



INDIAN INSTITUTE OF TECHNOLOGY MADRAS
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The Manager (Project Purchase)

Date: 13.02.2023

Open Tender Reference No:AM/SATY/25/IOE23/COMBUSTORRIG

GEM NAR ID: GEM/GARPTS/09022023/NUCO6IE04PIN

Due Date/Time: 27.02.2023 @ 3:00 PM

Dear Sir/Madam,

On behalf of the Indian Institute of Technology Madras, Tenders are invited in two bid system from Class-I local suppliers and Class II local suppliers, for the supply of “**Control system for High pressure combustor rig**” Conforming to the specifications given in **Annexure -A**.

Tender Documents may be downloaded from Central Public Procurement Portal <https://etenders.gov.in/eprocure/app>. Aspiring Bidders who have not enrolled / registered in e-procurement should enroll / register before participating through the website <https://etenders.gov.in/eprocure/app>. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at “**Help for contractors**”. [Special Instructions to the Contractors/Bidders for the e-submission of the bids online through this eProcurement Portal”]

Bidders can access tender documents on the website (For searching in the NIC site, kindly go to Tender Search option and type ‘IIT’. Thereafter, click on “GO” button to view all IIT Madras tenders). Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website <https://etenders.gov.in/eprocure/app> as per the schedule attached.

1 1)	Pre-bid Meeting Details	:	NA
2)	ICSR Vendor Registration	:	Vendor registration code. Vendor registration with IC&SR (IITM) is mandatory for bidders to participate in tenders. ** For Vendor Registration & Guidelines, Please follow the website : https://icandsr.iitm.ac.in/vendorportal ; Helpdesk: vendorhelpdesk@icsrpis.iitm.ac.in

No manual bids will be accepted. All tender documents including Technical and Financial bids should be submitted in the E-procurement portal.

Last date for receipt of tender	:	27.02.2023 @ 3:00 PM
Date & time of opening of tender	:	28.02.2023 @ 3:00 PM

3. Instructions to the Bidder:

<p><u>A)</u></p>	<p>Searching for tender documents</p>	<p>:</p> <ul style="list-style-type: none"> ● There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal. ● Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective “My Tender” folder. This would enable the CPP Portal to intimate the bidders through SMS / email in case there is any corrigendum issued to the tender document. ● The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.
<p><u>B)</u></p>	<p>Assistance to bidders</p>	<p>:</p> <ul style="list-style-type: none"> ● Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender. ● Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is [0120-4200462, 0120-4001002, 0120-4001005]
<p><u>C)</u></p>	<p>Enrollment Process to Bidders</p>	<p>:</p> <p><u>REGISTRATION</u></p> <ul style="list-style-type: none"> ● Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal <u>URL:https://etenders.gov.in/eprocure/app</u> by clicking on “Online Bidder Enrollment”. Enrollment on the CPP Portal is free of charge. ● As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts. ● Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal. ● Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.) ● Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse. ● Bidder then may log in to the site through the secured log-in by entering their user ID / password and the password of the DSC / eToken. ● Possession of a Valid Class II/III Digital Signature Certificate (DSC) in the form of smart card/e-token in the company's name is a prerequisite for registration and participating in the bid submission activities

		<p>through https://etenders.gov.in/eprocure/app</p> <ul style="list-style-type: none"> ● Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site https://etenders.gov.in/eprocure/app under the “Information about DSC”.
<u>D)</u>	Preparation of bids	<p>:</p> <ul style="list-style-type: none"> ● Bidder should take into account any corrigendum published on the tender document before submitting their bids. ● Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid. ● Bidder, in advance, should prepare the bid documents to be submitted as indicated in the tender document / schedule and generally shall be in PDF / XLS formats as the case may be. Bid documents may be scanned with 100 dpi with black and white option. ● To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, GSTIN Details, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use “My Documents” area available to them to upload such documents. These documents may be directly submitted from the “My Documents” area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.
<u>E)</u>	Submission of bids	<p>:</p> <ul style="list-style-type: none"> ● Bidder should log into the site well in advance for bid submission so that he/she can upload the bid in time i.e. on or before the bid submission date and time. Bidder will be responsible for any delay due to other issues. ● The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document. ● Bidder has to select the bid security declaration. Otherwise, the tender will be summarily rejected. ● A standard BOQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BOQ file, open it and complete the detail with their respective financial quotes and other details (such as name of the bidder). If the BOQ file is found to be modified by the bidder, the bid will be rejected. ● The server time (which is displayed on the bidders’ dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission. ● The Tender Inviting Authority (TIA) will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders due to local issues. ● The uploaded tender documents become readable only after the

		<p>tender opening by the authorized bid openers.</p> <ul style="list-style-type: none"> • Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details. • Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet. • More information useful for submitting online bids on the CPP Portal may be obtained at: https://etenders.gov.in/eprocure/app. • All tender documents including pre-qualification bid, Technical Bid & Financial Bid should be submitted separately in online CPP portal as per the specified format only. Right is reserved to ignore any tender which fails to comply with the above instructions. No manual bid submission will be entertained.
F)	Marking on Technical Bid	<ul style="list-style-type: none"> • The bidder eligibility criteria, technical specification and supply of item for this tender is given in Annexure A. • The Bidders shall go through the specification and submit the technical bid. • The Technical bid should be submitted in the proforma as per Annexure-B in pdf format only through online (e-tender). No manual submission of bid will be entertained. • The technical bid should have a page-wise heading as “Technical Bid” and page no. in all pages with seal and signature of authorized signatory. The total no. of pages should be mentioned at the last page of the documents. • The technical bid should consist of bidder eligibility criteria details and all technical details along with catalogue/ pamphlet which will give a detailed description of product with technical data sheet so that technical compliance can be verified.
G)	Marking on Price Bid	<ul style="list-style-type: none"> • Financial bid (BoQ) should be submitted in the prescribed proforma format as per Annexure-C in xls format through e-tender only. No manual or other form of submission of Financial Bid will not be entertained

4)	<p>Preparation of Tender: The bidders should submit the bids in two bid system as detailed below.</p> <p>Bid I _ Technical Bid</p> <p>The technical bid should consist of bidder eligibility criteria and technical specification compliance sheet as per Annexure-B.</p> <p>Bid II _ Price Bid</p> <p>The price bid should be submitted in excel format (BoQ) as per the proforma (Annexure C) uploaded in the e-Tender web site. The Quoted price should be for supply and installation of the item and inclusive of all cost and statutory levies at IIT Madras.</p>
5)	<p>Price:</p> <p>a) The price should be quoted only in INR net per unit (after breakup) and must include all packing, transit insurance and delivery charges to the Department of Applied Mechanics.</p> <p>b) The rate quoted shall be all inclusive of all taxes and no extra payment will be made other than statutory revisions as per the terms and conditions stipulated in this contract document.</p>

	<p>c) The percentage of tax & duties should be clearly indicated separately. IIT Madras is eligible for custom duty (5.5%). Relevant certificates will be issued wherever necessary.</p> <p>d) The offer/bids should be submitted through online only in two bid system i.e. Technical Bid and Financial Bid separately.</p>
6)	<p>Tenderer shall submit along with this tender:</p> <p>(i) Proof of having ISO or other equivalent certification given by appropriate authorities.</p> <p>(ii) Name and full address of the Banker and their swift code and PAN No. and GSTIN number.</p> <p>(iii) GST registration proof showing registration number, area of registration etc.</p> <p>(iv) All of your future correspondences including Invoices should bear the GST No. and Area Code.</p>
7)	<p>Terms of Delivery:</p> <p>Supplier will be fully responsible for the safe carriage, Installation/Commissioning of goods up to the Department of Applied Mechanics., IIT Madras or named place as per PO, Insurance coverage will be in the scope of the supplier.</p> <p>The tenderer should indicate clearly the time required for delivery of the item (subject to the approval of the Executive Committee-IIT-Madras). In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.</p> <p>In the event of delay or non-supply of materials/execution of Contract beyond the date of delivery/completion of job. The penalty will be levied @1% per week of delay subject to a max of 10% of the value of purchase order and if the delay is more than accepted time frame by IIT M, the PO would be partially or fully cancelled and liquidated damages will be enforced accordingly.</p>
8)	<p>Period for which the offer will remain open:</p> <p>The Tender shall remain open for acceptance/validity till: 120 days from the date of opening of the tender. However, the day up to which the offer is to remain open being declared closed holiday for the Indian Institute of Technology Madras, the offer shall remain open for acceptance till the next working day.</p>
9)	<p>EMD:</p> <p>The EMD of Rs. 3,60,000 to be transferred to the account details mentioned in Annexure D and proof should be enclosed in the Technical Bid. Any offer not accompanied with the EMD shall be rejected summarily as non-responsive.</p> <p>The EMD of the unsuccessful bidders shall be returned within 30 days of the end of the bid validity period. The same shall be forfeited, if the tenderers withdraw their offer after the opening during the bid validity period. The Institute shall not be liable for payment of any interest on EMD.</p> <p>EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME) and Startups as recognized by Department of Industrial Policy & Promotion (DIPP). (MSE/MSME/DIPP PROOF should be enclosed in the cover containing technical bid).</p>
10)	<p>Performance Security: -</p> <p>The successful bidder should submit Performance Security for an amount of 3% of the value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt in the name of “The Registrar, IIT Madras” from any scheduled commercial bank or Bank Guarantee from any scheduled commercial bank in India. The performance security should be furnished within 14 days from the date of the purchase order.</p> <p>Performance Security in the form of Bank Guarantee: - In case the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed directly to IIT Madras from the Bank.</p> <p>The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.</p>

11)	For the same tender, either the OEM or the authorized dealer/service provider can only quote. But both of them cannot quote separately for the same tender.
12)	The offers/bids should be sent only for a item/Equipments of latest version that is available in the market and supplied to a number of customers. A list of customers in India with details must accompany the quotations. Quotations for a prototype machine will not be accepted
13)	Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid.
14)	Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal/OEM.
15)	<p>Risk Purchase Clause</p> <p>In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.</p>
16)	<p>Payment:</p> <p>(i) No Advance payment will be made. However, 90% Payment against Delivery and 10% after installation are agreed to wherever the installation is involved.</p> <p>(ii) Advance Payment: No advance payment is generally admissible. In case a specific percentage of advance payment is required, the Vendor has to submit a Bank Guarantee from a scheduled commercial bank in India equivalent to the amount of advance payment.</p>
17)	<p>On-site Installation:</p> <p>The equipment/item or Machinery has to be installed or commissioned by the successful bidder within the number of days (as prescribed by PI) from the date of receipt of the item at the site of IIT Madras.</p>
18)	<p>Warranty/Guarantee:</p> <p>The offer should clearly specify the warranty or guarantee period for the machinery/equipment. Any extended warranty offered for the same has to be mentioned separately (For more details please refer our Technical Specifications).</p> <p>** Note: PO which involves installation, warranty/guarantee shall be applicable from date of installation.</p>
19)	<p>Acceptance and Rejection:</p> <p>Failure to comply with any of the instructions stated in this document or offering unsatisfactory explanations for non-compliance will likely to lead to rejection of offers.</p> <p>I.I.T. 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.</p>
20)	<p>Debarment from Bidding:</p> <p>In case of breach of Terms & Conditions, Bidder may be suspended from being eligible for bidding in any contract with the IIT Madras up to 2 Years [as per Rule 151(iii) of GFR] from the date of Tender.</p>
21)	<p>Disputes and Jurisdiction:</p> <p>Settlement of Disputes: Any dispute, controversy or claim arising out of or in connection with this PO including any question regarding its existence, validity, breach or termination, shall in the first instance be attempted to be resolved amicably by both the Parties. If attempts for such amicable resolution fails or no decision is reached within 30 days whichever is earlier, then such disputes shall be settled by arbitration in accordance with the Arbitration and Conciliation Act, 1996. Unless the Parties agree on a sole arbitrator, within 30 days from the receipt of a written request by one Party from the other Party to so agree, the arbitral panel shall comprise of three arbitrators. In that event, the supplier will nominate</p>

	<p>one arbitrator and the Project Coordinator of IITM shall nominate an arbitrator. The Dean IC&SR will nominate the Presiding Arbitrator of the arbitral tribunal. The arbitration proceeding shall be carried out in English language. The cost of arbitration and fees of the arbitrator(s) shall be shared equally by the Parties. The seat of arbitration shall be at IC&SR IIT Madras, Chennai.</p> <p>a. The Applicable Law: The Purchase Order shall be construed, interpreted and governed by the Laws of India. Court at Chennai shall have exclusive jurisdiction subject to the arbitration clause.</p> <p>b. Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.</p>
22)	<p>Force Majeure: The Supplier shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, its delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.</p> <p>For purposes of this Clause, “Force Majeure” means an event beyond the control of the Supplier and not involving the Supplier’s fault or negligence and not foreseeable. Such events may include, but are not limited to, acts of the Purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.</p> <p>If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such conditions and the cause thereof. Unless otherwise directed by the Purchaser in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.</p>
23)	<p>Eligibility Criteria:</p> <p><input type="checkbox"/> As per the Government of India Order, only “Class - I Local Suppliers” and “Class - II Local Suppliers” <u>can participate in this tender.</u></p> <p><input type="checkbox"/> <u>Bidder should confirm their acceptance that they comply with the provisions with report to “Guidelines for eligibility of a bidder from a country which shares a land border with India as detailed at Annexure-F. The bidder should submit Certificate for “Bidder from/ Not from Country sharing Land border with India & Registration of Bidder with Competent Authority” as per Order of DoE F.No.6/18/2019-PPD dated 23.07.2020 as mentioned.</u></p>
24)	<p>Preference to “class I Local Suppliers”: preference will be given to “class 1 local suppliers” (subject to class -I local supplier’s quoted price falling within the margin of purchase preference) as per public procurement (preference to make in India) order 2017 .O.M No P- 45021/2/2017 – pp(BE - 11) dt 04/06/2020 subject to the conditions that the “class 1 Local Supplier” should agree to supply goods / provide service at L1 rate and furnish a certificate with the technical bid document that the goods/service provided by them consists local content equal to or more than 50%.(certificate from Chartered Accountant in case value of contract exceeds Rs 10 crore).</p> <p><input type="checkbox"/> ‘Class - I local supplier’ means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to or more than 50% as defined under the above said order. Declaration to be provided as per Annexure-D per item/service/work.</p> <p><input type="checkbox"/> ‘Class - II local supplier’ means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to 20% but less than 50% as defined under the above said order. Declaration to be provided as per Annexure-D per item/service/work.</p> <p><input type="checkbox"/> ‘Margin of purchase preference’: - The margin of purchase preference shall be 20%. The Definition of the margin of purchase preference is defined in the Govt. of India Order No: P-45021/12/2017-PP (BE-II) Dt.4th June, 2020) Order 2017. As per the Government of India Order – “Margin of Purchase Preference” means the maximum extent to which the price quoted by a “Class-I local supplier” may be above the L1 for the purpose of purchase preference.</p> <p>**Note: Local content percentage to be calculated in accordance with the definition provided at clause 2 of revised public procurement preference to Make in India Policy vide GoI Order no. P-</p>

	45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019 and 04.06.2020) MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 & P-45021/102/2019-BE-II-Part(1) (E-50310) Dt.4th March 2021
25)	<p>Evaluation of Bids Bid evaluation will take place in two stages.</p> <p>Stage I Technical Bid evaluation All bidders who have fully complied with bidder eligibility criteria I, II and technical evaluation (Annexure A) will only be considered for opening of price bid.</p> <p>Stage II: Price Bid Evaluation The price bid evaluation will be based on price quoted by the bidder. The rate quoted for Control system for High pressure combustor rig unit will alone be taken up for arrival of Lowest Bid (L1) value.</p>
26)	<p>Selection of successful bidder and Award of Order The order will be directly awarded to the technically qualified bidder as per the condition in para 3A of DIPP, MoCI Order No. 45021/2/2017-PP (BE II) dated 16th September 2020.</p>
27)	All information including selection and rejection of technical or financial bids of the prospective bidders will be communicated through e-Tender portal. In terms of Rule 173(iv) of General Financial Rule 2017, the bidder shall be at liberty to question the bidding conditions, bidding process and/or rejection of bids.
28)	The tenderer shall certify that the tender document submitted by him / her are of the same replica of the tender document as published by IIT Madras and no corrections, additions and alterations made to the same. If any deviation found in the same at any stage and date, the bid / contract will be rejected / terminated and actions will be initiated as per the terms and conditions of the contract.
29)	Due to Covid-19 pandemic pre-bid meeting will be conducted through online. Clarification to the queries and doubts raised by the bidders will be issued as a corrigendum/addendum in the e-tenders portal.
30)	Due to Covid-19 pandemic the bidders will not be entertained to participate in opening of Bids. Since the tender is e-tender, the opening of the bids may be checked using the respective logins of the bidders.

ACKNOWLEDGEMENT

It is hereby acknowledged that I/We have gone through all the points listed under “Specification, Guidelines, Terms and Conditions” of tender document. I/We totally understand the terms and conditions and agree to abide by the same.

**SIGNATURE OF TENDERER ALONG
WITH
SEAL OF THE COMPANY WITH DATE**

Bidder Eligibility Criteria and Technical Specification for Control system for High pressure combustor rig

Tender No.AM/SATY/25/IOE23/COMBUSTORRIG

Bidder Eligibility Criteria – I (Public Procurement – Preference to Make in India)

Only 'Class-I local suppliers' and 'Class-II local suppliers', as defined under DIPP, MoCI Order No. P-45021/2/2017-PP (BE-II) dated 16th September 2020 and other subsequent orders issued therein.

Bidder Eligibility Criteria – II

The bidder/OEM should have supplied at least 3 similar items to IITs, NITs, IISERs, CSIR Labs or other Govt. organizations in the last 5 years, PO copies or installation certificates along with contact details of end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation.

The bidder should have 48 lakhs turnover in any one of the last 3 Financial Year.

III. Technical Specification For Control system for High pressure combustor rig

An experimental test rig to test gas turbine combustors for hydrogen methane blends is being developed at NCCRD, IIT Madras. The test facility envisages to test the combustors at high pressure and temperature conditions using Hydrogen and Methane blends at different compositions. This includes the development of an air supply line, combustor, fuel line, water supply line, instrumentation, and controlsystems.

The following items come under the scope of the present tender. Fabrication and erection of the

1. Hot Air supply line
2. Fuel supply line
3. Water supply line
4. Fuel leak detection system
5. PLC/Microcontroller with HMI interface using LabView or SCADA

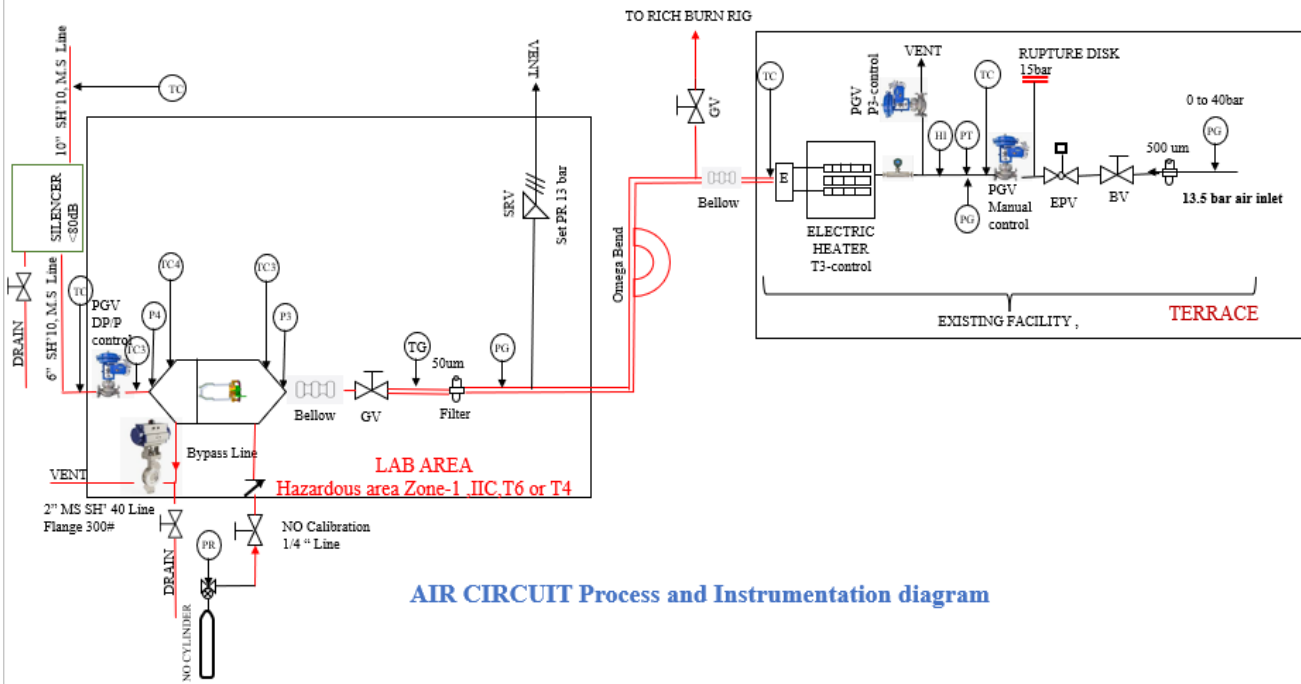
The below sections explain each of the above-mentioned items.

Hot Air Supply Line

A new hot air line must be branched from the existing hot air line from the heater. Branching must be done by adding a T-joint and isolation gate valves. The detailed schematic can be seen from the P&ID drawing. The pipeline has to be suitable for a maximum working pressure of 13 bar and 350C. The major items in the air pipeline are explained below:

S.No	Specification
EPV	
i)	Existing valve, must be connected with the PLC/microcontroller
ii)	Existing electropneumatic Open/Close valve
iii)	Signal type: 0 to 24V
PGV-manual control:	
i)	Existing valve, this has to be connected with the PLC/microcontroller
ii)	Type: Globe valve
iii)	Size & Rating: 4" valve with 300#
iv)	Actuation: electropneumatic with 10 bar air and 4 to 20mA control
Humidity Sensor:	
1)	Existing sensor, must be connected with the PLC/microcontroller
2)	Signal type: 4 to 20mA
Pressure sensor:	
1)	Existing sensor, must be connected with the PLC/microcontroller
2)	Signal type: 4 to 20mA
PGV-P3 control:	
1)	Make: L&T or Emerson
2)	Type: Globe valve
3)	Size & Rating: 4" valve with 300# ASMEB16.5 flanges
4)	MOC: Mild steel
5)	Design pressure: 20 bar
6)	Design Temperature: 60 C
7)	Actuation: electropneumatic with 10 bar air and 4 to 20mA control
8)	Actuation resolution: control within 0.1% of the stem length
9)	The pipeline must be slightly modified on the Cold side to add this valve and the vent line.
10)	To be connected with the PLC/Microcontroller
11)	Normally closed position
Air Mass flow meter:	
1)	Existing meter, must be connected with the PLC/microcontroller
2)	Type: Coriolis type mass flow meter
3)	Range: 0 to 3kg/s
4)	Signal type: 4 to 20mA
Electric Heater:	
1)	Existing equipment, must be connected with the PLC/microcontroller
2)	Signal type: 4 to 20mA and no-potential contact
Thermal expansion bellow:	

1)	Make: Athulya/Eagle Burgmann
2)	MOS: SS316
3)	4" Sh-40, 300#
4)	1.5 times working pressure
5)	1.5 times working temp
6)	containments around the bellow region are required
50-micron filter:	
1)	Type: Basket type filter
2)	Mesh Size: 50 micron
3)	MOC: Mild steel and the filtering element alone in SS316
4)	Design pressure: 20 bar
5)	Design Temperature: 400 C
6)	Graphite filled spiral wound gasket
Safety relief valve:	
1)	Discharge time – 1.5 minutes
2)	API 520
3)	Discharge rate
4)	Set pressure: 13 bar
5)	Cast-steel
6)	Flanged outlets
7)	Design pressure 40 bar
Manual Gate Valve:	
1)	Make: L&T or Emerson
2)	Type: Manual Gate valve
3)	Size & Rating: 4" valve with 300# ASMEB16.5 flanges
4)	MOC: Mild steel
5)	Design pressure: 20 bar
6)	Design Temperature: 400 C
Thermal expansion bellow:	
1)	Make: Athulya/Eagle Burgmann
2)	MOS: SS316
3)	4" Sh-40, 300#
4)	1.5 times working pressure
5)	1.5 times working temp
6)	containments around the bellow region are required
Test Rig:	
1)	Already available, the Supplier should connect the inlet and exhaust pipe with the rig.
2)	Pressure transmitters and thermocouples mentioned in the P&ID drawing has to be procured by supplier.
3)	The pressure and temperature sensors have to be connected with the PLC/Microcontroller.
4)	Pressure measurement range 0 to 15 bar, with 0.1% of full-scale accuracy
5)	All temperature has to be measured by K-type thermocouples



AIR CIRCUIT Process and Instrumentation diagram

1.	PGV-DP/P control:
	Make: L&T or Emerson
	Type: Globe valve
	Size & Rating: 4" valve with 300# ASMEB16.5 flanges
	MOC: SS316
	Design pressure: 20 bar
	Design Temperature: 550 C
	Actuation: electropneumatic with 10 bar air and 4 to 20mA control
	Actuation resolution: control within 0.1% of the stem length
	To be connected with the PLC/Microcontroller
	Normally Open position
2.	Butterfly drain valve:
	Make: Reputed make
	Type: butterfly valve
	Size & Rating: 2" valve with 300# ASMEB16.5 flanges
	MOC: SS316
	Design pressure: 20 bar
	Design Temperature: 350 C

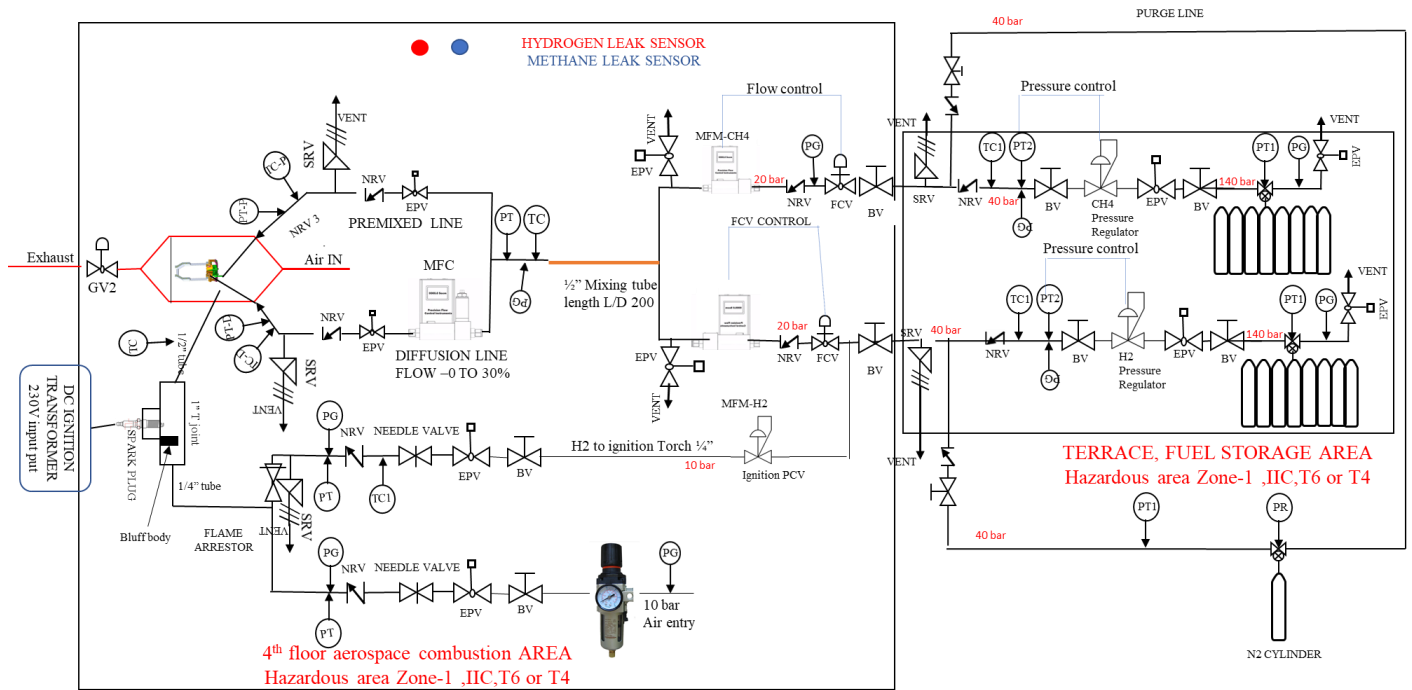
	Actuation: electropneumatic with 10 bar air and 4 to 20mA control
	To be connected with the PLC/Microcontroller
3.	Silencer:
	Fluid: Burnt gases with Steam and water
	Max flowrate: 2kg/s
	Noise: <80dB
	MOC: SS304
	Design pressure: 5 bar
	Design Temperature: 600 C
	The silencer should have drain and vent with isolation valves
	The Silencer should have sufficient lifting arrangement.
	The 10" line after the silencer should extend 3 meters above the terrace level
4.	Pipeline:
	The pipeline will be 4" with 40Sch seamless pipeline in the inlet and 6"/10"-10Sch pipe in the exhaust
	There is a 4" seamless pipeline already laid from the heater to the rig room, with just one manual valve in it. Any additional valve must be accounted for in this tender scope.
	<ul style="list-style-type: none"> The supplier must purchase the required 6" pipe, 10" pipeflanges, gasket, bolts, T-joints and bends.
	Pipeline supports has to be given at 0.5-meter interval.
	There will be core cutting needed to take pipes through walls for exhaust lines.
	The welding and hydrotest must be performed by the supplier.
	The approximate pipeline length will be around 5 meters with bends for 4" line, 6" line will be another 6m long with bends, and 10" line will be around 5m long (no bends). There may be bends required in each of these lines. The supplier is advised to visit the site and take proper measurements before submitting the quote.
5.	Gauges:
	Wall mounted Pressure and temperature gauges has to provided as mentioned in the drawing
	PG and TG make has to be Baumer/Forbes marshal/Wika.
	All pressure gauges shall be safety gauges with safety glass
	The pressure gauge range should be 0 to 25 bar
6.	Thermal insulation:
	All the hot surfaces in the inlet pipeline must to insulated with rockwool/ceramic wool and aluminum cladding
	The surface temperature after the insulation should be less than 60 C.

Fuel Supply Line

Two fuel supply lines must be laid to feed and control, one each for, Hydrogen and Methane gases. The maximum operating pressure will be 25 bar and the operating temperature will to 20 to 60C. The detailed P&ID drawing is attached. The different elements of the fuel circuit are explained below: Care should be taken to incorporate appropriate flow controllers/measurement systems for the two different fuels in the individual fuel supply lines.

	Fuel Shed:
	fuel shed has to be provided in the Terrace area
	The cylinder storage area will need a cylinder holding structure. Non-combustible shelter material with side cladding to prevent uplift by air pressure. Adequate protection from direct sunlight must be provided. Provision for tying the hose restraints should be available.
	All the parts should be bodily grounded and connected to nearest earth pit.
	Very good painting as per industry/safety standard.
	Adequate provision for entry and exit with cylinder (ramps etc....).
	Empty cylinders should be kept aside. Extend the length of the gas bank to accommodate empty cylinders.
	Zone-1 ,IIC,T6 or T4 classified peso approved luminous (Baliga/FCG/Rstall) should be provided. All the electrical terminations should have ATEX approved, double compression gland. The luminous should be able to provide 200lux@750mm from floor level. The wiring should be flame proof.
	Provision on the structure to switch ON the illumination with a Rotary switch. All the electrical equipment should be suitable for Zone-1, IIC, T6 or T4 classification.
	Anchoring of the cylinder holding structure with the civil foundation should be done.
	Rainwater gutters to be provided.
	Provision on the cylinder holding structure to house fire extinguisher, safety data sheets, PPE box (safety hard hat, safety goggle, antistatic cut resistant gloves and cotton lab coats)
	Toolbox to house anti sparking tools, Including adjustable wrenches and cylinder nozzle keys.
	Provisions on the shelter to place hazard communication signage.
	High pressure Gas Manifold:
	Cylinder nozzle (key operated valve) with guard
	Bull nose and SS braided hose with safety hose restraint wire for the high-pressure line
	Filter and check valve should be provided in the gas pipelines.
	ASME B31.3 & B31.9 orbitally weld SS316L header gas lines
	Composition of the regulator inlet manifold:
	Inlet valve
	Double station pressure regulator
	Safety capture Bonet SRV
	Outlet valve

	Purge line
	Vent line
	ASME safety relief valve
	Tubing & Fittings:
	The tubing must be routed from fuel shed to the rig with all the required valves and fittings.
	The entire fuel circuit is made of ½” tubes and fittings. The ignition torch line alone will be ¼”
	All the tubes must be to be Swagelok SS316 tubes only.
	All the fittings have to be Swagelok or Parker make only.
	Only Welded joints/fittings has to be used, if welding is not possible double compression Ferrule fittings can be used.
	After installation of the fuel circuit, Helium leak test has to be performed and certified by the supplier.
	The approximate pipeline length will be around 40 meters with bends. The supplier is advised to visit the site and take proper measurements before submitting the quote.
	Gauges:
	Wall mounted Pressure and temperature gauges has to provided as mentioned in the drawing
	PG and TG make has to be Baumer/Forbes marshal/Wika.
	All pressure gauges shall be safety gauges with safety glass
	The pressure gauge range should be 0 to 40 bar
	Instruments connected to PLC:
	All the pressure transmitters should have a range of 0 to 40 bar with accuracy of 0.1% of full scale value
	Pressure transmitters has to be Baumer/Forbes marshal/Wika.
	All fuel Pressure transmitters has to be Ex-d, ATEX approved for hazardous area Zone-1 ,IIC,T6 or T4 classification
	All the thermocouples have to K-type, Omega make thermocouples only.
	The SRV should give an indication in the PLC if they are opened

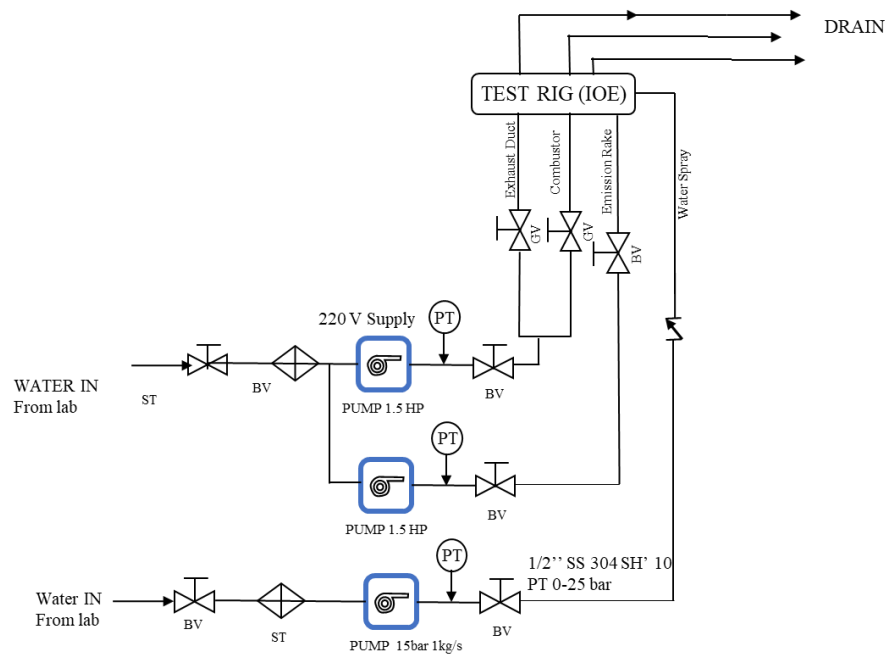


Valves and regulator:	
	The pressure regulator has to be Tescon, GCV or Swagelok make only. The pressure regulator will step down the 180 bar cylinder pressure to 40 bar line pressure.
	The flow control valve has to be Swagelok or Parker make only.
	All the ball valve, non-return valve and safety relief valves has be Swagelok or Parker make only.
	The actuators for the control valves (EPV) and regulators has to Ex-d,ATEX approved for hazardous area Zone-1 ,IIC,T6 or T4 classification
	The H2 flame arrestor in the ignition torch has to be rated for 10 bar.
	All the automatic valves and regulators has to connected with the PLC.
	All EPV and ball valves should have a position indicator
Fuel Mass flow meter:	
	Make: Emerson, Bronkhorst or equivalent
	Type: Coriolis
	Range: 0 to 35kg/hr for Hydrogen and 0 to 80kg/hr for Methane
	Accuracy: 0.1% of full scale
	MOC: SS316
	Design pressure: 40 bar
	Design Temperature: 60 C
	Signal : 4 to 20mA,
	Mass flow meter has to be connected with plc

	Fuel Mass flow controller:
	Make: Emerson, Bronkhorst or equivalent
	Type: Coriolis
	Range: 0 to 25kg/hr
	Fluid: mixture of Hydrogen and Methane
	Accuracy: 0.1% of full scale
	MOC: SS316
	Design pressure: 40 bar
	Design Temperature: 60 C
	Signal : 4 to 20mA,
	Mass flow controller has to be connected with plc
	General requirements:
	All the electropneumatic Isolation ball valve should be Atex approved
	PLC Looping the cori flow meter with the isolation valve to shut-off during excess flow
	All the Vent lines must be 3 meters above terrace level and a flash back arrestor must be provided (s-type bend 45 deg angle, properly supported). All the vents should be independent.
	Proportional safety relief valve should have a testing point
	Leak test with Helium test should be performed and certified
	All valves should be in normally closed position
	Gas tubes should enter 1 feet below the true ceiling, bring the vale alone to a operable height...
	Tube entry should be away from the emergency exit door.
	PVC sleeve for tube entry and use FM approved fire stop sealant to close the pVC sleeve
	Colour code has to be canary yellow with red bands.
	Lock enabled needle valve should be provided
	Put the ignition transformer in a safety enclosure, FRLSH cabling, safety enclose, glanding and earthing voltage rating of cable, cable should be harnessed....
	For ignition DC transformer should be used. It can be Herco or equivalent make. The transformer has to be operated from the PLC.

[Water Injection Line](#)

A new fuel supply line must be feed the water inside the rig. The water line will take water from the lab area and inject it into the rig at high pressure. The water P&ID drawing is attached below:



The major parts of the circuit are explained below:

	Water pumps:
	The pump will feed water at high pressure to the combustor, rig and emission rake.
	The pumps for the combustor and emission rake should be able to pump up to 8 bar at low flow rates.
	The pump for the combustor should be capable of supplying up to 15 bar at 1kg/s
	The RPM of the pumps should be controlled from PLC (using VFD) to maintain a set pressure in the line.
1.	General requirements:
	All the pipes upstream of the pump can be in uPVC
	The pipes and fittings downstream of the pump has to be in ½'' SS304 pipe suitable for 20 bar pressure
	The approximate pipeline length will be around 5 meters with bends. The supplier is advised to visit the site and take proper measurements before submitting the quote.
	The pressure transmitter in each line has to be connected to the PLC.
	Tank level gauge has to provided and installed in the main tank
	After pump venting point, isolation ball valve and non-return valve, when connected to a tank
	Inlet and outlet of the pump will need a runner bellow to absorb the water hammering effect.
	Pump should be on civil foundation
	Temperature has to be monitored in the hot side of the line
	Water flow indicator/ switch to ensure running pump without water

	<u>Fuel leak detection system</u>
	Honeywell make fuel leak detection sensors has to purchased and installed in the Lab area to monitor the fuel leaks. The lab should be provided with two H2 and two methane leak detection sensors. The location of the sensor will be provided later. The sensors will have to be integrated with the PLC/Microcontroller. The sensors has to be ATEX approved for hazardous area Zone-1 ,IIC,T6 or T4 classification. All the wires and cables in the lab area and H2 storage area should be FRLSH cables (fire resistant low smoke halogen free cables) with ATEX approved glands and proper cable dressing. The sensors need to be calibrated after installation and tested with known sample.
	<u>PLC/Microcontroller with HMI interface using LabView or SCADA</u>
	All the instruments and control valves have to be monitored and controlled using PLC or micro controller. Supplier has to decide the capacity of the PLC based on the Inputs and outputs listed in the P&ID drawing. SCADA or LabVIEW interface has to be provided. The Control logic and the preliminary display screen is detailed in an attached pdf document . The supplier may preferably choose Labview, as IITM as License for the same. The computers required for the HMI has to include in the scope. Existing instruments will be connected to the PLC, necessary provisions have to be provided for the same. The building fire alarm PLC must be linked with the lab PLC for transmitting emergency signals.
	The flow controller along with the pipelines must be shown to operate are the required flow conditions as given in the above tender. The first time experiment run assistance must also be given when the full rig experiment is done.
	<u>General and Electrical Requirements</u>
	Fuel shed area also should have a separate lightning protection equipment with <u>independent continuity grids, lightning protection pits and testers</u> .
	Fuel gas leak detection system should be interlocked and have interface capabilities to automatically shut OFF the fuel gas admittance, turn ON ventilation system, and turn off electrical power supply to the air heater.
	Static bonding and grounding should be done for the fuel storage area, cylinder manifolds and distribution pipelines with bonding and grounding monitoring stations
	Functional grounding on noncurrent carrying parts, cylinder holding parts, structure, fuel leak detection system and all ATEX approved equipment must be <u>done and should be connected to an independent earthing pit</u>
	Inspection grid for functional check of grounding in the gas bank and in the rig area has to be provided.

	Electrical power distribution boards, circuit boards or LT panels as required for the control panel and pumps/valve actuators in the area where there is hydrogen shall be meeting the flame proof and explosion proof construction requirement and 7 levels of electrical protection systems
	Over current and overload protection
	Transient voltage surge suppression.
	Single phase prevention or line voltage monitor and tripping system
	Microprocessor based earth leak relay interlock with main circuit breaker shall be set not more than 30 mA and tripping time not more than 15ms
	Ground fault monitor – tripping system when earthing continuity is not established
	Permanent electrical safety device to ensure verification of zero energy before opening of panel
	Multi-function meter and lockable emergency stops
	All the lighting in the rig area and gas bank area must be flame proof and explosion proof, suitable for Zone-1 gr-IIC, T6 classification area. Avoid CFL lighting, use only LED lighting.
	In the gas bank area, lab area and operating room, there should be emergency switches which can stop gas admittance. Another switch should be provided to kill all the electrical supply.
	Polycarbonate protection guard must be provided for all energized parts in electrical box
	All the wires and cables in the lab area and fuel storage area should be FRLSH cables (fire resistant low smoke halogen free cables) with ATEX approved glands and proper cable dressing,
	Metal raceway requirements:
	30% overboard clearance on metal raceway.
	25/6mm hot dip galvanised Gi Earth strips within the raceway.
	Non-corrosive Ni-cd bolts and securing screws
	Inspection grid for the earth strips within the metal raceways should be provided
	Gray colour coding should be followed for metal raceway
	Grounding of noncurrent carrying parts on metal raceway.
	Glanding for knockouts on the metal raceway should be done
	Mounting of metal raceway should be done on floor mounted elevated supports to avoid contact with moisture laden walls
	The power supply cables, and adaptors of the laser, camera etc. must be changed to flameproof, if they are kept inside the lab area.
	All designs for electrical systems should be done with ergonomic clearance and sufficient access for maintenance
	2 hr rated fire stop sealants for all penetration services entering the test area.
	Product safety certifications required
	Submit the list of qualified manufacturers for the field devices, classified electrical systems
	Other requirements:
	Installation of the flow control system and demonstration of the required flow rates must be done in NCCRD building 4 th floor and terrace.
	Commissioning should demonstrate the required flow rates in all of the flow control systems together.
	Warranty of 1 year from the date of commissioning is required.
	Please contact Mr. Shreeswaraj (7972354647) or Prof. Muruganandam(murgi@ae.iitm.ac.in) for visiting site.

TECHNICAL BID PROFORMA
Tender No.AM/SATY/25/IOE23/COMBUSTORRIG
Item Name: Control system for High pressure combustor rig

1.0 Bidder Eligibility Criteria:

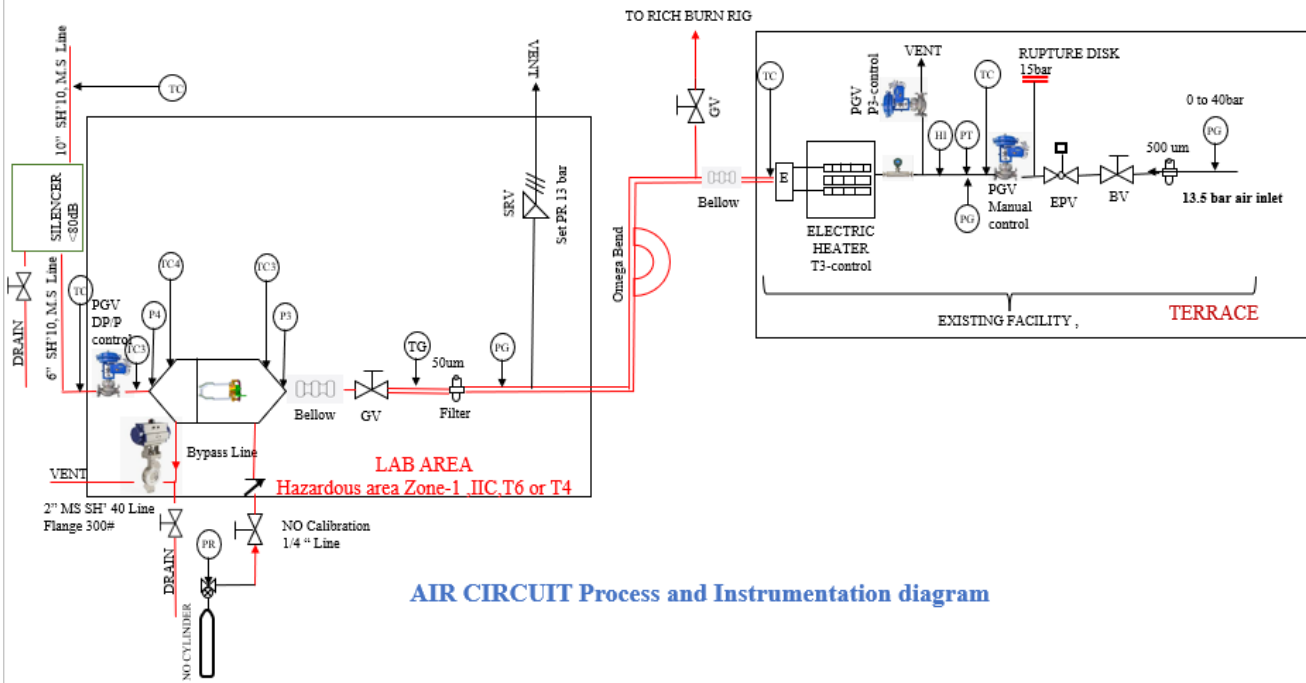
I	Bidder Eligibility Criteria-I (Public Procurement – Preference to Make in India)	Class I / Class II	Local Content value	Reference, Page No.
I	Only 'Class-I local suppliers' and 'Class-II local suppliers', as defined under DIPP, MoCI Order No. P-45021/2/2017-PP (BE II) dated 16 th September 2020 and other subsequent orders issued therein.			
2.0	Bidder Eligibility Criteria-II	Compliance (Yes/No)	Reference Page No.	Remarks, If any
1	The bidder/OEM should have supplied at least 3 similar items to IITs, NITs, IISERs, CSIR Labs or other Govt. organizations in the last 5 years, PO copies or installation certificates along with contact details of end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation.			
2	The bidder should have 48 lakhs turnover in any one of the last 3 Financial Year.			

3.0 Technical Compliance:

S.No	Specification	Complaiied /Not Complied	Reference Page .No
	Existing valve, must be connected with the PLC/microcontroller		
	Existing electropneumatic Open/Close valve Signal type: 0 to 24V		
PGV-manual control:			
	Existing valve, this has to be connected with the PLC/microcontroller		
	Type: Globe valve		
	Size & Rating: 4" valve with 300#		
	Actuation: electropneumatic with 10 bar air and 4 to 20mA control		
	Humidity Sensor:		

	Existing sensor, must be connected with the PLC/microcontroller		
	Signal type: 4 to 20mA		
Pressure sensor:			
	Existing sensor, must be connected with the PLC/microcontroller		
	Signal type: 4 to 20mA		
PGV-P3 control:			
	Make: L&T or Emerson		
	Type: Globe valve		
	Size & Rating: 4" valve with 300# ASME B16.5 flanges		
	MOC: Mild steel		
	Design pressure: 20 bar		
	Design Temperature: 60 C		
	Actuation: electropneumatic with 10 bar air and 4 to 20mA control		
	Actuation resolution: control within 0.1% of the stem length		
	The pipeline must be slightly modified on the Cold side to add this valve and the vent line.		
	To be connected with the PLC/Microcontroller		
	Normally closed position		
Air Mass flow meter:			
	Existing meter, must be connected with the PLC/microcontroller		
	Type: Coriolis type mass flow meter		
	Range: 0 to 3kg/s		
	Signal type: 4 to 20mA		
Electric Heater:			
	Existing equipment, must be connected with the PLC/microcontroller		
	Signal type: 4 to 20mA and no-potential contact		
Thermal expansion bellow:			
	Make: Athulya/Eagle Burgmann		
	MOS: SS316		
	4" Sh-40, 300#		
	1.5 times working pressure		
	1.5 times working temp		
	containments around the bellow region are required		
50-micron filter:			
	Type: Basket type filter		

	Mesh Size: 50 micron		
	MOC: Mild steel and the filtering element alone in SS316		
	Design pressure: 20 bar		
	Design Temperature: 400 C		
	Graphite filled spiral wound gasket		
	Safety relief valve:		
	Discharge time – 1.5 minutes		
	API 520		
	Discharge rate		
	Set pressure: 13 bar		
	Cast-steel		
	Flanged outlets		
	Design pressure 40 bar		
Manual Gate Valve:			
	Make: L&T or Emerson		
	Type: Manual Gate valve		
	Size & Rating: 4” valve with 300# ASME B16.5 flanges		
	MOC: Mild steel		
	Design pressure: 20 bar		
	Design Temperature: 400 C		
Thermal expansion bellow:			
	Make: Athulya/Eagle Burgmann		
	MOS: SS316		
	4” Sh-40, 300#		
	1.5 times working pressure		
	1.5 times working temp		
	containments around the bellow region are required		
Test Rig:			
	Already available, the Supplier should connect the inlet and exhaust pipe with the rig.		
	Pressure and thermocouples mentioned in the P&ID drawing has to be procured by supplier.		
	The pressure and temperature sensors have to be connected with the PLC/Microcontroller.		
	Pressure measurement range 0 to 15 bar, with 0.1% of full-scale accuracy		
	All temperature has to be measured by K-type thermocouples		



AIR CIRCUIT Process and Instrumentation diagram

7.	PGV-DP/P control:		
	Make: L&T or Emerson		
	Type: Globe valve		
	Size & Rating: 4" valve with 300# ASMEB16.5 flanges		
	MOC: SS316		
	Design pressure: 20 bar		
	Design Temperature: 550 C		
	Actuation: electropneumatic with 10 bar air and 4 to 20mA control		
	Actuation resolution: control within 0.1% of the stem length		
	To be connected with the PLC/Microcontroller		
	Normally Open position		
8.	Butterfly drain valve:		
	Make: Reputed make		
	Type: butterfly valve		
	Size & Rating: 2" valve with 300# ASMEB16.5 flanges		
	MOC: SS316		
	Design pressure: 20 bar		
	Design Temperature: 350 C		
	Actuation: electropneumatic with 10 bar air and 4 to 20mA control		
	To be connected with the PLC/Microcontroller		

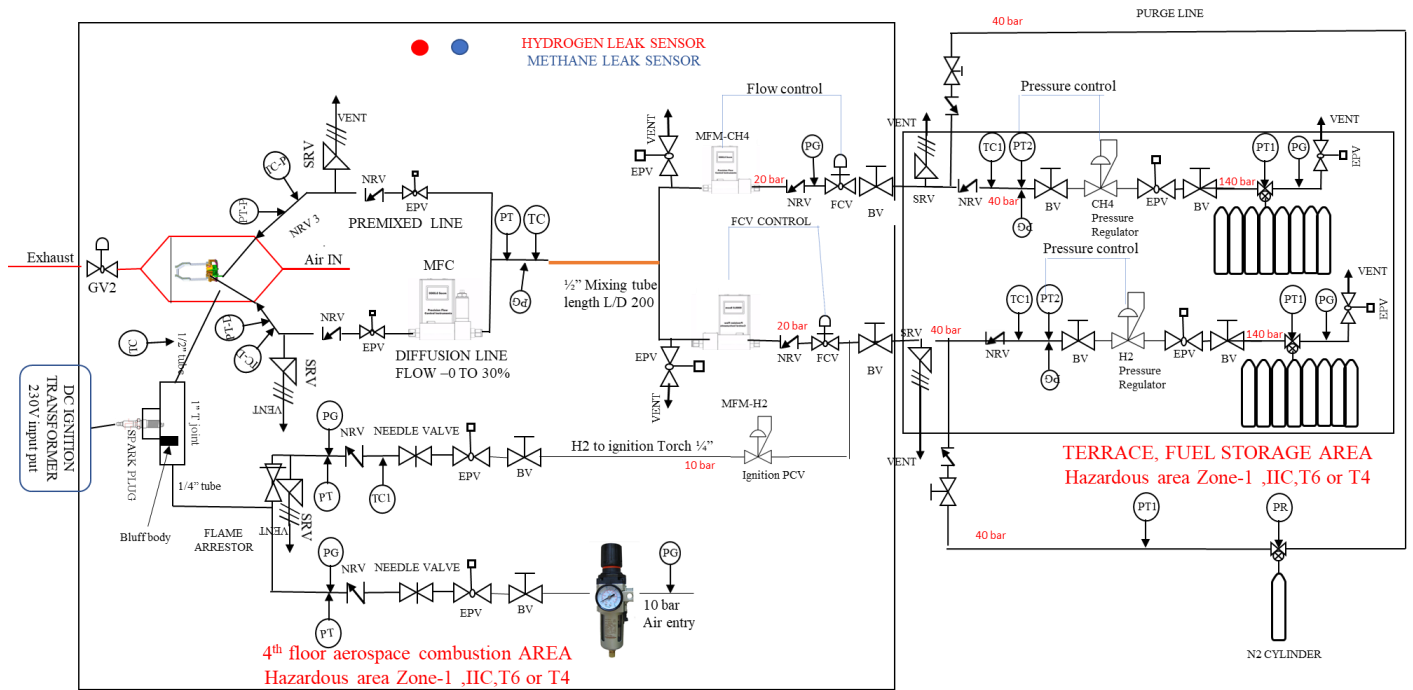
9.	Silencer:		
	Fluid: Burnt gases with Steam and water		
	Max flowrate: 2kg/s		
	Noise: <80dB		
	MOC: SS304		
	Design pressure: 5 bar		
	Design Temperature: 600 C		
	The silencer should have drain and vent with isolation valves		
	The Silencer should have sufficient lifting arrangement.		
	The 10" line after the silencer should extend 3 meters above the terrace level		
10.	Pipeline:		
	The pipeline will be 4" with 40Sch seamless pipeline in the inlet and 6"/10"-10Sch pipe in the exhaust		
	There is a 4" seamless pipeline already laid from the heater to the rig room, with just one manual valve in it. Any additional valve must be accounted for in this tender scope.		
	<ul style="list-style-type: none"> The supplier must purchase the required 6" pipe, 10" pipeflanges, gasket, bolts, T-joints and bends. 		
	Pipeline supports has to given at 0.5-meter interval.		
	There will be core cutting needed to take pipes through walls for exhaust lines.		
	The welding and hydrotest must be performed by the supplier.		
	The approximate pipeline length will be around 5 meters with bends for 4" line, 6" line will be another 6m long with bends, and 10" line will be around 5m long (no bends). There may be bends required in each of these lines. The supplier is advised to visit the site and take proper measurements before submitting the quote.		
11.	Gauges:		
	Wall mounted Pressure and temperature gauges has to provided as mentioned in the drawing		
	PG and TG make has to be Baumer/Forbes marshal/Wika.		
	All pressure gauges shall be safety gauges with safety glass		
	The pressure gauge range should be 0 to 25 bar		
12.	Thermal insulation:		
	All the hot surfaces in the inlet pipeline must to insulated with rockwool/ceramic wool and aluminum cladding		
	The surface temperature after the insulation should be less than 60 C.		

Fuel Supply Line

Two fuel supply lines must be laid to feed and control, one each for, Hydrogen and Methane gases. The maximum operating pressure will be 25 bar and the operating temperature will to 20 to 60C. The detailed P&ID drawing is attached. The different elements of the fuel circuit are explained below: Care should be taken to incorporate appropriate flow controllers/measurement systems for the two different fuels in the individual fuel supply lines.

	Fuel Shed:		
	Fuel shed has to be provided in the Terrace area		
	The cylinder storage area will need a cylinder holding structure. Non-combustible shelter material with side cladding to prevent uplift by air pressure. Adequate protection from direct sunlight must be provided. Provision for tying the hose restraints should be available.		
	All the parts should be bodily grounded and connected to nearest earth pit.		
	Building needs to have Lightning protection. Meeting IEC 62305 standard.		
	Very good painting as per industry/safety standard.		
	Adequate provision for entry and exit with cylinder (ramps etc....).		
	Empty cylinders should be kept aside. Extend the length of the gas bank to accommodate empty cylinders.		
	Zone-1 ,IIC,T6 or T4 classified peso approved luminous (Baliga/FCG/Rstall) should be provided. All the electrical terminations should have ATEX approved, double compression gland. The luminous should be able to provide 200lux @750mm from floor level. The wiring should be flame proof.		
	Provision on the structure to switch ON the illumination with a Rotary switch. All the electrical equipment should be suitable for Zone-1, IIC, T6 or T4 classification.		
	Anchoring of the cylinder holding structure with the civil foundation should be done.		
	Rainwater gutters to be provided.		
	Provision on the cylinder holding structure to house fire extinguisher, safety data sheets, PPE box (safety hard hat, safety goggle, antistatic cut resistant gloves and cotton lab coats)		
	Toolbox to house anti sparking tools, Including adjustable wrenches and cylinder nozzle keys.		
	Provisions on the shelter to place hazard communication signage.		
	High pressure Gas Manifold:		

	Cylinder nozzle (key operated valve) with guard		
	Bull nose and SS braided hose with safety hose restraint wire for the high-pressure line		
	Filter and check valve should be provided in the gas pipelines.		
	ASME B31.3 & B31.9 orbitally weld SS316L header gas lines		
	Composition of the regulator inlet manifold:		
	Inlet valve		
	Double station pressure regulator		
	Safety capture Bonet SRV		
	Outlet valve		
	Purge line		
	Vent line		
	ASME safety relief valve		
	Tubing & Fittings:		
	The tubing must be routed from fuel shed to the rig with all the required valves and fittings.		
	The entire fuel circuit is made of ½” tubes and fittings. The ignition torch line alone will be ¼”		
	All the tubes must be to be Swagelok SS316 tubes only.		
	All the fittings have to be Swagelok or Parker make only.		
	Only Welded joints/fittings has to be used, if welding is not possible double compression Ferrule fittings can be used.		
	After installation of the fuel circuit, Helium leak test has to be performed and certified by the supplier.		
	The approximate pipeline length will be around 40 meters with bends. The supplier is advised to visit the site and take proper measurements before submitting the quote.		
	Gauges:		
	Wall mounted Pressure and temperature gauges has to provided as mentioned in the drawing		
	PG and TG make has to be Baumer/Forbes marshal/Wika.		
	All pressure gauges shall be safety gauges with safety glass		
	The pressure gauge range should be 0 to 40 bar		
	Instruments connected to PLC:		
	All the pressure transmitters should have a range of 0 to 40 bar with accuracy of 0.1% of full scale value		
	Pressure transmitters has to be Baumer/Forbes marshal/Wika.		
	All fuel Pressure transmitters has to be Ex-d, ATEX approved for hazardous area Zone-1 ,IIC,T6 or T4 classification		
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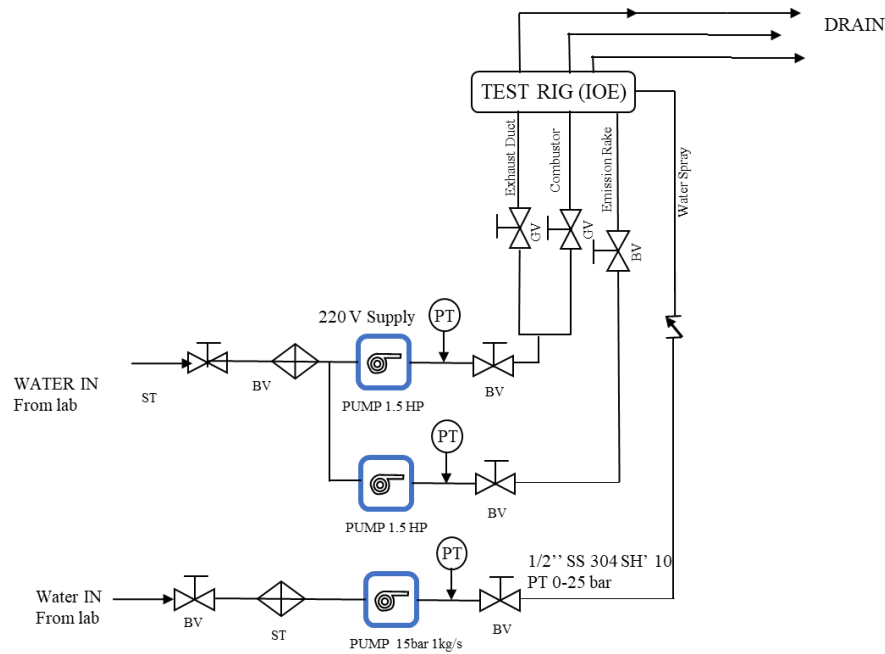


	Valves and regulator:		
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	All the automatic valves and regulators has to connected with the PLC.		
	All EPV and ball valves should have a position indicator		
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	Make: Emerson, Bronkhorst or equivalent		
	Type: Coriolis		
	Range: 0 to 35kg/hr for Hydrogen and 0 to 80kg/hr for Methane		
	Accuracy: 0.1% of full scale		
	MOC: SS316		
	Design pressure: 40 bar		
	Design Temperature: 60 C		

	Signal : 4 to 20mA,		
	Mass flow meter has to be connected with plc		
	Fuel Mass flow controller:		
	Make: Emerson, Bronkhorst or equivalent		
	Type: Coriolis		
	Range: 0 to 25kg/hr		
	Fluid: mixture of Hydrogen and Methane		
	Accuracy: 0.1% of full scale		
	MOC: SS316		
	Design pressure: 40 bar		
	Design Temperature: 60 C		
	Signal : 4 to 20mA,		
	Mass flow controller has to be connected with plc		
	General requirements:		
	All the electropneumatic Isolation ball valve should be Atex approved		
	PLC Looping the cori flow meter with the isolation valve to shut-off during excess flow		
	All the Vent lines must be 3 meters above terrace level and a flash back arrestor must be provided (s-type bend 45 deg angle, properly supported). All the vents should be independent.		
	Proportional safety relief valve should have a testing point		
	Leak test with Helium test should be performed and certified		
	All valves should be in normally closed position		
	Gas tubes should enter 1 feet below the true ceiling, bring the vale alone to a operable height...		
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	For ignition DC transformer should be used. It can be Herco or equivalent make. The transformer has to be operated from the PLC.		

Water Injection Line

A new fuel supply line must be feed the water inside the rig. The water line will take water from the lab area and inject it into the rig at high pressure. The water P&ID drawing is attached below:



The major parts of the circuit are explained below:

	Water pumps:		
	The pump will feed water at high pressure to the combustor, rig and emission rake.		
	The pumps for the combustor and emission rake should be able to pump up to 8 bar at low flow rates.		
	The pump for the combustor should be capable of supplying up to 15 bar at 1kg/s		
	The RPM of the pumps should be controlled from PLC (using VFD) to maintain a set pressure in the line.		
2.	General requirements:		
	All the pipes upstream of the pump can be in uPVC		
	The pipes and fittings downstream of the pump has to be in 1/2" SS304 pipe suitable for 20 bar pressure		
	The approximate pipeline length will be around 5 meters with bends. The supplier is advised to visit the site and take proper measurements before submitting the quote.		
	The pressure transmitter in each line has to be connected to the PLC.		
	Tank level gauge has to provided and installed in the main tank		
	After pump venting point, isolation ball valve and non-return valve, when connected to a tank		
	Inlet and outlet of the pump will need a runner bellow to absorb the water hammering effect.		
	Pump should be on civil foundation		
	Temperature has to be monitored in the hot side of the line		

	Water flow indicator/ switch to ensure running pump without water		
	<u>Fuel leak detection system</u>		
	Honeywell make fuel leak detection sensors has to purchased and installed in the Lab area to monitor the fuel leaks. The lab should be provided with two H2 and two methane leak detection sensors. The location of the sensor will be provided later. The sensors will have to be integrated with the PLC/Microcontroller. The sensors has to be ATEX approved for hazardous area Zone-1 ,IIC,T6 or T4 classification. All the wires and cables in the lab area and H2 storage area should be FRLSH cables (fire resistant low smoke halogen free cables) with ATEX approved glands and proper cable dressing. The sensors need to be calibrated after installation and tested with known sample.		
	<u>PLC/Microcontroller with HMI interface using LabView or SCADA</u>		
	All the instruments and control valves have to monitored and controlled using PLC or micro controller. Supplier has to decide the capacity of the PLC based on the Inputs and outputs listed in the P&ID drawing. SCADA or LabVIEW interface has to be provided. The Control logic and the preliminary display screen is detailed in an attached power point document . The supplier may preferably choose Labview, as IITM as License for the same. The computers required for the HMI has to include in the scope. Existing instruments will be connected to the PLC, necessary provisions have to be provided for the same. The building fire alarm PLC must be linked with the lab PLC for transmitting emergency signals.		
	The flow controller along with the pipelines must be shown to operate are the required flow conditions as given in the above tender. The first time experiment run assistance must also be given when the full rig experiment is done.		
	<u>General and Electrical Requirements</u>		
	Fuel shed area also should have a separate lightning		

	protection equipment with independent continuity grids, lightning protection pits and testers.		
	Fuel gas leak detection system should be interlocked and have interface capabilities to automatically shut OFF the fuel gas admittance, turn ON ventilation system, and turn off electrical power supply to the air heater.		
	Static bonding and grounding should be done for the fuel storage area, cylinder manifolds and distribution pipelines with bonding and grounding monitoring stations		
	Functional grounding on noncurrent carrying parts, cylinder holding parts, structure, fuel leak detection system and all ATEX approved equipment must be done and should be connected to an independent earthing pit		
	Inspection grid for functional check of grounding in the gas bank and in the rig area has to be provided.		
	Electrical power distribution boards, circuit boards or LT panels as required for the control panel and pumps/valve actuators in the area where there is hydrogen shall be meeting the flame proof and explosion proof construction requirement and 7 levels of electrical protection systems		
	Over current and overload protection		
	Transient voltage surge suppression.		
	Single phase prevention or line voltage monitor and tripping system		
	Microprocessor based earth leak relay interlock with main circuit breaker shall be set not more than 30 mA and tripping time not more than 15ms		
	Ground fault monitor – tripping system when earthing continuity is not established		
	Permanent electrical safety device to ensure verification of zero energy before opening of panel		
	Multi-function meter and lockable emergency stops		
	All the lighting in the rig area and gas bank area must be flame proof and explosion proof, suitable for Zone-1 gr-IIC, T6 classification area. Avoid CFL lighting, use only LED lighting.		
	In the gas bank area, lab area and operating room, there should be emergency switches which can stop gas admittance. Another switch should be provided to kill all the electrical supply.		
	Polycarbonate protection guard must be provided for all energized parts in electrical box		
	All the wires and cables in the lab area and fuel storage area should be FRLSH cables (fire resistant low smoke halogen free cables) with ATEX approved glands and proper cable dressing,		
	Metal raceway requirements:		
	30% overboard clearance on metal raceway.		
	25/6mm hot dip galvanised Gi Earth strips within the raceway.		

	Non-corrosive Ni-cd bolts and securing screws		
	Inspection grid for the earth strips within the metal raceways should be provided		
	Gray colour coding should be followed for metal raceway		
	Grounding of noncurrent carrying parts on metal raceway.		
	Glanding for knockouts on the metal raceway should be done		
	Mounting of metal raceway should be done on floor mounted elevated supports to avoid contact with moisture laden walls		
	The power supply cables, and adaptors of the laser, camera etc. must be changed to flameproof, if they are kept inside the lab area.		
	All designs for electrical systems should be done with ergonomic clearance and sufficient access for maintenance		
	2 hr rated fire stop sealants for all penetration services entering the test area.		
	Product safety certifications required		
	Submit the list of qualified manufacturers for the field devices, classified electrical systems		
Other requirements:			
	Installation of the flow control system and demonstration of the required flow rates must be done in NCCRD building 4 th floor and terrace.		
	Commissioning should demonstrate the required flow rates in all of the flow control systems together.		
	Warranty of 1 year from the date of commissioning is required.		
	Please contact Mr. Shreeswaraj (7972354647) or Prof. Muruganandam(murgi@ae.iitm.ac.in) for visiting site.		

**SIGNATURE OF BIDDER ALONG WITH
SEAL OF THE COMPANY WITH DATE**

FINANCIAL BID (PROFORMA) - BILL OF QUANTITIES (BOQ)

**Item Name: Control system for High pressure combustor rig
Tender No.AM/SATY/25/IOE23/COMBUSTORRIG**

It. No	Description of work	Quantity	Units	Basic Rate in INR	GST in Percentage	Total Amount with taxes in INR
1	Control system for High pressure combustor rig with 1 Year Warranty	1	Nos.			
	Grand Total					

Total Amount Rupees in words _____



CENTRE FOR INDUSTRIAL CONSULTANCY & SPONSORED RESEARCH (IC&SR)
INDIAN INSTITUTE OF TECHNOLOGY MADRAS
CHENNAI 600 036



ELECTRONIC CLEARING SERVICE (Credit Clearing)/ REAL TIME GROSS SETTLEMENT (RTGS) FACILITY FOR RECEIVING PAYMENTS

A. Details of Account Holder

Name of the Institution	Indian Institute of Technology - Madras
Complete Contact Address	Industrial Consultancy and Sponsored Research Indian Institute of Technology-Madras, IIT- Madras Campus Post Office, Sardar Patel Road, Guindy, CHENNAI - 600 036
Permanent Account Number (PAN)*	AAAAI3615G
GST REGISTRATION NO.	33AAAAI3615G1Z6
Telephone No./ Fax No.	Tel - 044-2257 8356
E- mail ID of the FO/AO/REG/DIR	dricsr@iitm.ac.in

B. Bank Account Details:

Institution Account Name (As per Bank Record)	The Registrar, Indian Institute of Technology - Madras
Account No.	2722101003872
IFSC CODE	CNRB0002722
SWIFT CODE	CNRBINBBIIT
Bank Name (in full)	Canara Bank
Branch Name	IIT-Madras Branch
Complete Branch Address	Canara Bank, IIT-Madras Branch, IIT- Madras Campus Post Office, Sardar Patel Road, Guindy, CHENNAI - 600 036
MICR No.	600015085
Account Type	Savings Account

Certified that the Institute's account is in an RTGS enabled branch.
I hereby declare that the particulars given above are correct and complete.

Date:

Signature of the Competent Authority
of the Institution with seal.

उप कुलसचिव (आई.टी.एम. एवं एस.आर.)
DEPUTY REGISTRAR (IC & SR)
आई.आई.टी. मद्रास, चेन्नै
I.I.T. MADRAS, CHENNAI - 600 036.

FORMAT FOR AFFIDAVIT OF SELF-CERTIFICATION UNDER PREFERENCE TO MAKE IN INDIA – PER ITEM

Tender Reference Number:

Name of the item / Service:

Date: _____

I/We _____ S/o, D/o, W/o, _____

Resident of

Hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019 and 04.06.2020) MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 & P-45021/102/2019-BE-II-Part (1) (E-50310) Dt.4th March 2021 and any subsequent modifications/Amendments, if any and

That the local content for all inputs which constitute the said item/service/work has been verified by me and I am responsible for the correctness of the claims made therein.

✓ Tick () and Fill the Appropriate Category	
<input type="checkbox"/>	I/We _____ [name of the supplier] hereby confirm in respect of quoted items that Local Content is equal to or more than 50% and come under “ Class-I Local Supplier ” category.
<input type="checkbox"/>	I/We _____ [name of the supplier] hereby confirm in respect of quoted items that Local Content is equal to 20% but less than 50% and come under “ Class-II Local Supplier ” category.

● The details of the location (s) at which the local value addition is made and the proportionate value of local content in percentage

Address _____ Percentage of Local content: _____%

For and on behalf of

(Name of firm/entity)

Authorized signatory (To be duly authorized by the Board of Directors)

<Insert Name, Designation and Contact No.>

[Note: In case of procurement for a value in excess of Rs. 10 Crores, the bidders shall provide this certificate from statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.]

This letter should be on the letterhead of the quoting firm and should be signed by a competent authority. Non-submission of this will lead to Disqualification of bids.

(To be given on the letter head of the bidder)

No. _____

Dated: _____

CERTIFICATE

(Bidders from India)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I am not from such a country.

OR (*whichever is applicable*)

(Bidders from Country which shares a land border with India)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I from _____ (Name of Country) and has been registered with the Competent Authority. I also certify that I fulfil all the requirements in this regard and is eligible to be considered. *(Copy/ evidence of valid registration by the Competent Authority is to be attached)*

Place:

Date:

Signature of the Tenderer
Name & Address of the
Tenderer with Office Stamp