



DEPARTMENT OF AEROSPACE ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY MADRAS
CHENNAI – 600036, INDIA

Ref. No. ASE/1819/156/MUAY/SRCH/036

Date: 10.07.2020

Item Name: **Fabrication of a High pressure test Rig to test Gas-turbine combustors**

Due Date: 03.08.2020

1. Quotations are invited in **two-bid system** for the item described overleaf (in Annexure I). The offers /bids should be submitted as Technical bid and Financial bid separately. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, transportation, packing & forwarding, installation, warranty, payment terms, pricing terms etc. The Technical bid and Financial bid should be put in separate covers and sealed. Both the sealed covers should be put in a bigger cover. The words "**Fabrication of a High pressure test Rig to test Gas-turbine combustors**" should be written on the left side of the Outer bigger cover and sealed.
2. **Earnest Money Deposit:** Earnest money deposit of Rs.25,000 payable by Demand Draft drawn on any Nationalised Bank of India favouring "Registrar, IIT Madras" is to be submitted along with the technical bid. Waiver of EMD for vendors with valid MSME/MSE certificate is permitted.
3. The quotations should be valid for sixty days from the due date and the period of delivery required should also be clearly indicated.
4. The total cost of the equipment in terms of CIP Chennai should be clearly mentioned .
5. Cost breakup for all modules included in the scope of supply is mandatory
6. Terms of warranty and guarantee should be explicitly mentioned. Warranty must be valid for at least for 12 months from the date of commissioning.
7. Warranty service must be provided on-site at IIT, Madras for duration of warranty period.
8. Packing and delivery charges, customs and clearance duty should be clearly stated.
9. Goods shall not be supplied without an official supply order.
10. Local firms : Quotations should be for free delivery to this institute. If quotations are for ex-godown, delivery charges should be indicated separately.
11. Firms outside Chennai: Quotations should be for F.O.R. Chennai. If F.O.R. consignor station, freight charges by passenger train / lorry transport must be indicated. If ex-godown, packing, forwarding and freight charges must be indicated.
12. If the required good is to be imported, delivery with CIP upto Chennai airport must be made. All relevant documents for customs clearance and other import formalities have to be provided well in advance.
13. IIT Madras is eligible for concessional rate of GST 5%(for purchase of equipments, parts and consumables used in research). Concessional GST certificate will be issued after issue of purchase order.
14. The rate of sales / general taxes and the percentage of such other taxes legally leviable and intended to be claimed should be distinctly shown along with the price quoted.
Where



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15. this is not done, no claim for sales / general taxes will be admitted at any stage and on any ground whatsoever.
16. Payment: Payment is after delivery of goods. Every attempt will be made to make payment within 30 days from the date of receipt of bill / acceptance of goods, whichever is later. Advance payment will be considered only in special cases.
17. IIT Madras is eligible for concessional rate of customs duty. Necessary certificate will be issued on demand.
18. IIT Madras has the right to accept the whole or any part of the tender or portion of the quantity offered or reject it in full without assigning any reason. The selection of extended warranty / AMC is entirely at the discretion of the Principal Investigator/Co-Principal Investigator

The sealed quotation may be sent to
The Senior Manager (Project Purchase),
IC & SR Building, 2nd Floor,
IIT Madras,
Chennai – 600036, Ph. (O) +91-44-22579798

Contact Person For Bid submission:

Name: Mr. N. E. Nagarajan
Number: 9841245125



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ANNEXURE 1

Fabrication of a High pressure test Rig to test Gas-turbine combustors

An experimental test rig to test gas turbine combustors is being developed at NCCRD, IIT Madras. The test facility envisages to test the combustors at high pressure and temperature conditions. Maximum Pressure will be 10 Bar and Maximum Temperature of the rig will be 650 deg C with an air flow rate of 2.5 Kg/s. Experiments will be conducted to measure emissions, operability and sub-atmospheric performance.

Sealed tenders are invited from eligible bidders for developing the high pressure test rig and its supporting stand. Details of each work are described along with the necessary drawings below. 2D drawings of each component are attached with this document.

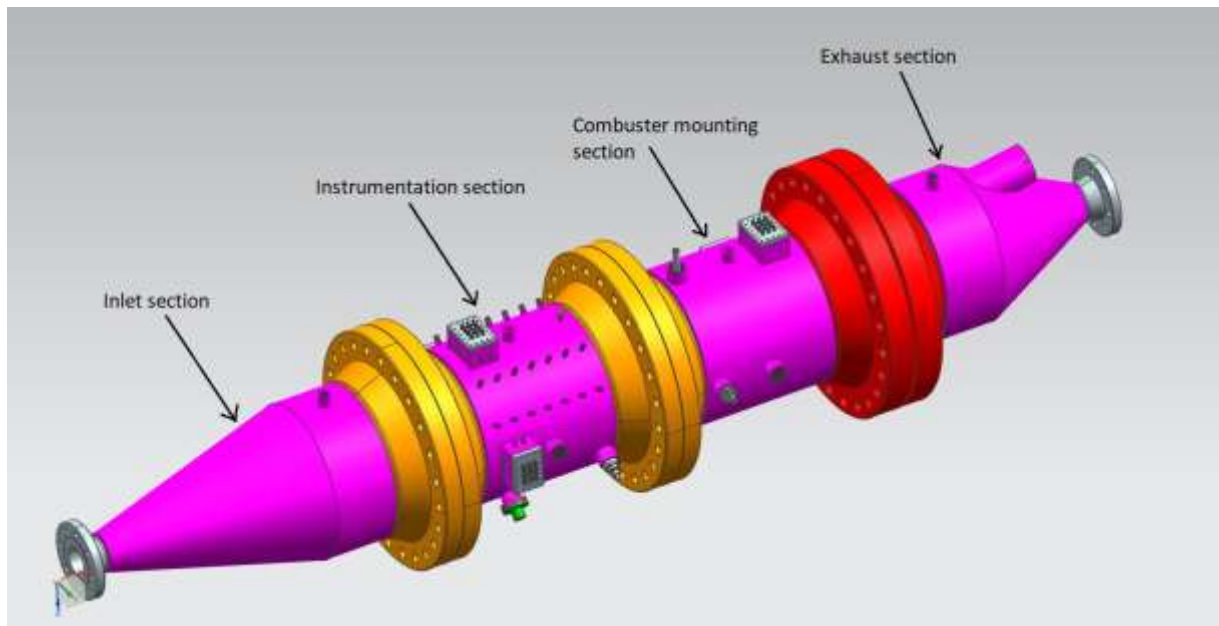


Fig.1 CAD Model of the test rig.

CAD model of the test rig is shown in Fig.1.

The Test Rig is mainly divided into 4 sections. It is named as follows.

1. Inlet Test Rig section (Section 1)
2. Instrumentation section (Section 2)



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3. Combustor mounting section (Section 3)
4. Exhaust section (Section 4)

Details of the fabrication work to be done for each section is listed in the table below. Specific 2D drawings of each section and sub components are available in the attached files.

1. Inlet Test Rig section (Section 1)

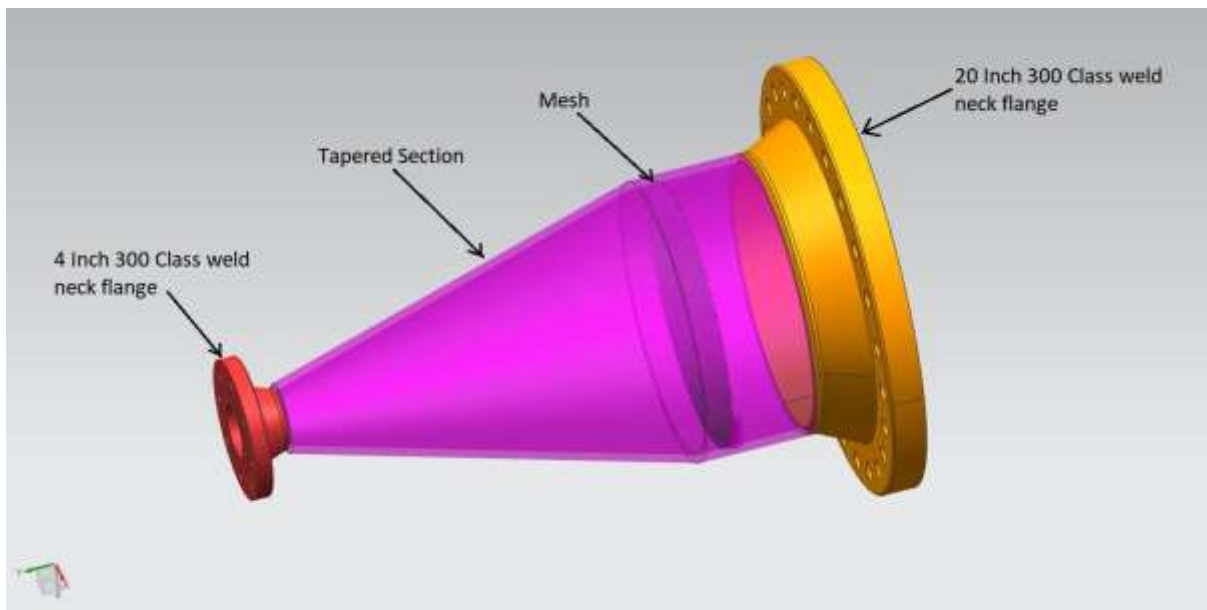


Fig. 2: Inlet Test rig section

Works to be done

1. Fabrication the Tapered section (Refer to Dg 1011 (Inlet section)).
2. Welding of Tapered section to 20 inch 300 class flange (Will be supplied by IITM) and 4 inch 300 class weld neck flange (Will be supplied by IITM).
3. Welding of the wire mesh (5*5 Diameter 2mm Stainless steel wire mesh - as per drawing Dg 1023) to the tapered section.

2. Instrumentation section (Section 2)

Works to be done

1. Fabrication of Pipe section (Refer to Dg 1012 (Sensor section)).
2. Fabrication of feed-through blocks (3 numbers) for temperature sensors and welding to the pipe section. (Refer to Dg 1015 (Feed through block- Sensor section)).



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3. Fabrication of fuel splitter (2 numbers) and welding it to the pipe section. (Refer to Dg 1019 (Fuel splitter drawing).
4. Welding of pipe section with 300 class flanges (Will be supplied by IITM) at both ends.

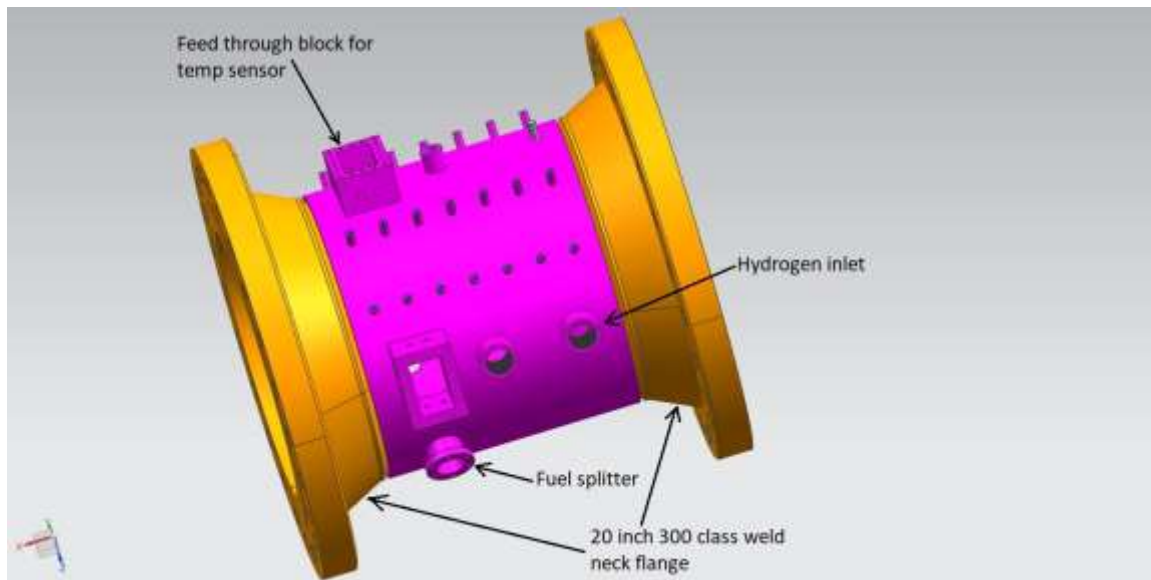


Fig.3 Instrumentation section.

3. Combustor mounting section (Section 3)

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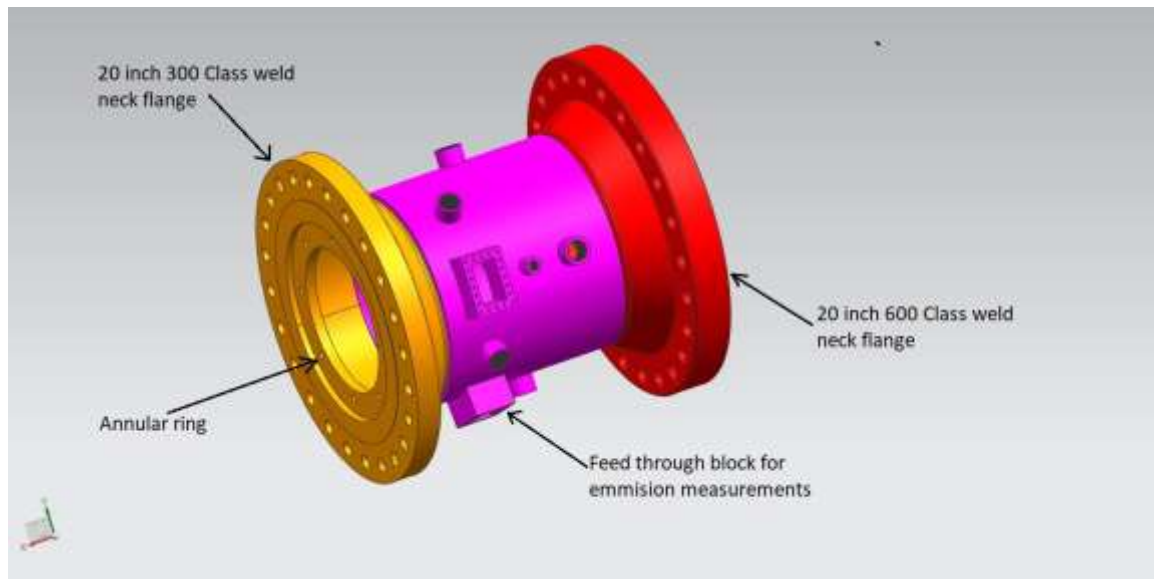


Fig.4 Combustor mounting section

Works to be done

1. Fabrication the Pipe section (Refer to Dg 1013 (Combustor covering section).
2. Fabrication of feed through blocks (2 numbers) for temperature sensors and welding to the pipe section. (Refer to Dg 1016 (Feed through block (Combustor covering section).
3. Welding of 300 Class flange (Will be supplied by IITM) and 600 Class flange (Will be supplied by IITM) to the pipe section.
4. Welding of annular ring to the 20 inch 300 class flange at the location specified in 2d drawing. (Refer to Dg 1018 (Flange with annular ring).

4. Exhaust section (Section 4)

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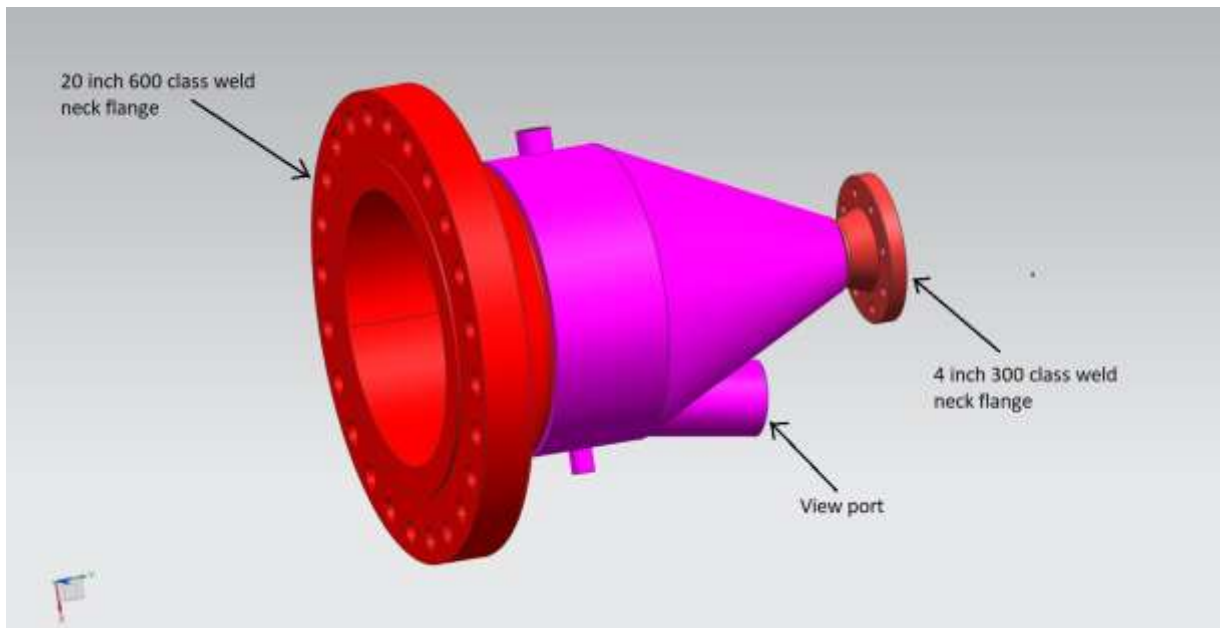


Fig.5. Exhaust section

Works to be done

1. Fabrication of Tapered section (Refer to Dg 1014 (Exhaust cone)).
2. Fabrication of Viewport and welding it to the tapered section at correct location.
3. Welding of tapered section to 20 inch 600 class weld neck flange (Will be provided by IITM) and to 4 inch 300 class weld neck flange.

5. Miscellaneous works (Section 5)

a) Spray tube fabrication

The function of the spray tube is to cool down the high temperature exhaust gases by spraying water through the minute holes provided in the spray tube. The size of the tubing will be 1 inch with holes of 2.5 mm diameter with a 15 mm gap between the holes. Two spray tube sections are to be fabricated and one spray section tube's hole should be located at an angle of 15° from the main axis of symmetry (along the length). This is to avoid the jet from the tubes hitting each other.



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2D Drawings of the spray tube are provided along with the tender document (Refer to Dg-1020 (Spray tube)).

Fig.6. Spray tube

b) Welding of annular ring to 20 inch 300 class weld neck flange

The annular ring (Refer to Dg-1018 (Annular ring)) should be welded to one of the 300 Class weld neck flange (Provided by IITM) connected to the combustor covering section. The Ring should be welded at a location which is 15 mm from the front section of the flange.

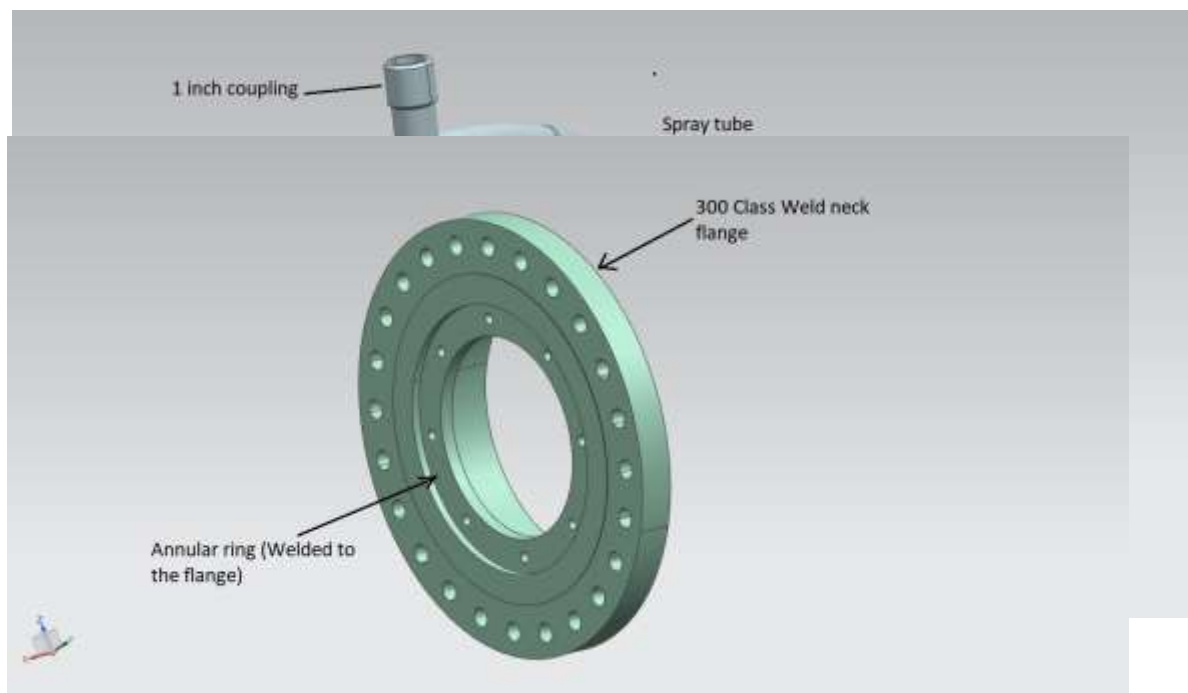


Fig.7. Flange with annular ring

c) Fabrication of cover plate for Feed through block

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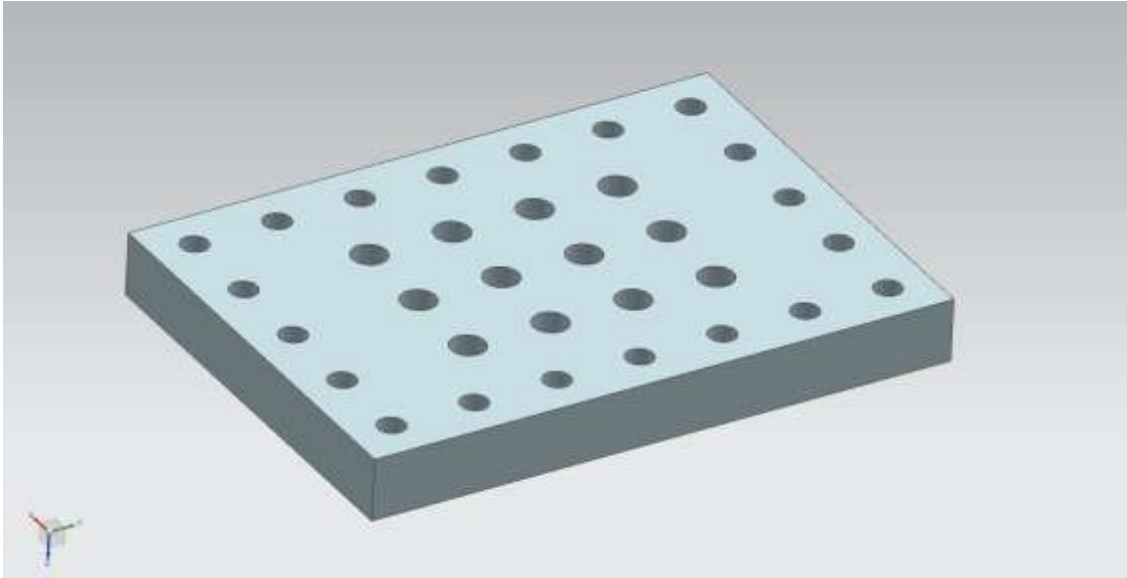


Fig.8. Cover plate for Feed through block

Refer to Dg-1017 (Cover plate) for the 2D drawing for the above diagram.

d) Viewport cover plate

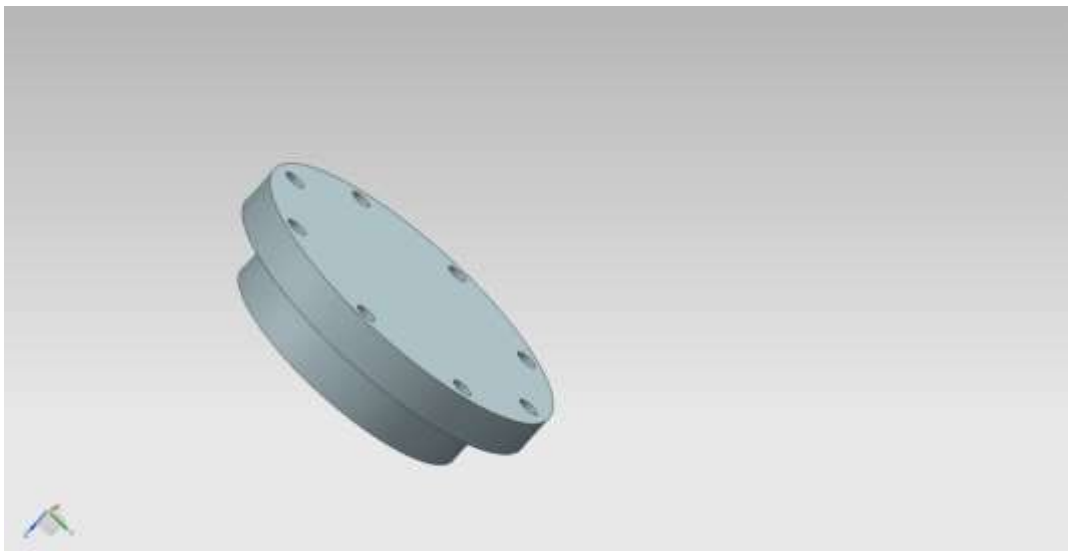


Fig.9. Cover plate for Viewport

Refer to Dg-1021 (View port Cover plate) for the 2D drawing for the above diagram



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BILL OF MATERIALS

Sl. No	Purchase or Fabricating item	Quantity
1	4" Weld neck flange CLASS 300 SS 316	2
2	Tapered section in section 1 (As per drawing Dg 1011.	1
3	Wire mesh in Inlet section (As per drawing Dg 1023)	1
4	Pipe section in Section 2 (Schedule 40 20 inch)-(As per drawing Dg 1012)	1
5	Feed through block for temperature sensor (As per 2D drawing Dg 1015 and Dg 1016)	5
6	Fuel splitter (As per drawing Dg 1019)	2
7	Pipe section in Section 3 (Schedule 40 20 inch)-(As per drawing Dg 1013)	1
8	Spray tube (As per drawing Dg 1020)	1
9	Conical section in exhaust section 4 (As per drawing Dg 1014)	1
10	Quartz glass (100 mm Dia with 30 mm thick)	4
11	Drain valve (1" SS #300 valve) and drain tube (1" Dia, Sch 40, 100 mm length)	1
12	Lifting Eyebolt (M24 × 80mm)	6
13	Bolts, nuts and washers (High tensile, Grade 10.9) for complete Rig including all flanges 1. 20" 300 Class weld neck flanges 2. 20" 600 Class weld neck flanges 3. 4" 300 Class weld neck flanges 4. Annular ring	55 (M30 × 180mm) 30 (M42 × 260mm) 20 (M20 × 100mm) 10 (M16 × 75mm)
14	Gaskets (Spiral wound gaskets)- to be fabricated as per ASME B16.20 1. 20" 300 Class weld neck flange 2. 20" 600 Class weld neck flange 3. 4" 300 Class weld neck flange 4. Between Feed through block and cover plate (As cover plate template- 5mm thickness) 5. Between Viewport and cover plate for viewport (As cover plate for viewport template- 5mm thick) 6. Between Quartz glass and cover plate for viewport – 5mm thick	6 4 6 6 3 3

Work Specifications:

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The material used and work should be of the specification given below:--

- 1) Pipes and Reducers (conical section): SS 316 Stainless steel, Schedule- 40.
Dimension as per ANSI/ASME B36.19. (Sizes: 20") and material as per ASTM A106.
- 2) Pipe Make : Suraj, Sumitomo or equivalent.
- 3) Pipe Fittings : Seamless stainless steel forged fittings as per class 300 and material as per ASTM A234 WPB class 300.
- 4) Valve Make : Leader, Audco or equivalent.
- 5) Pressure Testing : The Rig should be pressure tested at 16 bar for a duration of 30 minutes. Conical sections alone to be hydrostatically tested separately.
- 6) Test Certificate : Test certificates for the pipes and fittings should be furnished by the bidder.
- 7) Vendor should perform all the design and fabrication works as per the relevant ASME standards. Vendor should prepare the engineering drawing as per the 2D drawings given and submit along with the bid. CAD model of the rig is available to vendor on request basis.
- 8) Hydrostatic testing and post weld heat treatment should be done for the Rig sections separately as per the ASME standards.
- 9) Radiography and NDT test should be done for each section of the rig.
- 10) The Welder should furnish WQR with a valid certificate along with a recent photograph.
- 11) All joints are to be TIG welded following ASME BPVC SECTION 8 standards.
Conical sections need to be stress relieved.
- 12) All sharp corners are to be rounded off to min 3mm radius.
- 13) Surface finish for flange gasket face shall be 3.2 to 6.3 μm .
- 14) Mill certificates for pipes and fittings should be provided.
- 15) Vendor should follow safe working procedure and ensure safety of their employees.

Terms and Conditions:

1. Warranty terms: All the components quoted in the tender bid should be covered under warranty for 3 years.
2. Warranty service must be provided on-site at IIT, Madras for the duration of the warranty period.
3. Vendors should provide continuous technical support and maintenance of work done. The vendor must have at least 10 years of experience in similar works as required in the tender.
4. Vendors must have sufficient experience in executing major piping and erection works in reputed organizations (end users) of value not less than Rs.20 lakhs. The Experience of the vendors



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will also be used as a criterion for the selection of bids that meet technical requirements. List of reputed end users inclusive of educational institutions in India (at least 3) with contact details wherein similar works have been executed should be furnished. Testimonials from the reputed organizations must be provided with the tender bid.

5. The vendor should complete all the works within 45 days from the date of release of PO.
6. Vendors must provide detailed documentation for the work to be done in the bid along with complete information on the makes of the hardware items, fabrication and erection standards.
7. For any technical clarifications, please contact Mr.Dinraj V P (9746298581).
8. Vendors should furnish the tender with a price split up against each of the work listed in the document.