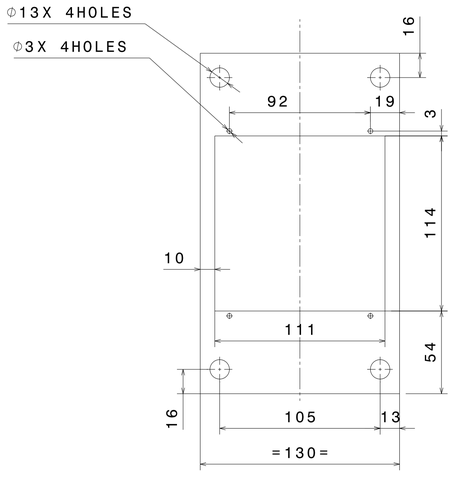


FRONT VIEW



SIDE VIEW

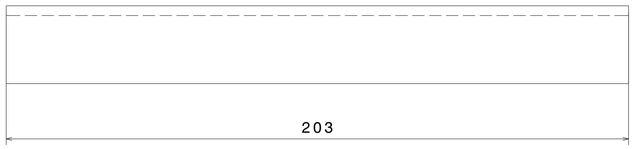
(3) PLATE-3
SCALE-1:5



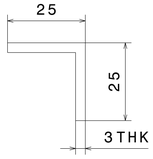
FRONT VIEW

SIDE VIEW

(4) PLATE-4
SCALE-1:2

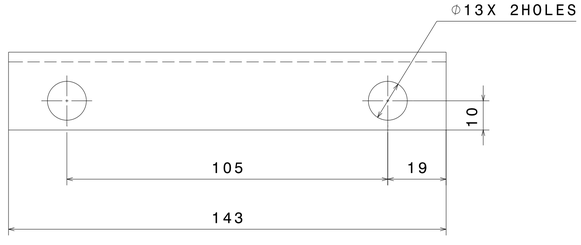


FRONT VIEW

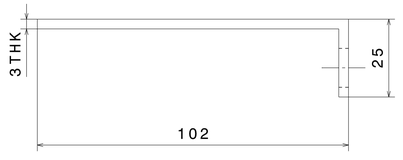


SIDE VIEW

(5) L-CHANNEL
SCALE-1:1



FRONT VIEW



SIDE VIEW

(6) L-PLATE
SCALE-1:1

MATERIAL:	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025	REVISION COLUMN						MED	SIZE A1	INSTITUTE FOR PLASMA RESEARCH (LIGO-INDIA) BHAT, GANDHINAGAR-382 428.
CO-ORDINATED BY					REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY	ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED		
MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS											SCALE	AS NOTED	DATE
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-315			DRAWN	A.N.N.	01/08/2015
UPTO 10	10-50	50-120	OVER 120-400								CHECKED	R.K.	
±1°	±0°-30'	±0°-20'	±0°-10'		±0.1	±0.2	±0.3	±0.5			APPROVED	M.K.G.	

THIRD ANGLE PROJECTION

TITLE: ANNULUS TUBING ASSEMBLY

REF DRG NO: VH01-001-R1 REV R1

DRG.NO VH01-007-R1 SHEET 04 OF 04

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

Technical Compliance-Sheet for Procurement of BSC & HAM chamber *(To be filled and return along with tender)*

Sr. No.	Section	Parameter / Text	Compliance	Vendor Response
1	1.0	Introduction		
	1.1	Basic Symmetric Chamber (BSC)	Provide Ultra High Vacuum environment	
	1.2	Horizontal Access Module chamber (HAM)	Provide Ultra High Vacuum environment	
2	2.1	Overall Dimensions of Basic Symmetric Chamber (BSC)	Length: 4820 mm, OD : 2680 mm, overall Height: 5210 of the chamber	
	2.2	Overall Dimensions of Horizontal Access Module (HAM)	Length: 3032 mm, OD : 2165 mm, overall Height: 2918 of the chamber	
3	**3.0**	**The Scope of work**		
	3.1	Study of the drawings of "BSC" / "HAM" provided with contract document to meet the functional requirements (dimensions, surface finish, weld joints, lifting lugs and its locations)	Achieve manufacturing feasibility, and propose necessary changes if necessary for purchaser's approval.	
	3.2	Preparation and qualification (where necessary) and get approval	Manufacturing Drawings, Manufacturing and Inspection plan (MIP), Quality Assurance Plan (QAP), Manufacturing process sheets (MIS), with manufacturing procedures, Welding Procedures - (WPS), (PQR), Welder Qualification (WPQ)	
	3.3	Material Procurement	Assessment of material Quantity requirement and subsequent procurement in one lot	
	3.4	Additional scope of work	Dispatch, transit insurance and Transport of supplies to delivery site after FAT is additional scope	
	3.5	Cleaning of manufactured / fabricated parts of BSC / HAM chamber	- **Cleaning:** - Establish Cleaning procedure for vacuum chamber parts and get approval - Establish post Cleaning handling and storing procedure for vacuum chamber parts	

			- Establish cleaning set up to clean the components as per approved procedures	
	3.6	Manufacturing, Fabrication and Assembly	Manufacture, fabricate and assemble the BSC and HAM Chamber as per approved manufacturing drawings, MIP and QAP	
	3.7	Tools, Jigs & Fixtures	Design and manufacture necessary Tools, Jigs & Fixtures covering scope of work necessary for - - Handling, - Lifting, - Machining and temporary storage	
	3.8	Special transportation structure / fixture & tools for handling of the chambers delivered to purchaser's site	Design, manufacturing, testing and supply of these tools Provide necessary performance guarantee for the tools	
	3.9	Make necessary arrangement for the provision of equipment's (vacuum pumps, gauges, vacuum leak detector etc.) for demonstration of ultimate vacuum and during vacuum leak testing	Provision of equipment's (vacuum pumps, gauges, vacuum leak detector, gas etc.) - During Demonstration of ultimate vacuum - During vacuum leak testing	
	3.10	Provision of blank off flanges	Provide necessary blank-off flanges wherever necessary - for leak testing - to seal off all the opening of the chamber during transportation	
	3.11	Provision of flanged connections	Provision of flanged connections - to mount gauges, pumps and other control instruments whenever it is necessary during execution of scope of work	
	3.12	Supply of temporary support structure	Provide dismantalable structure which shall be used to store parts of BSC and HAM chambers when they need opening during operations	

	3.13	Inspection and testing	Carry out identified and approved stage wise inspection and maintain the records of observations	
	3.14	Loading, transportation safe handling	The chamber shall be handled safely to prevent any distortion - The parts of BSC and HAM shall not be subjected to other additional loads / stresses not mentioned in this specification All supplies shall be delivered at LIGO Lab, RRCAT, Indore, MP.	
	3.15	Records of manufacturing, inspection and testing for entire scope of supply	Covering scope of work digital records shall be captured in the form of photographs, video with commentary and supply them with final deliverables.	
	3.16	Factory acceptance testing and reporting	Factory acceptance testing and preparation of corresponding reports for dispatch clearance (as detailed in respective annexures: - - Raw material test reports and certificates (Annexure-1) - Visual & Dimensional inspection (Annexure-5) - Cleaning inspection (Assenxure-4) - Helium leak testing of all welds and sealing joints (Annexure-6) - Demonstration of ultimate vacuum of 1 X 10^{-7} mbar (Annexure-7) following approved procedure - Packing inspection (As per section 9) - Obtain certificate for "shipping release" from purchaser (or his authorised representative)	

	3.17	Onsite acceptance of supplied goods after they are delivered at RRCAT, Indore	Unpack the delivered supplies from packing and perform its inspection. Complete the check points for final acceptance on site: - Check for any physical damage to supplied deliveries - Verification of readings and indicators on the gauges / impact sensors mounted on the vacuum sealed equipment(s), packing and merchandises delivered as part of scope of work - Visual and if necessary dimensional inspection to confirm distortion and dimensions are within acceptable limits - Obtain final acceptance certificate from the purchaser for release of payment	
4	4.0	Design function parameters of BSC and HAM chambers	Assessment of Functional parameters and guarantee for performance by demonstration during inspection and testing after manufacturing of supply goods. (Parameters defined in Table no. 1)	
5	5.0	Material Procurement and applicable specifications	Material procured shall be of Hot Rolled Annealed and Pickled (HRAP) condition as per specifications provided in - Table-2 for Basic Symmetric Chamber (BSC) - Table-3 for Horizontal Access Module (HAM) Chamber	

	5.5	Inspection of procured material	Testing and inspection of raw material and standard bought out items: - Inspection & testing of all materials shall be carried out by vendor at his cost in laboratory approved by Purchaser - testing may be witnessed by Purchaser - Purchaser may ask for test coupons from procured material and perform independent testing	
	5.6	Material procurement quantity	Vendor shall procure the material in sufficient quantity of appropriate size in one lot considering all applicable allowances as mentioned for manufacturing, qualification testing and specimen coupons	
6	6.1	Welding consumables	Following point related to Welding and consumables: - Welding consumables procurement and usage shall meet specification of annexure-3. - Weld Qualification shall be as per clause #5 and #6 of annexure-3 - Average heat input shall be quantified based on qualified welding procedure	
	6.2	Weld consumable usage	Vendor shall provide details of - - Storage - Procedure for traceability of usage	
	6.3	Welding details	Vendor shall provide details of welding considering: - Shop welding plan (SWP) - Weld procedure specifications (WPS) - Weld procedure qualification records (PQR) - NDT applicable and to be performed to inspect soundness of weld for any defect	

	6.5	Welder qualification	To qualify welders vendor shall submit: - Weld PQR - Welded samples of weld procedure qualification - Welder shall be deployed on job work after approval from purchaser	
7	7.0	Inspection and testing	All inspection and testing shall be as per annexure-5 based on: - Approved drawings and MIP & ITP - Using approved test and inspection procedures by qualified & certified personnel	
	7.3	Reference temperature for dimensional check	All dimensional check shall be carried out: - If the dimension check is not carried out at ref. uniform temp then it shall be compensated correspondingly - All records of the tests and inspection shall be maintained by the vendor and the shall be submitted to the purchaser	
	7.4	Additional scope for inspection and testing	If deemed necessary Purchaser will have right to specify additional Inspection / testing other than specified in tender specification document - Cost of such test / Inspection will be borne by The purchaser. - Any additional checks deemed necessary which are not previously included in MIP, shall be performed by vendor without additional cost to purchaser	
	7.5	Vendor responsibility for inspection and testing	Quality surveillance as well as quality audit by the purchaser or his authorized representative shall not relieve the vendor from the responsibility of meeting the specification or the inspection duties. Vendor shall be responsible to	

			demonstrated compliance with the function requirement as specified in drawings related to dimension, tolerance, assembly fits and vacuum	
	7.7	Change request	Vendor who want to deviate from specification provided and approved for acceptance to purchaser: - he shall submit the deviation request (in prescribed format) and get it approved by providing necessary justification for the change which is necessary - Change request procedure shall be mutually decided and agreed upon between vendor and purchaser before commencement of concerned work	
8	8.0	Cleaning, storage and workmanship	Vendor shall note: - Surface treatment shall follow Annexure-4 - Clean condition and good workmanship are essence at all stages of storage, handling, manufacturing, inspection, testing, assembly and final packing and shall be maintained by using clean room areas, proper covers and care - Direct contact of stainless steel parts of vacuum chambers is not allowed with other items of carbon steel at any stage. Stainless steel and carbon steel material and parts shall be stored in separate areas - Stainless steel fabrication area shall be shielded from contamination in the form of dust, fumes and weld splatters	
9	9.0	Handling, packing and		

		delivery		
	9.1	Work area	Vendor shall include following details in his bids: - Details of work shop floor space and its layout for taking up activities details in scope of work of manufacture, testing and assembly of BSC and HAM - Details of clean work area (class 100000 (ISO 8) for activities of storage, assembly and testing and packing	
	9.2	Corrosion and damage to surface	Vendor shall ensure: - no corrosion of surfaces of clean parts, - no damage to machined surfaces during storage, handling, inspection and packing - no distortion of parts to alter their finished dimensions during transportation and handling	
	9.3	Contamination to inner surface	Vendor shall cover all the openings to prevent any ingress of contaminant to protect inner surfaces	
	9.4	Packing details	Items placed in packing shall be properly identified on the package box by providing details of: - Content with name of the part and its dimensions, weight and quantity in number - Packing list placed inside package - net and gross weight of package - Handling and storage instructions - Package number	
	9.6	Shipping release certificate and delivery of shipment	Vendor shall initiate delivery only after obtaining shipping release certificate from Purchaser after the acceptance and approval of FAT report	

	9.7	Transport of shipment	Vendor shall ensure that: - Shipment is delivered directly without any transhipment to the delivery site specified by purchaser - Road survey will be made by him for the route of shipment transport, to avoid any delay, obstructions, clearances - Any necessary changes to the access road along the shipment transport route. - To obtain required clearance from statuary bodies for transportation of supplies. This responsibility lies within the scope of the vendor - Moving supplies up to installation location at delivery site is responsibility of vendor (as specified)	
10	10.0	Documentation		
	10.1	Input drawings	Purchaser shall supply set of drawings - as mentioned in table-4 for BSC - as mentioned in Table-5 for HAM	
	10.2	Drawings verification and Preparation of drawings	Purchaser shall supply 3D CATIA model and 2D Drawings derived from the model for BSC and HAM Chamber - Vendor shall make necessary changes based on the drawings verification (if necessary) and prepare manufacturing drawing for approval by purchaser - At the end of manufacturing scope of work, vendor shall prepare as built 2D drawings and 3D model of equipment and its parts and supply to purchasers in the format compatible with CATIA / SOLIDWORKS and pdf version for records - To use CAD software other than SOLIDWORKS, vendor need to	

			seek permission from the purchaser	
	10.3	Manufacturing drawings	The vendor shall ensure that: - manufacturing drawings include all dimensions with tolerances for individual components, subassembly and assembly - tolerances shall be progressive covering intermediate stages - drawings for all necessary specific customised tools to be used are prepared - shop manufacturing drawings include details for surface finish, welding, specified inspection method, bill of material, allowances for cutting, machining and final finish, and applicable standard if any - all drawings are prepared in approved CAD software only and supplied in respective CAD and pdf format with one set of hard copy for approval - necessary supporting justification shall be provided wherever there is substantial changes compared to the supplied drawings data - he shall accommodate minor changes to the dimensions during course to execution of scope of work - he prepares as built drawings at the end of scope of work covering accounting for approved changes and deviations	
	10.4	Applicable codes and standards	This section provide the details of applicable codes and standards related to design, material, manufacturing welding, inspection and testing. Latest edition of applicable codes & standards shall be used. Vendor shall seek	

			clarification in case they come across any ambiguity - Take note of the list provided in this section	
	10.5	Specific details applicable to scope of work	This section provide details of imposed conditions used in administration of scope of work related to - Specification for material (Annexure-1) - Specification for rolling, machining and manufacturing (Annexure 2) - Specification for welding and welding qualification of the austenitic stainless steel (Annexure 3) - Specification for cleaning and cleanliness (Annexure 4) - Specification for inspection and testing (Annexure 5) - Specification for vacuum leak tightness and leak testing (Annexure 6) - Specification for Vacuum requirement (Annexure 7) - Various parts details & Load specification for BSC / HAM (Annexure 8) Details of applicable codes and standards related to design, material, manufacturing welding, inspection and testing, latest edition of applicable codes & standards (included in section 10.4) shall be used. Vendor shall seek clarification in case they there is doubt on the content or otherwise	

	10.6	Conflict and interpretation	In case of conflict is observed by vendor in specifications mentioned in documents, the vendor shall contact purchaser for guidance and clarification. The purchaser's decision given in such situation shall be considered as final.	
	10.7	Details of document submissions to be made	Vendor shall prepare documents and submit to purchaser for approval covering all stages of manufacturing, testing and supply of BSC and HAM as stated in table-7	
	10.8	Deviation report	The vendor shall record all deviations incorporated after due approval, which necessitated throughout the manufacturing, inspection and testing stages. Standard forms shall be used by the vendor for raising Deviation Requests (DRs) supplied by purchaser to seek approval before its implementation	
	10.9	Work progress report	The vendor shall prepare detailed monthly progress reports on the works performed and submit soft and hard copy for each month to the purchaser. - Decision on date of submission by purchaser shall be made by mutual agreement with vendor.	
	10.10	Records of manufacturing, inspection and testing of entire scope of work	This work is a prototype in nature (Manufacture and assembly of BSC / HAM), and Vendor shall prepare and submit a comprehensive note on: - the manufacturing experience, covering all the activities - highlight of specific details of difficulties / problems faced, if any, - Procedure by which difficulties were overcome by including necessary details. - All deviation / change requests	

Technical Compliance-Sheet for Procurement of BSC & HAM chamber *(To be filled and return along with tender)*				
			with mention of their necessity, its impact on the functional requirement specified and status of approval by purchaser	
11	11.0	Delivery	Scope of work covered under this contract shall be accomplished within nine months from the date of approval of manufacturing drawings - List of deliverable are listed in annexure-9 and detailed in Table 21, 22 & 23	
12	12.0	Guideline on Notification / Hold points	Table-8 is provided as guideline on Notification and hold points for purchaser - Vendor shall take note of this list and with suggestion / modification done should include it in the bid covering points included in this guideline	

I/We have noted all specified technical points and corresponding specifications of the compliance listed in the table above. We have provided our response against each of the point included in the compliance matrix. We undertake to fulfil our compliance response mentioned above.

Signature of Bidder
(Official seal)

Place:

Date:

Section-D

PART-II

PRICE BID FORMAT

(Bidders are requested to offer their price bid in the following format in Indian Rupees)

Sr. No.	Description	Qty.	HSN Code	Currency INR	Unit Rate	Applicable GST	Unit Rate (Incl. GST)	Total Amount
		(a)	(b)	(c)	(d)	(e)	(g)= d+e	(h) = a x g
1.	Manufacturing, testing at vendors site and supply of BSC Chamber Assembly as per the specification mentioned in the tender document at Annexure-9 (Including loading, packing, forwarding, unloading, shifting, handling with accessories)	1 Set			-	-	-	-
2.	Manufacturing, testing at vendors site and supply of HAM Chamber Assembly as per the specification mentioned in the tender documents at Annexure-9 (Including loading, packing, forwarding, unloading, shifting, handling with accessories)	1 Set						
							Total Rs.	

Ex- Works Price (in words) for

1. **BSC Chamber (Rupees _____only)**
2. **HAM Chamber (Rupees _____only)**

Section-D

NOTE:

Freight and insurance charges will be paid at actual subject to production of documentary evidence for payment of freight and insurance.

Description	Vendor Terms
Warranty – 1 year from the date of acceptance at RRCAT, Indore site	
Payment – See IPR payment terms mentioned under Sr.No.8 of document named ***"Deferred_terms_IPR_LP_PT_02.V3"***	
Delivery schedule – 9 months from the date of Approval of Manufacturing Drawings	
Validity - 120 days	
Any other terms –	

IMPORTANT NOTE

[1] Custom Duty Exemption certificate will not be issued to any bidder under any circumstances.
[2] GST @ 5% is applicable for IPR as per details given under clause No.18.4.4 (Section-A) of Form No.IPR-LP-PT-02.V3
[3] Quotation should be submitted in Indian Rupees (INR) only.
[4] Vendor is responsible for the safe delivery of the material at RRCAT, Indore.

Place:

Date: **Signature of Bidder with Seal**

Our 2 Part Tender No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019 for Fabrication, Testing and Supply of Basic Symmetric Chamber (BSC) and Horizontal Access Module (HAM) as per the specification given in the tender documents.

(This need to be printed in Tenderer's letter head)

To
The Purchase Officer
Institute for Plasma Research
Near Indira Bridge
Bhat
Gandhinagar-382428 (INDIA)

Ref: Tender Notice No. IPR/TN/PUR/TPT/19-20/34 dated 24-10-2019

Dear Sir,

I/We have gone through the tendering conditions pertaining to the Two Part Tender and General Conditions of Contracts and Special Conditions of Contracts contained in Section "B" of Form No: IPR-LP-PT-02.V3. I/We hereby agree to supply the stores conforming to the tender specifications and also agree to abide by your General Conditions of all Contracts and Special Conditions of Contract contained in Section "B" of the Tender document.

- You will be at liberty to accept any one or more of the items of stores offered by us and I/We shall be bound to supply you the stores as may be specified in the Purchase Order/Contract.

- I/We hereby agree to keep the price valid for your acceptance for a period of 120 days from the date of opening of the tender.

- Deviations to technical specifications of the tender documents are detailed in Annexure-A of the tender form while deviations proposed to the General/Special Conditions of Contract are detailed in Annexure "B" to this tender.

- I/We have also attached all the leaflets/catalogue, etc. pertaining to the stores offered.

Yours faithfully
Stamp and Signature of the Tenderer