टाटा मूलभूत अनुसंधान संस्थान
TATA INSTITUTE OF FUNDAMENTAL RESEARCH
भारत सरकार के परमाणु ऊर्जा विभाग की स्वायत्त संस्था एवं समविश्वविद्यालय
(An Autonomous Institute of the Department of Atomic Energy, Government of India, and a Deemed University)
सर्वेक्षण संख्या **36 /** पी, गोपनपल्ली गांव, सेरिलिंगमपल्ली मंडल, रंगारेड्डी जिला, हैदराबाद **- 500 046**
36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy District, Hyderabad - 500 046

Telephone:+91-40-20203009	**Date 08/10/2024**
Website :www.tifrh.res.in	**Email: krishnaae@tifrh.res.in**

NOTICE INVITING TENDER

(TWO PART PUBLIC TENDER) **for the following works:**

Supply, Installation, Testing and commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility,TIFR,Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist.,Hyderabad-500046.

निविदा सं. **Tender No.**	**TIFR/PD/CF24-102/240900**
निविदा का प्रकार **Type of Tender**	**Two Part Tender (Part-I: Technical Bid and Part- II: Price Bid)**
अनुमानित लागत **Estimated Cost**	**Rs. 1,24,22,554/-**
ईएमडी की लागत **Cost of EMD**	**Rs.2,48,451/-** (डिमांड ड्राफ्ट "टीआईएफआर सेंटर फॉर इंटरडिसिप्लिनरी साइंसेस" के पक्ष में तैयार किया जाना है, जो हैदराबाद में देय है (तकनीकी बोली भाग **- I** के साथ संलग्न किया जाना है)।" **Rs.2,48,451/-(Demand Draft to be drawn in favor of "TIFR Center for Interdisciplinary Sciences", Payable at Hyderabad (To be enclosed with the Technical Bid Part – I).**
बोली पूर्व बैठक और समय **Pre bidding meeting & Time**	**14.10.2024 at 11:00 Hrs**
निविदा प्रस्तुत करने की अंतिम तिथि **Last Date for Submission of Tender**	**21.10.2024 by 13:00 Hrs**
बोली खोलने की तिथि (केवल भाग**-I:** तकनीकी बिड) **Date of Opening Bids(Only Part-I: Technical Bid)**	**21.10.2024 at 15:00 Hrs**

- "यदि भाग "I" और भाग "II" बोलियों को अलग-अलग लिफाफों में सील नहीं किया जाता है तो निविदा को अस्वीकार कर दिया जाएगा।"
- In case the Part "I" and Part "II" bids are not sealed in separate envelopes the tender will be rejected.
- तकनीकी बोली में मूल्य का कोई संकेत नहीं होना चाहिए।
  The technical bid should not contain any indication of the price.

- निविदा शुल्क और ईएमडी के भुगतान के बिना प्राप्त तकनीकी बोली को सरसरी तौर पर अस्वीकार कर दिया जाएगा। The Technical Bid received without payment of tender fees and EMD shall be summarily rejected.

संपर्क: श्री कृष्ण, दूरभाष: 040- 20203009 किसी भी तकनीकी या वाणिज्यिक शर्तों के लिए निविदा में उल्लिखित स्पष्टीकरण Contacts: Mr. Krishna, Tel: 040- 20203009 for any technical or commercial terms clarifications mentioned in the tender.

Sealed tenders are invited for the aforesaid works from contractors having similar work experience in reputed Research Institutions, Universities, Central Government/Public Sector Undertaking, Private Laboratories, Multinational Companies, etc. Interested contractors who are satisfying prequalification criteria stipulated by TIFR-Hyderabad shall only submit their bids. For further details and any clarification on the tender you may please contact Head-Technical Services, Survey No.36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy District, Hyderabad-500046.

Last date for submission of the tender is 21.10. 2024 by 13:00 Hrs.

(Rajasekhar. R)

Head-Technical Services

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(An Autonomous Institute of the Department of Atomic Energy, Government of India, and a Deemed University)
सर्वेक्षण संख्या **36 /** पी, गोपनपल्ली गांव, सेरिलिंगमपल्ली मंडल, रंगारेड्डी जिला, हैदराबाद **- 500 046**
36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy District, Hyderabad - 500 046

TENDER DOCUMENT

Supply, Installation, Testing and Commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility, TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046.

NAME OF THE TENDERER:.....

Address: .....

.....

.....

.....

Last date of submission of the tender: On or before 21.10.2024 by 13:00 Hrs

TECHNICAL BID

VOLUME-I

Supply, Installation, Testing and Commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility, TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046.

Tender Notice	**:**	**TIFR/PD/CF24-102/240900**
Name of Work	**:**	**Supply, Installation, Testing and commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility.**
Location	**:**	**Tata Institute of Fundamental Research Survey No. 36/P, Gopanpally village, Serilingampally Mandal, Ranga Reddy District, Hyderabad – 500046.**
Estimated Cost	**:**	**Rs.1,24,22,554/-**
EMD	**:**	**Rs.2,48,451- (Demand Draft to be drawn in favor of "TIFR Center for Interdisciplinary Sciences", Payable at Hyderabad (To be enclosed with the Technical Bid Part – I).**
Delivery Period	**:**	**360 Days (Completion Period)**
Validity	**:**	**Seventy Five (75) days after opening of Part-I, Technical Bid**

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SECTION-I	**IMPORTANT INFORMATION**

INTRODUCTION

The Tata Institute of Fundamental Research is a National Centre of the Government of India, under the umbrella of the Department of Atomic Energy, as well as a deemed University awarding degrees for master's and doctoral programs. Tata Institute of Fundamental Research Centre for Interdisciplinary Sciences, Hyderabad invites bids for the following work:

Supply, Installation, Testing and commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility, TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046.

1. PARTICULARS

a)	Location	TIFR, Survey No. 36/P, Gopanpally (Villa Serilingampally (Mandal), Ranga Reddy I Hyderabad-500046.
b)	Pre-Bid Meeting Date & Time	14.10.2024 at 11:00 Hrs
c)	Closing date & time of receipt of bids	21.10.2024 by 13:00 Hrs
d)	Date & time of opening of Sealed Cover-I conta Technical Bid	21.10.2024 at 15:00 Hrs
e)	Date of opening of Sealed cover-II containing Financia of eligible bidders	To be intimated to eligible bidders subsequ which is likely to be within 7 days after openin Technical Bid

2. GENERAL INSTRUCTIONS

2.1. TIFR shall award the contract for the project through the two Bid systems.

2.2. The Contractor is advised to visit and examine the site of work and its surroundings and obtain any information that may be necessary, in addition to those provided in this document. The Contractor shall be deemed to have fully acquainted himself about the site condition, whether he inspects it or not.

2.3. The Contractor should adhere to the building bye-laws applicable for the area.

2.4. All clarifications shall be sought before the date of pre-bid meeting. The bidders may make suggestions which shall be considered during the Pre Bid Meeting. No further clarifications shall be issued after the issue of noteworthy replies to the pre-bid queries.

2.5. The submission of the bid by Contractor would imply that they have carefully read and agreed to the terms and conditions contained in this bid document.

2.6. The bid for the work shall remain open for acceptance for a period of 75(seventy five) days from the date of submission of the bids, which period may be extended by mutual agreement and the Contractor shall not cancel or withdraw the offer during this period.

2.7. This bid document shall form a part of the contract agreement.

3. SUBMISSION OF BIDS

Bids shall be submitted to Head- Technical Services**, TIFR,Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist, Hyderabad-500046** in a sealed Master envelope super scribed "Bid for **Supply, Installation, Testing and commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility, TIFR** with our enquiry no. and due date, containing two separate sealed covers clearly super scribed as **"Technical Bid"** and **" Financial Bid"** before the closing date and time of submission in the following manner:

a) **"Technical Bid":** This will contain Technical part, Eligibility Documents along with testimonials. Earnest Money Deposit (EMD).

b) **"Financial Bid":** This will contain the complete bidding document with duly filled in Schedule of Financial Quote of Financial Bid & Tender Drawings.

The Bids without signature of the authorized person of bidder and seal, without EMD, with conditions or conditional rebates shall be summarily rejected.

4. EVALUATION OF BID

4.1. **EVALUATION OF TECHNICAL BID:** The bids received will first be first opened and will be examined for EMD/ Declaration Letter, Eligibility Criteria, Conditions, etc. Conditional Tenders and Tenders without EMD/Declaration Letter shall be summarily rejected.

4.2. **EVALUATION OF FINANCIAL BID:** The Financial Bid should contain the complete bid document with duly filled in Schedule of Financial Quote of Financial Bid and signed Tender drawings. Financial Bids of Technically qualified Bidders will only be opened. Work will be awarded to lowest bidder (L1) based on their quotes after making necessary arithmetical checks.

5. SCOPE & OBJECTIVE

The Objective of the tender is to **Supply, Installation, Testing and commissioning of fire detection & alarm system and total flooding clean gas fire suppression system for Petawatt Laser Facility, TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046** as per the specifications and Bill of quantities mentioned in the Financial Bid.

Period of Completion of Work: 360 days from the date of issue of work order

Defect Liability Period: 12 months from the date of handing over of completed system as per tender.

6. PAYMENT SCHEDULE:

The contractor shall submit the bills for payments along with a detailed statement showing the actual works carried out under different heads of items in the format specified by the TIFR. Minimum value of the work for interim payment **(Three Running Bill)** shall be 30% of the work order value. All interim(Maximum Three Running Bill) and final bills will be settled based on the joint measurements of each item of work and certified by TIFR Engineer.TIFR officers may sanction the secured advance up to an amount not exceeding 90% of the value of the materials as assessed by the engineer-in-charge,or an amount not exceeding 90% of the material element cost in the tendered rate of the finished item of work,whichever is lower on production of sufficient documentary evidence i.e.,Original invoice, inventory, insurance for the fire and theft etc. All interim bills will be paid within 15 days from the date of the submission and the final bill along with the relevant documents will be settled within 30 days from the date of submission with certification of TIFR engineer.

SECTION-II ELIGIBILITY CRITERIA FOR TENDER QUALIFICATION

Supply, Installation, Testing and commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility, TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046.

- **Eligibility criteria:**
  1. The Agencies/Contractors shall hold a valid labor license issued by appropriate authority and must be valid throughout the contractual period.
  2. An Authorized dealer/ Channel partner of Fire Alarm Systems, VESDA & IG-541 with manufacturing from the OEM are only eligible.
  3. IT Returns for the last three consecutive financial years ended on March 31, 2024 audited by CA.
  4. The Agencies/Contractors should have an average annual turnover of **Rs.49.6** Lakhs during three previous financial years ending March 31, 2024.
  5. The Agencies/Contractors should have a latest solvency certificate issued by any nationalized bank of value not less than Rs.**49.6** Lakhs
  6. The Agencies/Contractors should not have incurred any loss in more than two years during the immediate last five consecutive financial years, duly certified by the Chartered Accountant.
  7. The Agencies/Contractors should have valid PAN from Income Tax Authority, GST registration No. etc. and any other registration applicable/mandatory for contract.
  8. Submission of Technical Data Sheets as per Annexure-IV
  9. The Agencies/Contractors should have executed similar installations of fire alarm & detection, VESDA and clean agent fire suppression works at least.
     - 9.1. One similar work costing Rs. **99.3** Lakhs or
     - 9.2. Two similar works costing Rs.**74.5** Lakhs or
     - 9.3. Three similar works costing Rs.**49.6** Lakhs during the last 7 financial years ended on the end date of receiving tender for Research Institutes, Universities, Private Laboratories, R & D institutes, etc. in any Government /PSU/Private organizations of repute.

The value of executed works shall be brought to the current costing level by enhancing the actual value of work at a simple rate of 7% per annum calculated from the date of completion to the last date of receipt of applications for tender.

The Agencies/Contractors should furnish copies of work orders along with BOQ and completion certificates are mandated from the clients in support of the above.

Note:

- Agencies/Contractors are advised to inspect the site to understand the scope of work comprehensively before submission of tender.
- Agencies/Contractors should arrange the site inspection to TIFR officials for the qualifying works at their own cost if required.
- Agencies/Contractors should have a full-fledged in-house project management team to undertake the jobs.
- The Agencies/Contractors shall **strictly furnish** aforesaid information in the formats/schedules given. **Non adherence to furnishing of information in the given format/schedules given will lead to disqualification of tender.**
- Instructions to Agencies/Contractors for furnishing the information is given as under:
  - Each page of the application shall be signed by a person having necessary authority to do so.
  - If the space in the proforma is insufficient for furnishing full details, such information may be given in separate sheets.
  - Applicants are required to furnish information against each item of the application. In case a certain item is not applicable, please write NA. Application containing incorrect and or inadequate information is liable to be rejected.

SCHEDULE – A

BASIC INFORMATION

1.	Name of the firm	:
2.	a) Address	:
	b) Telephone / Fax No.	:
	c) Mobile No. Contact Person	:
	d) PAN No.	:
	e) GST Registration No.	:
	f) Labour License Details	:
	Branch Office if any in Hyderabad	:
3.	Type of Organization (Proprietorships / Partnership) Ltd. Co. / Co-Operative) (Copy of relevant document to be enclosed)	:
4.	Date of Incorporation	:
5.	Nature of Business	:
6.	Experience as prime Agencies/ Contractors (in Yrs.)	:
7.	Name and address of Bankers	:
8.	Organization chart of the Company including names and positions of directors / key personnel	:

Signature of the Applicant (s)

SCHEDULE – B

Total flooding fire suppression Related Works (Copies of the completion certificate to be enclosed)

A. Similar work of costing **Rs.99.3** lakhs or two similar works of costing **Rs.74.5** lakhs or 3 similar works of costing Rs.**49.6** Lakhs during last 7 financial years ended on end date of receiving tender for Research Institutes, Universities, Private Laboratories, R & D institutes, etc

Sr. No	Name of the project & Address	Description of work in brief	Name of the Engineer	Name of the client also indicate whether Govt or semi Govt or Pvt body with full postal address	Contract Amount in Rs.	Year of commencement	Date of Completion		Whether work was left /uncompleted or the contract was terminated from either side? Give Details.	Any other relevant information relevant information
							Stipulated	Actual		
1.										
2.										

B. List of works in progress above Rs.**49.6** lakhs.

S No.	Name of the project & Address	Description of work in brief	Name of the Engineer with full postal address.	Name of the Client. Also indicate whether Govt. or semi Govt. or Pvt. Body with full postal address	Contract Amount in (Rs.)	Date of Completion	Present stage of work with reasons if the work is getting delayed	Any other relevant information
1.								
2.								
3.								

Signature of the Applicant (s)

SCHEDULE – C

TECHNICAL PERSONNEL & SPECIAL EXPERIENCE

List of technical personnel in your establishment giving details about their technical qualification and experience

Sr No	Name	Age	Qualifications	Project Experience	Nature of works handled	Name of the project Handled	Date from which employed in your organization	Indicate special experience in Air Conditioners installation & Testing projects in which were employed
1								
2								

2. Indicate other points if any to show your technical and managerial competency to indicate any important point in your favour.

Signature of the Applicant(s)

SCHEDULE – D

FINANCIAL POSITION AND WORKING RESULTS

				2021-22	2022-23	2023-24
1	Annual turnover	:	Rs.			
2.	Net Profit	:	Rs.			
3.	Credit Facilities from the Bank	:	Rs.			
a)	Cash Credit	:	Rs.			
b)	Overdraft Limit	:	Rs.			
c)	Guarantee	:	Rs.			
d)	Others	:	Rs.			
4.	Certificate from the Bankers regarding financial soundness of the applicant	:	Enclosed (Yes / No)			
5.	Solvency Certificate from the Bankers	:	Enclosed (Yes / No)			

Signature of the Application (s)

SCHEDULE – E

MISCELLANEOUS INFORMATION

1	Whether it would be possible to process Bank Guarantee for various advances during execution of the work.	:
2	Details of Civil Suits / Litigations arose during execution of the contracts in the last 5 years.	:
3	Latest Income Tax Clearance Certificate	:
4	Name of the two senior official of Organizations preferably Govt./Semi Govt/ Autonomous/ Public Sector Organization for whom you have executed important and major fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system who may be directly contracted by TIFR to gather information about your ability, competence and capacity of your work/organization/etc.	:
5	Number of Supplementary sheets attached.	:

Signature of the Applicant

SECTION-III	**NOTICE & INSTRUCTIONS**

1. Sealed item rate tenders in the prescribed form are invited from Head-Technical Services, Tata Institute of Fundamental Research, Centre for Interdisciplinary Services, Hyderabad, for the following:

Tender Notice No.	**TIFR/PD/CF24-102/240900**
Name of Work	**Supply, Installation, Testing and commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility, TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046.**
Estimated Cost	**Rs.1,24,22,554/-**
Time Limit	**360 days (Completion Period)**
Earnest Money Deposit	**Rs.2,48,451/- (Demand Draft to be drawn in favor of "TIFR Centre for Interdisciplinary Sciences "Payable at Hyderabad (To be enclosed with the Technical Bid Part –I)).**
Last Date & Time of Submission of Tender	**21.10.2024 by 13:00 Hrs**
Date & Time of Opening of Technical Bid	**21.10.2024 at 15:00 Hrs**

2. Submission of Tender & Opening:

Tenders shall be submitted in a sealed envelope super scribed with Tender enquiry No., Due Date and with heading as "**Supply, Installation, Testing and commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility, TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046."** containing two separate sealed covers clearly super scribed as "TECHNICAL BID" and "FINANCIAL BID" on or before the closing date and time of submission in the following manner:

"TECHNICAL BID": This will contain the following:

a) Proof of Tender Cost paid already

b) Earnest Money Deposit as stipulated

c) Schedules giving information on Eligibility Criteria with supporting documents specified for tender qualification.

"FINANCIAL BID": Signed copy of the Financial Bid quoting amount in the stipulated format and signed copies of the tender drawings.

3.Earnest Money Deposit (EMD): EMD shall be submitted in the form of Demand Draft / Pay Order / Banker's cheque issued by a Scheduled Bank, drawn in favor of **"TIFR Center for Interdisciplinary Sciences", (To be enclosed with the Technical Bid (Part-I))**

Earnest Money Deposit (EMD): Every Bidder has to pay EMD of amount as specified elsewhere in this tender by Demand Draft in favor of **"TIFR Center for Interdisciplinary Sciences"** along with the offer. Quotations received without EMD shall be rejected and no correspondence whatsoever will be entertained. For successful bidders the EMD will be adjusted against Performance Guarantee and will be refunded after completion of work /supply of material at site and for unsuccessful bidders EMD will be refunded after placing the order to successful bidder.

4. Performance guarantee

The tenderer, whose tender is accepted, will be required to furnish a performance guarantee of 2.5% of the tendered amount within 7 (seven) working days from the date of intimation. This guarantee shall be in the form Demand Draft / Pay Order / Banker's cheque / Deposit or Government Securities / Fixed Deposit Receipt (FDR) or Guarantee Bonds (BG) of any Scheduled Bank in accordance with the form as Annexure – I hereto. In case a fixed deposit receipt of any Bank is furnished by the contractor to TIFR as part of the performance guarantee and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to TIFR to make good the deficit.

The Performance Guarantee shall be initially valid up to the stipulated date of completion **plus 60 days** beyond that. In case the time for completion of work gets enlarged, the contractor shall get the validity of performance Guarantee extended to cover such enlarged time for completion of work. The performance guarantee shall be returned to the contractor, without any interest, after recording of the completion certificate for the work by the competent authority.

The Engineer-in-charge shall make a claim under the Performance guarantee for amounts to which TIFR entitled under the contract (notwithstanding and / or without prejudice to any other provisions in the contract agreement) in the event of:

a) Failure to attend and rectify the problems in the guarantee period, in which event the Engineer- in-charge may claim the full amount of the Performance guarantee.

b) Failure by the contractor to pay TIFR, Hyderabad any amount due, either as agreed by the contractor or determined under any of the Clauses / Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer-in-charge.

In the event of the contract being determined under provisions of any of the relevant clauses of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of TIFR, Hyderabad.

5.Security Deposit: The tenderer, whose tender is accepted, will also be required to furnish by way of Security Deposit for fulfillment of his contract, an amount equal to 5% of the tendered value of the work. Earnest Money deposited at the time of tenders will be treated as part of the Security Deposit.

In case a fixed deposit receipt of any bank is furnished by the contractor to TIFR, Hyderabad as part of the security deposit and the bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to TIFR, Hyderabad to make good the deficit.

All compensation or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from, or from any sums which may be due to or may become due to the contractor by TIFR or any account whatsoever and in the event of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid, the contractor shall within 10 days make good in cash or fixed deposit receipt tendered by the State Bank of India or by scheduled banks (if deposited for more than 12 months) endorsed in favor of the TIFR, HYDERABAD, any sum or sums which may have been deducted from, or raised by sale of his security deposit or any part thereof.

Security Deposit shall be initially valid up to one year from the date of completion of work **(Over all 24 Months).** In case the time for completion of work gets enlarged, the contractor shall get the validity of Security Deposit extended to cover such enlarged time for completion of work. The Security Deposit shall be returned to the contractor, without any interest, after completion of defect liability period.

Security Deposit as deducted above can be released against Bank Guarantee issued by a Scheduled Bank on its accumulation to a minimum of Rs.5 Lakhs subject to the condition that

amount of such Bank Guarantee, except last one, shall not be less than Rs.5 Lakhs.Bank Guarantee should be submitted which will be valid upto the expiry of defect liability period.

6.Acceptance of Tender: The competent authority, on behalf of TIFR, Hyderabad does not bind itself to accept the lowest or any other tender, and reserves to himself the authority to reject any or all the tenders received, without assignment of any reason. All tenders, in which any of the prescribed conditions is not fulfilled or any condition, including that of conditional rebates, is put forth by the tenderer, shall be summarily rejected.

The Competent Authority, on behalf of TIFR, Hyderabad reserves to itself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rates quoted. The officer inviting tenders shall have the right of rejecting all or any of the tenders and will not be bound to accept the lowest tender or any other tender.

7. Validity of Tender: The tender for the work shall remain open for acceptance for a period of 75 days from the last date of submission of tenders. If any tenderer withdraws his tender before the said period, or before issue of Letter of Intent, whichever is earlier, or makes any modifications in the terms and conditions of the tender which are not acceptable to the Department, then TIFR, Hyderabad shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money absolutely. Further the tenderer shall not be allowed to participate in the retendering process of the work.

8. Levy / Taxes payable by contractor:

i.GST or any other tax on materials and services in respect of this contract shall be payable by the contractor and TIFR shall not entertain any claim whatsoever in this respect.

ii.The contractor shall deposit royalty and obtain necessary permits as required for supply of the sand, aggregate, stone etc. from local authorities.

9.Deduction of Income Tax : As per Section 194-C of Income tax Act 1961, as amended by letter No. 275/9/72/9-TJ (Circular No. 86) dated 19.5.72 and No. 275/14/91-IT (B) (Circular No. 593) dated 5.2.91, received from Ministry of Finance, Department of Revenue, Central Board of Direct Taxes, New Delhi, the Income tax @ 2% and Surcharge thereon @12% (or any other amended rate by Ministry of Finance from time to time), of the gross value of the work done will be recovered from the bills. A certificate for the amount recovered will be issued by the Department.

10.Site visit by the tenderer before tendering: Tenderers are advised to inspect and examine the site and its surroundings during working hours and satisfy themselves before submitting their tenders as to the nature of the ground and subsoil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed.

11. Signing of Tender and receipts for payments: In the event of the tender being submitted by a firm, it must be signed separately by each partner thereof or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power-of-attorney authorizing him to do so, such power of attorney to be produced with the tender, and it must disclose that the firm is duly registered under the Indian Partnership Act-1952. Receipts for payments made on account of work, when executed by a firm, must also be signed by all the partners, except where contractors are described in their tender as a firm, in which case the receipts must be signed in the name of the firm by one of the partners, or by some other person having due authority to give effectual receipts for the firm.

12. Tenderer's responsibilities: The tenderer shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a tenderer implies that they have read this notice & all other contract documents, and has made himself aware of the scope & specifications of the work to be done and local conditions and factors having a bearing on the execution of the work.

13. Signing of contract: The Notice Inviting Tender shall form a part of the contract document. The successful tenderer / contractor, on acceptance of his tender by the Accepting Authority, shall, within 15 days from the stipulated date of start of the work, sign the contract consisting of: the Notice Inviting Tender, all the documents including all conditions, specifications and drawings, if any, forms the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.

14.Canvassing, either directly or indirectly, in connection with the tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection and may be barred from future participation in TIFR works.

Head-Technical Services
For and on behalf of ***TIFR, Hyderabad***

SECTION-IV GENERAL CONDITIONS OF CONTRACT

1. Definition of Terms:

1.1. In constructing these general conditions and the specifications the following works shall have the meanings herein assigned to them unless there is something in the subject or context inconsistent with such construction.

1.2. The `Purchaser' shall mean Tata Institute of Fundamental Research- -Hyderabad, Tata Institute of Fundamental Research, 36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy District, Hyderabad 500046 and shall include the Purchaser's heirs, successors and assigns.

1.3. The term 'Engineer In-Charge' and `Engineer' shall mean Engineer In-Charge, TIFR- Hyderabad or some other person for the time being or from time to time duly appointed in writing by the Purchaser to act as Engineer In-Charge for the purpose of the Contract or in default of such appointment the Purchaser.

1.4. The term `Contractor'/`Supplier'/`Bidder'/`Vendor' shall mean the Bidder whose tender has been accepted by the Owner and shall include the Bidder's heirs, successors and assigns approved by the Purchaser:

1.5. The term `Sub-Contractor' shall mean the firm or persons named in the contract for any art of the work or any person to whom any part of the work has been sublet with the consent in writing of the Engineer In-Charge and shall include his heirs, successors and assigns approved by the Purchaser.

1.6. The Term `Inspector' shall mean any person appointed by or on behalf of the Purchaser to inspect supplies, stores or work under the contract or any person deputed by the Inspector for the purpose.

1.7. The term `Particulars' shall mean, the following :

- 1.7.1. Specifications
- 1.7.2. Drawing (ANNEXURE-V)
- 1.7.3. Sealed Pattern denoting a pattern sealed and signed by the Inspector.
- 1.7.4. Proprietary make denoting the product of an individual firm.
- 1.7.5. Any other details governing the construction, manufacture and/or supply as existing for the contract.

1.8. The term `Specification' shall mean the specifications annexed to or issued with these Conditions of Contract.

1.9. The term `Site' shall mean the place or places at which the Equipment is to be delivered or work done by the Contractor; and shall include, where applicable, the lands and buildings upon or in which the works are to be executed and shall also include the place or places at which fabrication and other work is being carried out by the Contractor.

1.10. `Electrical Equipment', `Stores', `Work' or `Works' shall mean and include equipment and materials to be provided and work to be done by the Contractor under the Contract.

1.11. The `Contract' shall mean acceptance of the work order placed on contractor/supplier under section (2) of these conditions and shall include these conditions of Contract, Specifications, Schedule, Drawing, Letter of Intent of the Purchaser and any subsequent amendments mutually agreed upon.

1.12. 'Tests on Completion' shall mean such tests which are prescribed by the specifications or have been mutually agreed to between the Contractor/Supplier and the Purchaser to be made before the equipment is taken over by the Purchaser.

1.13. Writing' shall include any manuscript, typewritten or printed statement under or over signature or seal as the case may be. Words importing `person' shall include firms, companies, corporations and association of individuals whether incorporated or not.

1.14. Words importing singular shall also include plural and vice versa where context requires.

1.15. Bidders are advised to visit and inspect the work-site to make themselves fully conversant with the site conditions and nature of work. Any claim by them after the opening of bids on account of themselves being unaware of any site condition shall not be entertained.

2. Contract

Contractor/Supplier/Manufacturer should send their acceptance letter on receipt of `Letter of Intent' or 'Work Order' or 'Purchase Order' within the stipulated period. On expiry of said period or exorbitant delay in commencing or executing the work, the Purchaser shall not be liable to any claim from the Contractor/ Supplier for work entrusted to and may revoke the contract.

3. Work at Site

3.1. Access to the works shall be allowed only to the Contractor/Supplier, Sub-Contractors or his duly appointed representatives. The Contractor/ Supplier shall not object to the execution of other works by other contractors or tradesmen and shall afford them every facility for execution of their several works simultaneously with his own.

3.2. Work at the Purchaser's premises shall be carried out at such time as the Purchaser may approve but the Purchaser shall give the Contractor/ Supplier all reasonable facilities for the same. The Contractor/Supplier shall provide sufficient fencing, notice boards etc. to guard the works and warn the public.

3.3. The Contractor shall obey Central, Local and State regulations and enactments pertaining to workmen and labor and the Engineer In-Charge shall have the right to enquire into and decide all complaints on such matters. The Contractor should comply with the Minimum Wages Act and should also ensure that safe practices are followed by his people at site.

3.4. The contractor should follow safety precautions and maintain safety PPE's to their workmen throughout the project.Penalty will be imposed by TIFRH if violation of safety precautions.

4. Delays

The Contractor/Supplier shall not be entitled to any compensation for any loss suffered by him on account of delays in commencing or executing the work, whatever the cause for such delays may

be, including delays in procuring Government controlled or other materials and delay in obtaining instructions and decisions from the Engineer In-Charge.

5. Taking Over

The equipment when erected at site shall be deemed to have been taken over by the Purchaser when the Engineer In-Charge will have certified in writing that the equipment has fulfilled the contract conditions.

6. Extension of Time

If the Contractor/Supplier is delayed in the progress of work by changes ordered in the work, or by any cause, which the Engineer In-Charge shall decide to justify the delay, then the time of completion shall be extended by a reasonable time. In this regard, the Contractor shall maintain a proper hindrance register and record all such events with due signature of E-I-C on occurrence of such instances for seeking extension of time. However, no such extension shall be allowed unless requested for extension is made in writing by the Contractor/Supplier to the Engineer In-Charge within 15 days from the date of occurrence of the delay.

7. Liquidated Damages

7.1. For all delays, which do not merit any extension of time, the Contractor/ Supplier shall attract 1% penalty per week for the first 4 weeks of delay and 2% penalty per week for the next 4 weeks of the total contract value. The amount of liquidated damages shall be recoverable from the payment due to the Contractor/Supplier up to maximum of 10% of value of contract.

7.2. The deduction of liquidated damages shall not, however, absolve the Contractor/Supplier of his responsibility and obligations under the contract to complete the work in its entirety and shall also be without prejudice to action by the Purchaser under clause:

7.3. `Termination of Contract by the Purchaser'. After that the same shall be completed by the Purchaser at the Contractor's/Supplier's risk and cost.

8. Other Damages:

8.1. The Contractor/Supplier/Manufacturer shall be responsible for all injury to persons, animals or things and for all damage to the works, structure of, and decorative work in the property which may arise from operation or neglect of himself or any of his Subcontractor or of his or Sub-Contractor's employees, whether such injury or damage may arise from carelessness, accident or any other cause whatever in any way connected with the carrying out of this contract. This clause shall be held to include any damage to buildings, whether immediately adjacent or otherwise, any damage to roads, streets, foot paths, as well as all damage caused to the works forming the subject of this

contract by frost or other inclemency of weather. The Contractor/Supplier shall indemnify the Purchaser and hold him harmless in respect of all and any expenses on property as aforesaid and also in respect of any claim made in respect of injury or damage under any acts of Government or otherwise and also in respect of any award of compensation or damages consequent upon such claim. Contractor shall furnish necessary insurance documents (Contractor All Risk Policy) taken for the site before commencement of work.

8.2. The Contractor/Supplier/Manufacturer shall reinstate all damage of every sort mentioned in this clause, so as to deliver up the whole of the contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of the Owner/third parties.

8.3. The Contractor/Supplier/Manufacturer shall indemnify the Purchaser against all claims which may be made against the Purchaser, by any member of the public or other party, in respect of anything which may arise in respect of the works or in consequence thereof and shall, at his own expense, effect and maintain, until the work has been 'Taken Over' under clause 5.

8.4. The Contractor/Supplier/Manufacturer shall also indemnify the Purchaser against all claims which may be made upon the Purchaser whether under the Workmen's Compensation Act or any other statute in force during the currency of this contract or at common law in respect of any employee of the Contractor/Supplier or of any of his sub-contractor and shall at his own expense effect and maintain until the work has been `Taken Over', with an approved office. Contractor shall furnish a copy of the labor license before commencement of work. If the aforesaid are not applicable contractor should furnish declaration to this effect and shall indemnify TIFR-Hyderabad, Hyderabad for violation of any such compliances.

8.5. The Purchaser, with the concurrence of the Engineer In-Charge, shall be at liberty and is hereby empowered to deduct the amount of any damages compensation costs, charges and expenses arising or accruing from or in respect of any such claims or damages from any sums due to or become due to the Contractor/Supplier.

9. Guarantee and Defects Liability Period:

9.1. The Contractor/Supplier/Manufacturer shall guarantee that all equipment shall be free from any defect due to the defective materials and bad workmanship and that the equipment shall operate satisfactorily and that the performance and efficiencies of the equipment shall be not less than the guaranteed values. The guarantee shall be valid for a period of 12 months after the date of commissioning as certified by the Engineer In-Charge. Any parts found defective shall be replaced free of all costs by the Contractor/Supplier. The services of the Contractor's/Supplier's personnel if requisitioned during this period for such work shall be made available free of any cost to the Purchaser.

9.2. If the defects are not remedied within a reasonable time, the Purchaser may proceed to do so at the Contractor's/Supplier's risk and expense without prejudice to any other rights.

10. Terms of Payment

The contractor will be paid only Three Running Account (RA) Bill and Final Bill considering the progress of works based on measurement of works completed. The contractor shall submit the bills for payments along with a detailed statement showing the actual works carried out under different heads of items in the format specified by TIFR-, Hyderabad. Minimum value of the work for interim payment shall be 30% of the work order value.TIFR officers may sanction the secured advance up to an amount not exceeding 90% of the value of the materials as assessed by the Engineer-in-charge,or an amount not exceeding 90% of the material element cost in the tendered rate of the finished item of work,whichever is lower on production of sufficient documentary evidence i.e. Original invoice,inventory,insurance for the fire and theft etc.

10.1 BILL FORMAT

Tender Item No.	Description of Items (At least 2 lines)	Unit	Tender Quantity	Executed Quantity	Rate	%work done	Amount

NOTE: All quantities in the bill should be cumulative.

All measurements should be in the order of tender sequence and should be recorded in the measurement book.The Measurement should be strictly in the below mentioned format only.

10.2MEASUREMENT FORMAT

Tender Item No.	Description of Item & Location against each Measurement taken	Nos.	Length	Width	Height	Qty.	Remarks

The works which have been certified for running bills will also be verified along with the final bill and any defects found need to be replaced / rectified by the contractor at his cost. Till the time, the site is handed over in full, it is the contractor's liability to safeguard the works done and

completed at site. The Progress of work should not be affected in any way quoting the reason of non-availability of funds / materials / releasing of Running bill. The liability of the contractor is to complete all works in his scope in the scheduled time as per the terms of contract and will not relieve the contractors from his obligations once the Running bill is paid / kept pending

10.3 Final Payment

Payments of Final bill shall be made after deduction of security deposit /Performance guarantee as specified. The Security Deposit / Performance guarantee, shall be refunded on expiry of the Defects Liability Period after rectifying all defects to the satisfaction of the TIFR-Hyderabad/E.I.C. The acceptance of payment of the final bill by the Contractor would indicate that he would have no further claim in respect of the work executed.

11. Special conditions of Contract governing supplies of the Equipment of this Tender:

11.1. **Scope:**

11.1.1. This specification covers the supply of material as per the enclosed details and quantities and supervision of erection/installation, testing and commissioning of the material.

11.1.2. The Contractor/Manufacturer/Supplier shall quote for all the materials along with accessories as mentioned in the enquiry.

11.1.3. All the supply shall be in accordance with relevant I.S. Specifications and recognized standards.

11.2. **Inspection & Testing and commissioning of Material:**

11.2.1. Contractor/Manufacturer/Supplier shall submit the lists of Type Tests and Routine Tests to be conducted on the material in the Technical Data Sheet.

11.2.2. All the materials shall be tested at factory as per IS Specifications of material by Purchaser's Engineer In-Charge/Engineers before dispatch at the cost of Contractor/Manufacturer/Supplier.

11.2.3. Contractor/Manufacturer/Supplier shall inform the concerned Engineer In-Charge for inspection and testing in accordance and fix up a suitable date for the same.

11.3. **Test Certificates:**

Contractor/Manufacturer/Supplier shall submit the Test Certificates of all materials.

11.4. **Taxes & Duty:**

11.4.1. Contractor/Manufacturer/Supplier shall quote the basic price of material. Excise Duty, Custom Duty, Sales Tax, GST, Octroi, Delivery Charges, Transit Insurance and/or any other charges, if any, must be indicated separately.

11.4.2. TIFR being a research institute of Govt. of India, is eligible for Excise Duty Exemption on equipment supplies. Necessary exemption certificate will be provided by TIFR.

11.4.3. Transit Insurance: The Transit Insurance from the point of dispatch to the site of erection shall be in the scope of Supplier and the cost shall be indicated separately.

11.5. **Delivery of Material:**

11.5.1. The Contractor/Manufacturer/Supplier shall be held responsible for loading of all equipment and 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 damage on arrival at destination. The packing and marking of packages shall be done by and at the expenses of Manufacturer/Supplier. Each package shall contain a packing note quoting purchase order number and detail of the contents.

11.5.2. All the materials must be delivered at site i.e. Hyderabad - TIFR at 36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy District, Hyderabad-500046. The unloading and positioning of all equipment at the designated locations specified by the Engineer In-Charge shall be in the scope of the Supplier. The Supplier shall arrange for handling equipment, labour for rigging, etc. as required.

11.5.3. Material must be delivered at site in all respects as mentioned in the Purchase Order.

11.6.**Guarantee:**

If during the period of guarantee any fault or defect arises, the material shall be replaced/repaired immediately free of cost, as well as any replacement of accessories required shall be done free of cost.

11.7.**Mistake in Drawing:**

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

11.8.**Responsibility for Completeness:**

Any fittings or accessories which may not be specifically mentioned in the specifications but which are usual or necessary are to be provided by the Contractor/Supplier without extra charge and the equipment must be complete in all details.

11.9. **Extra/Deviation items & Variations in quantity**

TIFR-Hyderabad has the right to omit/delete any of the items and also increase/decrease the quantities mentioned in the tender. No claim or any compensation in this regard will be accepted or paid to the contractor. However, if any new /additional items/deviated items are to be executed, the contractor is bound to execute such items with prior approval from TIFR-Hyderabad after furnishing the proper rate analysis for such extra/deviated items.

11.10. **Rejection of Defective Equipment:**

11.10.1. If the equipment after the acceptance thereof is discovered to be defective, notwithstanding that such defects could have been discovered at the time of inspection or found to have failed to fulfill the requirements of the contract or developed defects after the erection within a period of 12 months from the date of erection, even if such erection is done by the Purchaser, he shall be entitled to give a notice on the Contractor/Supplier setting forth details of such defects or failure and the Contractor/Supplier shall, provided such notice is given within a period of 14 months from the date of such erection or acceptance, forthwith make the defective equipment good or alter the same to make it comply with the requirements of the contract at his own cost and further if in the opinion of the Purchaser, the defects are of such a nature that the defects cannot be made good or required without impairing the efficiency or workability of the equipment or if in the opinion of the Purchaser the Equipment cannot be repaired or altered to make it comply with the requirements of the Contract, the Contractor/Supplier shall, provided a notice given by the Purchaser in this behalf within a period of 14 months from the date of erection or acceptance thereof, remove and replace the same with the equipment conforming to the stipulated particulars, in all respects at the Contractor's/Supplier's own cost. Should he fail to do so within a reasonable time, the Purchaser may reject and replace, at the cost of the Contractor/Supplier, with equipment of the same particulars or if equipment conforming to the stipulated particulars are not in the opinion of the Purchaser readily procurable, such opinion being final, then with the nearest substitutes.

11.10.2. In the event of such rejection the Purchaser shall be entitled to use the Equipment in a reasonable and proper manner for a time reasonably sufficient to enable him to obtain replacement equipment as herein before provided.

11.11. **Inspection and Final Tests:**

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

11.12.**Intimation about Delivery:**

If the Purchaser shall have notified the Contractor/Supplier in writing that the former is not ready to take delivery, no equipment or materials shall be forwarded until an intimation in writing shall have been given to the Contractor/Supplier by the Purchaser that he is ready to take delivery.

11.13.**Delay in erection:**

Wherever erection of an equipment or machinery is the responsibility of the Contractor/Supplier 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/Supplier shall be liable to bear any additional expenditure that the Purchaser may incur towards erection. The Contractor/Supplier shall, however not be entitled to any gain due to such an action by the Purchaser.

11.14.**Definition of Equipment:**

The work `Equipment' wherever, it appears in these `Special Conditions of Contract' governing supplier of Equipment in this Tender shall mean all switchgears, panels, etc. or parts thereof or what the Contractor/Supplier agrees to supply under Contract as specified in the work order.

11.15.**Force Majeure:**

Normally Force Majeure shall cover only acts of God, fire, wars, strike, riots and civil commotion, floods, epidemic, quarantine related strikes, freight embargoes, etc. The contractor shall not be liable for any liquidated damages for delay or any failure to perform the contract arising out of Force Majeure conditions, provided that the contractor shall within ten days from the beginning of such delay notify the department in writing the cause of delay along with convincing supporting evidence. The department once convinced and accepted the reason may extend the supply completion period by a suitable / reasonable margin.

11.16. **Termination of Contract by the Purchaser:**

11.16.1. If the Contractor/Supplier commits any `Act of Insolvency' or shall be adjudged an Insolvent or shall have an order for compulsory winding up made against him or pass effective resolution for winding up voluntarily, or if the Contractor/Supplier shall suffer any payment under this contract to be attached by or on behalf of any of the creditors of the Contractor/ Supplier, or shall assign the Contract without the prior consent in writing of the Engineer In-Charge, or shall charge or encumber this Contract or any payments due or which may become due to the Contractor/Supplier there under, or if the Engineer In-Charge shall certify in writing to the Purchaser that the Contractor/Supplier –

11.16.1.1. has abandoned the Contract, or

11.16.1.2. has failed to commence the works, or has without any lawful excuse these conditions suspended the progress of the works for seven days after receiving from the Engineer In-Charge written notice to proceed, or

11.16.1.3. has failed to proceed with the work with such due diligence and failed to make such due progress as would enable the works to be completed in accordance with the approved programme of work,, or

11.16.1.4. has failed to remove materials from the site or to pull down and replace work for seven days after receiving from the Engineer In-Charge written notice that the said materials or work were condemned and rejected by the Engineer In-Charge under these conditions, or

11.16.1.5. has neglected or failed persistently to observe and perform all or any of the acts matters or things by this contract to be observed and performed by the Contractor for seven days after written notice shall have been given to the Contractor/ Supplier requiring the Contractor/Supplier to observe or perform the same, or

11.16.1.6. has to the detriment of good workmanship or in defiance of the Engineer In-Charge's instructions to the contrary sub-let any part of the contract, then and in any of the above said causes, the Purchaser with the written consent of the Engineer In-Charge may, notwithstanding any previous waiver, after giving seven days' notice in writing under the provisions of this clause to the Contractor/Supplier, determine the contract but without prejudice to the powers of the Engineer In- Charge or the obligations and liabilities of the Contract, the whole of which shall continue to be in force as if the contract has not been so determined and as if the work

subsequently executed has been executed by and on behalf of the Contractor/ Supplier.

11.16.2. After the issue of such notice, the Contractor/Supplier shall not be at liberty to remove from site any equipment, tools and materials belonging to him which shall have been placed thereon for the purpose of the works and the Purchaser shall have lien upon such equipment, tools or materials to subsist from the date of such notice and until the notice shall have been complied with.

11.16.3. If the Contractor/Supplier shall fail to comply with the requirements of said notice for seven days after such notice has been given, the Purchaser shall have the power to enter upon and take possession of the works and site and all equipment, tools and materials thereon, and to engage any other person, firm or agency to complete the works, utilizing the equipment, tools and materials to the extent possible. The Purchaser shall not in any way be responsible for damage or loss of the tools, equipment and materials and the Contractor/Supplier shall not have any compensation therefore.

11.16.4. Upon completion of the works, the Engineer In-Charge shall certify the amount of expenditure properly incurred consequent on and incidental to the default of the Contractor/Supplier as aforesaid and such amount shall be deducted from the payments due to the Contractor/Supplier, including the Security Deposit. If the said amount exceeds the payment due to the Contractor/Supplier, the Purchaser shall be at liberty to dispose off any of the Contractor's/Supplier's materials, tools or equipment and apply the proceeds for the payments due from the Contractor/Supplier and recover the balance by process of law.

11.16.5. After the works have been completed after the amounts due to the Contractor/Supplier, the Engineer In- Charge shall give notice in writing to the Contractor/Supplier to remove the surplus equipment and material from site. If such equipment and materials are not removed within a period of 14 days after such notice, the Purchaser shall have the power to remove and sell the same holding the proceeds less the cost of removal and sale, to the credit of the Contractor/Supplier. The Purchaser shall not be responsible for any loss sustained by the Contractor/Supplier from the sale of the equipment and material.

12. Contractor's Representative:

The Contractor/Supplier shall employ at least one qualified representative (i.e. safety engineer with minimum 3 years of experience of similar works as stipulated by TIFR-Hyderabad in the work order) whose name shall have previously been communicated in writing to the Engineer In-Charge and approved by him to supervise the erection. Any written order or instructions given to the representative shall be deemed to have been

given to the Contractor/Supplier. The Engineer In-Charge shall be at liberty to object to any particular representative/or any persons employed by the Contractor/Supplier on the work and the Contractor/Supplier shall remove the person objected to, on the receipt of the Engineer In-Charge, in writing, a request requiring him to do so and shall provide in his place another competent representative acceptable to the Engineer In-Charge.

The Contractor's/Supplier's representative shall be a qualified electrical/ mechanical engineer possessing adequate site experience in similar nature of works.

13. Completion Time:

Unless otherwise agreed in writing between the Purchaser and the Contractor/Supplier, the work contract shall be completed within the stipulated period mentioned elsewhere in this tender document from the date of Work/Purchase Order issued to Contractor/Supplier by the Purchaser.

14. Delivery of Material at Site:

The Contractor/Supplier/Manufacturer shall arrange for safe transit and delivery of material at site and unloading the material at site.

15. Validity of Tender:

The quotation should be valid for 75 days after opening of the Part—I: Technical Bids.

16. Measurements:

All joint measurements of quantities shall be done by the Contractor at his own cost in the presence of the Engineer In-Charge or any authorized person deputed by him who will certify the routes, length and quantities etc. for the purpose of determination of the amount payable.

17. Spare Parts & Manuals:

Manufacturer/Contractor/Supplier should submit operation, maintenance and spare part list and manuals for all equipment.

18. Training:

Manufacturer/Contractor/Supplier should provide training for operation and maintenance free of cost for equipment supplied.

19. Special Instruction for bidding process

This tender is a two part tender. The Part-I: Technical Bid and Part-II: Financial Bid. Bidders shall seal each bid separately with a clear label on the envelope about its content. Both the bids should be submitted in a single drop two cover method. Any pricing details must not appear in the Part-I: Technical Bid.

20. Drawings and Documentation:

Contractor should make and submit the drawing as per the site conditions and take approval from EIC.As-built drawings as specified in this technical specifications shall be submitted by the Contractor.

21. Permissions and Approvals:

All statutory permissions and approvals from Electricity authority as may be required for commissioning of the entire system shall be carried out by the contractor. All necessary documentation for obtaining such permissions and approvals shall be done by the contractor. Purchaser shall assist in providing required declarations. Statutory fees shall be paid by the purchaser.

22. Guarantee:

The equipment shall be guaranteed against all design and manufacturing defects, poor workmanship etc. for a period of 12 months from the date of commissioning or 15 months from the date of supply, whichever is earlier. Any defects discovered during this period shall be rectified by the vendor free of cost to the purchaser.

SECTION-V	**TECHNICAL SPECIFICATIONS**

SCOPE OF WORK:

- Design, supply, installation, testing and commissioning of Analogue Addressable Fire Detection and Alarm System for all rooms & floors of entire petawatt Laser Building.
- Design, supply, installation, testing and commissioning of Very Early Smoke Detection Apparatus (VESDA) system for laser hall in Petawatt Laser building.
- Design, supply, installation, testing and commissioning of Total flooding inert gas fire suppression system for laser hall in Petawatt Laser building.

I. TECHNICAL SPECIFICATION FOR ANALOGUE ADDRESSABLE FIRE DETECTION AND ALARM SYSTEM

The system design shall be as per IS 2189 / NFPA 2001-2015/NFPA-72 and all items shall be UL/VDS/FM/LPCB listed.

DETAILED SCOPE OF WORK:

1. Design, supply, installation, testing and commissioning and handing over to client at site of Analogue addressable Fire Detection and Alarm System for petawatt Building as per the Technical specifications.
2. Supply and laying of cabling necessary for installation of the system as indicated in the specification. Any openings/closing in the wall/ceiling required for the installation shall be made good in appropriate manner.
3. The minimum loop length with all devices in the facility to be restricted to the 1.0 to 1.2 km and each loop shall be provided with fault isolator at the beginning, end and one number for every 10 devices in the loop.
4. Necessary interfaces / Network cards / RS485 etc are to be provided in the FDA panel for centralized monitoring using the existing software available with the department.
5. Interfacing of the Analogue addressable fire alarm panel shall be connected through LAN to integrate with third p[arty BMS by which the status of panel shall be monitored for alarm / trouble status at the control room.
6. Necessary Equipment required for testing of the FDA system like Smoke generator kit, Hot air blowers etc and items required for maintenance.
7. FDA panel supplied as part of this tender document shall have Modbus communication feature / open protocol to interface similar data of FDA systems to the above centralized monitoring software and necessary software key if any to be submitted by the supplier.

8. Party shall provide necessary information of Modbus configuration data for communication drivers and holding registers for interfacing with the existing software.
9. Suitable licensing software if any required for configuring of FDA panel, devices, loop cards, event logging etc using PC / Laptop shall be provided.

BRIEF SPECIFICATIONS

A. FDA system

1. The supply & installation of the entire FDA system shall conform to IS 2189 / BS 5839 / NFPA 71 & 72 / TAC norms. All equipment and systems shall be tested and approved by LPCB/UL/FM/relevant IS/EN Standard.
2. Shall have solid state, microprocessor based, modular construction, with control panel, addressable analogue control unit for addressing individual detectors, switching systems (for disconnecting AHU & power supply) connected to it and related accessories (loop sounders, MCP, FI, I/O modules, etc.,)
3. Shall be able to achieve pinpoint location of alarm indication.
4. Shall have provision for setting alarm levels of individual detectors (for dust compensation).
5. Shall have provision for self-diagnostic check testing of the system. System should function while undergoing self-check of a particular portion (Zone) of the system.
6. Shall have trend monitoring of individual FDA sensors sensitivity values and provision to be available to extend the FDA sensors sensitivity values to centralized monitoring system remotely.
7. Should annunciate alarms due to fault / open / short circuit along with fault isolation of segments of the system.
8. Should discriminate between fire/false alarm conditions with logging of memory (either in-built or external printer) able to clearly identify the unit address and time.
9. Short / open circuit shall also be reported at the Fire Alarm Control Panel (FACP) in such cases, the system through the use of fault isolators shall be able to isolate that segment between the two fault isolators. The missing detectors / devices shall also be reported at the FACP with identification of the location.
10. FACP shall have its own battery backup for minimum of 48 hours in normal run and then half an hour in alarm condition. The backup time calculation shall be done as per relevant standards. The battery shall be rechargeable maintenance free type, housed inside the FACP.
11. Should have provision to trip A/C Air handling unit.
12. Should have provision for triggering the gas suppression system.
13. Shall withstand wide ambient temperature & humidity variation.
14. Shall have provision to be interfaced with Public address system & auto dialing facility.
15. Shall have networking capability through LAN and necessary RS485 control cards, network cards etc for connecting FDA panel at a common control room.

16. The Fire Alarm Control Panel shall include a full-featured operator interface control for the field programming and control of the fire alarm system. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel. The FACP shall have the ability to download all network applications and firmware from the configuration computer from a single location on the system.
17. Addresses of each FDA sensor, hooter, manual call point etc., shall be legibly marked near respective sensors.
18. To assess the quantum of work, the tenderer may visit the site with prior intimation to purchase officer and their premises.
19. Manufacturing year of FDA panel and sensors should be of 2022 or latest and sensors in the FDA system are compatible for the FDA panel at least minimum 10-15 years from the date of installation.

DETAILED TECHNICAL SPECIFICATIONS

A. FDA PANEL (FIRE ALARM CONTROL PANEL)

1	Make:	Notifier/Simplex 4100ES/Bosch UL/ Siemens Cerberus Pro UL / Equivalent meeting all the specifications & subject to approval of Department
2	Type	Addressable, Analogue (AA), Microprocessor based, suitable for AA detectors, AA Manual call points, AA hooters etc., with High resolution LCD display, with built-in system health verification checks, with capability for intelligence, fault isolation, sensor self – test, Alarm delay function, in suitable IP rating (To be specified by tenderer).
3	No. of loops	Four loop panel
4	No. of zones	20 minimum
5	Display	LCD Display for all events, 40 character on each line
6	Input power Rating	a. 230 V AC ,50Hz, Main / UPS Source b. 24 V built in Zero Maintenance batteries suitable for minimum 48 hour’s battery backup in transit condition.
7	Output	NO/NC Potential free contacts for remote display & alarm annunciation (loop wire) and for AHU tripping.

8	Minimum Addressable capability	159 addressable devices per loop.
9	Approvals / Listing	UL/EN54/FM (including components like power supply cards etc.,)

B. ADDRESSABLE / INTELLIGENT DETECTORS

1. Make: :Notifier/Simplex 4100ES/Bosch UL/ Siemens Cerberus Pro UL / Equivalent meeting all the specifications
2. Type : Addressable, Analogue / Intelligent, Detectors along with mounting base modular construction with capability for intelligence, remote / local test, status & alarm display functions programmable from panel / hand held device, with possibility to connect loop powered base sounders, with dust compensation feature.
3. Type of Detector: : Multi (Thermal/Photo-Electric), Photoelectric, Heat and its advanced type like laser, etc.,
4. Status indication : Blinking LED
5. Alarm indication : Twin LED
6. Sensor Operating Range : -100 C to 500 C,20-95% RH
7. Input Voltage : 17 to 31 V DC, two wire supply
8. Listing /Approval : UL /LPCB/FM
9. All the detectors and devices should have user friendly addressing feature with basic hand tools without any need for dongle or laptop or electronic licenses. Systems having dependency on dongle or laptop, or electronic licenses should be given Free of cost to TIFR for lifetime.

C. AA MANUAL CALL POINT

1). Make : Compatible to FACP recommended by manufacturer. Break glass type as per IS 2189.
2). Type : Addressable, Resettable, with LED indication, weather proof in case of outdoor application.
3). Operating voltage : 14 to 22 V DC

D. HOOTER/ SOUNDER

1). Make : Compatible to FACP recommended by manufacturer.
2). Type: : Analog addressable, variable frequency.
3). Operating voltage : 17 to 31 V DC (To be powered from the 2-wire detector loop itself and no separate power supply or additional cable should be used.)
4). Approvals: UL/FM/LPCB
5). Sound output : Minimum 85 dB at 1m distance.

E. AA FAULT ISOLATOR MODULE

1). Make : Compatible to FACP recommended by manufacturer.
2). Type : Addressable
3). Operating voltage : 17 to 31 V DC
4). Features : 1. With minimum short circuit time of 50 m sec.
2. LED Display when in isolation mode.
5). Relay cards, I/O Module devices and related accessories (Switching units, etc) : Yes

F. RESPONSE INDICATOR

1). Type : Standard type
2). Operating voltage : 17 to 31V DC
3). Features : LED display when in isolation mode or alarm mode.

G. INTERCONNECTING CABLE

1). Make : KEI/Uniflex/Delton/Paramount/Teleflex.
2). Type : FRLS, twisted pair, Shielded, armoured cable.
3). Size : 2x 1.5 Sq.mm FRLS Test certificate to be provided

H HOOTER

1). Make : Compatible to FACP recommended by manufacturer.
2). Operating voltage : 24 v
3). Sound output : Minimum 65 dB with range of 100-120 m
4). Location : Shall be provided outside the building with proper weather shield.

I. DUCT DETECTOR HOUSING

The duct housing assemblies shall mount an analogue / addressable detector. The housing shall also protect the measuring chamber from damage and insects. The housing shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. Drilling templates and gaskets to facilitate locating and mounting the housing shall also be provided. The housing shall be with a smooth finished structure / cabinet. Remote alarm LED indicators and remote test stations shall be provided. Duct Detectors shall be provided with Relay modules to trip A/C Air Handling Units in case of fire/ smoke detection by system. The Detector shall have UL / FM / LPCB approval.

Proof for valid approval /listing (listing No., validity etc.) of detectors and accessories including control panel shall be submitted along with offer.

II. TECHNICAL SPECIFICATION FOR VERY EARLY SMOKE DETECTION APPARATUS (VESDA) AND ACCESSORIES

General
The bidder shall supply and install the VESDA system for the Laser hall in petawatt Building

Design Requirements
1. Shall consist of a highly sensitive LASER-based smoke detector, aspirator, and filter. VESDA system should be addressable VESDA UL 268 7TH edition having an integrated Signaling Line Circuit (SLC) to communicate with FACP directly over the SLC.
2. It shall have a display featuring LEDs and a Reset/Isolate button. The system shall be configured by a Programmer that is either portable or PC based.The system shall allow programming of:
- up to three smoke threshold alarm levels;
- time delays;
- faults in airflow, detector, power and filter as well as an indication of the urgency of the fault;
- Three relay outputs for remote indication of alarm and fault.

3. It shall consist of an air sampling pipe network to transport air to the detection system, supported by calculations from a computer-based design modeling tool.
4. Interface to the Building Management system shall be provided.
5. Performance Requirements
- Shall be tested and approved to cover the area for room sizes 4000 sq. feet.
- Shall be approved to provide very early smoke detection and provide up to three output levels corresponding to Alert (optional), Pre-Alarm and Fire. These levels shall be programmable and able to be set at sensitivities ranging from 0.005 – 20% obsc/m.
- Shall report any fault on the unit using the fault relay or via VSM.
- Shall be self monitoring for filter contamination.
- Shall incorporate a flow sensor in the pipe inlet port and provide staged airflow faults.

Detector Assembly
1. The Detector, Filter, Aspirator and Relay Outputs shall be housed in an enclosure and shall be arranged in such a way that air is drawn from the fire risk and a sample passed through the Dual Stage Filter and Detector by the Aspirator.
2. The Detector shall be LASER-based type and shall have an obscuration sensitivity range of 0.005 – 20% obs/m.
3. The Detector shall have up to three independent field programmable smoke alarm thresholds across its sensitivity range with adjustable time delays for each threshold between 0-60 seconds.
4. The Detector shall also incorporate the facility to transmit a fault either via VESDAnet or relay.

5. The detector shall have a single pipe inlet which must contain a flow sensor. Both Minor and Urgent flow faults for both high and low shall be reported.
6. The filter must be a two-stage disposable filter cartridge. The first stage shall be capable of filtering particles in excess of 20 microns from the air sample. The second stage shall be ultra- fine, removing more than 99% of contaminant particles of 0.3microns or larger, to provide a clean air barrier around the detector's optics to prevent contamination and increase service life.
7. The aspirator shall be a purpose-designed rotary vane air pump. It shall be capable of supporting a single pipe run of 50m, or two or three pipe runs, with a transport time of less than 60 seconds or as appropriate codes dictate.
8. The Assembly must contain relays for alarm and fault conditions. The relays shall be software programmable (latching or non-latching). The relays must be rated at 2 AMP at 30 VDC. Remote relays shall be offered as an option and either configured to replicate those on the detector or programmed differently.
9. The assembly shall have built-in event and smoke logging. It shall store smoke levels, alarm conditions, operator actions and faults. The date and time of each even shall be recorded. Each detector (zone) shall be capable of storing up to 12,000 events.

Displays
1. The detector will be provided with LED indicators only.
2. Each Detector shall provide the following features at a minimum:
Independent high intensity alarm indicators for Pre-Alarm and Fire (Alert indicated by the Pre-Alarm LED flashing) corresponding to the alarm thresholds of the detector
Fault indicator
OK indicator
Isolate indicator

A single button supporting the following features:
a) Reset – (a single push of the button) Unlatches all latched alarm conditions on the assigned VLC zone.
b) Isolate – (push and hold) Isolates the individual VLC zone (inhibits Alarm and Fault relays and initiates the Fault relay).

Programmers
1. When required, a Programmer module may be in a remote mounting box, a 19" remote Rack, or in a portable hand-held unit (VN version).
Alternatively, programming may be performed using a Windows® application running on a PC; connected through a PC-Link HLI for VN.
Connected across RS232 with VESDA link for RO.
2. Each Programmer shall support the following features at a minimum:

- Programming of any device on the VESDAnet system.
- Viewing of the status of any device in the system.
- Adjustment of the alarm thresholds of a nominated detector.
- Initiation of Auto Learn™, to automatically configure the detector's alarm threshold settings to suit the current environment.
- Multi-level password control.
- Programmable latching or non-latching relay operation.
- Programmable high and low flow settings for airflow supervision.
- Programmable maintenance intervals.
- Facilities for referencing with time dilution compensation. (VN only)
- Testing of relays assigned to a specific zone to aid commissioning.

Device Networking Requirements
1. The devices in the smoke detection system shall be capable of communicating with each other via twisted pair RS485 cable. The network shall be able to support up to 250 devices (detectors, displays and programmers), of which at least 100 detectors can be supported.
2. The unit shall be capable of being configured in a fault tolerant loop for both short circuit and open circuit.
3. PC based configuration tools shall be available to configure and manage the network of detectors.
Digital Communication Port Should comply to EIA RS485 Protocol.

Application
1. Detection Alarm Levels
The laser based aspirating detection system shall have up to three (3) independently programmable alarm thresholds. The three alarm levels may be used as follows:
Alarm Level 1 (Alert) Activate a visual and audible alarm in the fire risk area.
Alarm Level 2 (Pre-Alarm) Activate the electrical/electronic equipment shutdown relay and activate visual and audible alarms in the Security Office or other appropriate location.
Alarm Level 3 (Fire) Activate an alarm condition in the Fire Alarm Control Panel to call the Fire Brigade and activate all warning systems.

NOTE:
The alarm level functions as listed are possible scenarios. Consideration should be given to the best utilisation of these facilities for each application and the requirements of local authorities.

2. Initial Detection Alarm Settings
Initial settings for the alarm levels shall be determined by the requirements of the fire zone.

Default settings of the unit shall be:

- Alarm Level 1 (Alert) not configured (0.08% Obs/m if configured)
- Alarm Level 2 (Pre-Alarm) 0.14% Obs/m
- Alarm Level 3 (Fire) 0.2% Obs/m

3. Alarm Delay Thresholds
Alarm delay threshold shall be programmable for the following:

- Alarm Level 1 (Alert)
- Alarm Level 2 (Pre-Alarm)
- Alarm Level 3 (Fire)

4. Fault Alarms
The Detector Fault relay shall be connected to the appropriate alarm zone on the Fire Alarm Control Panel in such a way that a Detector Fault would register a fault condition on the FACP. The fault relay shall also be connected to the appropriate control system.
(Check local Codes, Standards or Regulations to determine whether compliance with this set-up is required).

5. Power Supply and Batteries
The system shall be powered from a regulated supply of nominally 24V DC. The battery charger and battery shall comply with the relevant Codes, Standards or Regulations. Typically 02 hours standby battery backup is required followed by 30 minutes in an alarm condition.
In case common UPS power supply is used, the above backup conditions shall have to be adhered.

Sampling Pipe Design
Sampling Pipe

- The sampling pipe shall be smooth bore with an internal diameter between 15-25mm. Normally, pipe with an outside diameter of 25mm and internal diameter of 21mm should be used.
- The pipe material should be suitable for the environment in which it is installed, or should be the material as required by the specifying body.
- All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
- The pipe shall be identified as Aspirating Smoke Detector Pipe (or similar wording) along its entire length at regular intervals not exceeding the manufacturers recommendation or that of local codes and standards.
- All pipes should be supported at not less than 1.5m centres, or that of the local codes or standards.

- The far end of each trunk or branch pipe shall be fitted with an end cap and drilled with a hole appropriately sized to achieve the performance as specified and as calculated by the system design.

Sampling Holes

Sampling holes of 2mm, or otherwise appropriately sized holes, shall not be separated by more than the maximum distance allowable for conventional point detectors as specified in the local code or standard. Intervals may vary according to calculations. For AS1670 the maximum allowable distance is 10m. For BFPSA the maximum allowable distance is 10m. For NFPA the maximum allowable distance is 30 ft.

Each sampling point shall be identified in accordance with Codes or Standards.
Consideration shall be given to the manufacturer's recommendations and standards in relation to the number of Sampling Points and the distance of the Sampling Points from the ceiling or roof structure and forced ventilation systems.

Installation

The Detection System

The contractor shall install the system in accordance with the manufacturer's System Design Manual.

The Capillary Sampling Network

Where false ceilings are installed, the sampling pipe shall be installed above the ceiling, and Capillary Sampling Points shall be installed on the ceiling and connected by means of a capillary tube.

The minimum internal diameter of the Capillary tube shall be 5mm, the maximum length of the Capillary tube shall be 2m unless the manufacturer in consultation with the engineer have specified otherwise.

The Capillary tube shall terminate at a Ceiling Sampling Point specifically designed and approved by the manufacturer. The performance characteristics of the Sampling Points shall be taken into account during the system design.

Design Brief of total flooding system

For the laser hall area in petawatt building, there is to be a fire detection system by Analog fire detection & alarm system and VESDA system. In case of fire being detected by any one of the above both systems, there will be an Audio Visual notification stating the fire condition in the protected space. In a scenario where both the systems confirms a fire condition, the second Audio Visual notification will be activated, which will be called as a Pre - Discharge Alarm. This will also activate the countdown timer for the solenoid actuation signal to be sent to the Total Flooding System.

At any point during the countdown, if the GAS INHIBIT switch is activated, the countdown timer will be paused till the switch is reset. The timer will resume from the point where it had stopped thereby continuing the sequence of functions.

Total flooding systems work on the concept that, upon confirmation of fire condition in the protected hazard, an actuation signal is released from the Gas release panel / Fire alarm Control Panel to the solenoid actuator mounted on top of the master cylinder, or however the arrangement is based on each specific system.

Upon completion of the countdown timer, there is an actuation signal sent from GRP / FACP to the solenoid actuator mounted on the Master Cylinder, thereby actuating it. This master cylinder starts to discharge and simultaneously also actuates the slave cylinders, if any.

At the time of discharge, there will be third Audio Visual notification from the GRP / FACP establishing the confirmation of Gas / Suppressant discharge into the protected volume.

The total battery of cylinders are connected to a common manifold and the gas / suppressant is then routed by means of a piping network to the protected hazard. Based on the area / volume of this protected hazard, the gas is discharged through an arrangement of nozzles placed specifically to achieve a uniform concentration of the gas throughout the volume.

The suppressant that is used for flooding of the protected hazard is primarily chosen after careful consideration of the potential fire hazard that is present in the space and the class of fire that it may lead to. The total discharge time and the design concentration on the gas or suppressant that is used, depends upon the standard that is used as reference for the design and also upon the local authority having jurisdiction.

Lastly, in case where the fire condition is established by any person before the 2 detection systems register the fire, then the GAS RELEASE switch placed near the exit of the protected hazard can be activated. This would start the discharge operation for the Gas / Suppressant without waiting for fire confirmation from the 2 monitoring Fire zones.

Additional System details
In addition to the above system philosophy, the following features are also included in the operations.
1. Main Reserve Switch –
There is a switch provided in the cabling from the FACP / GRP to the solenoid actuators for the Cylinder banks. This is for toggling the actuation signal between the main and standby set of cylinders, depending upon which bank is in service.
2. Maintenance Switch –

The cabling from the FACP / GRP to the Main Reserve switch has a Maintenance switch provided in between. As the name suggests, this switch is to cut off the actuation signal from the FACP / GRP. It is to be used when the system is under maintenance and / or repair so as to prevent any false activation signal from the panel to discharge the cylinders.
3. Manual actuator –
Each master cylinder will have a manual actuator provided along with the solenoid electric actuator. This is to ensure that in case of a system failure when electrical actuation is not possible, the system can be discharged manually by operation of this apparatus.

General working principle for Total Flooding Systems:

IG541 Agent IG541 agent is a plentiful, non-corrosive gas that does not support combustion nor react with most substances. IG541 agent contains only naturally occurring gases which have no impact on the ozone layer or the environment in general. IG541 agent is a mixture of three inerting (oxygen diluting) gases: 52% nitrogen, 40% argon, and 8% carbon dioxide. The IG541 agent extinguishes fire by lowering the oxygen content below the level that supports combustion. When the IG541 agent is discharged into a room, it introduces the proper mixture of gases that still allow a person to breathe in a reduced oxygen atmosphere. It actually enhances the body's ability to assimilate oxygen. The normal atmosphere in a room contains approximately of 21% oxygen and less than 1% carbon dioxide. If the oxygen content is reduced below 15%, most ordinary combustibles will not burn. The IG541 agent will reduce the oxygen concentration to approximately 12.5% while increasing the carbon dioxide content to about 3%. The increase in the carbon dioxide content increases a person's respiration rate and the body's ability to absorb oxygen. Simply stated, the human body is stimulated by the carbon dioxide to breathe deeper and more frequently to compensate for the lower oxygen content of the atmosphere. Environmental impact The IG541 agent is a mixture of three naturally occurring gasses: Nitrogen, Argon, and Carbon dioxide. As IG541 is derived from gasses present in the earth's atmosphere, it exhibits no ozone depleting potential, does not contribute to global warming, nor does it contribute unique chemical species with extended atmospheric lifetime. Because IG541 is composed of atmospheric gasses, it does not pose the problems of toxicity associated with the chemically derived Clean Agent fire extinguishing.

IG541 Fire Suppression System, is an engineered system utilizing a fixed nozzle agent distribution network. The system is designed and installed in accordance with the authorities having jurisdiction and NFPA 2001, "Clean Agent Fire Extinguishing Systems." When properly designed, the IG541 system will extinguish fire in Class A, B, and C hazards by lowering the oxygen content below the level that supports combustion. The system can be actuated by detection and control equipment for automatic system operation along with providing local and remote manual operation as needed. Accessories are used to provide alarms, ventilation control, door closures, or other auxiliary shutdown. When the IG541 agent is discharged into a room, it introduces the proper mixture of gases

that will allow a person to breathe in a reduced oxygen atmosphere. The IG541 system is particularly useful for suppressing fire in hazards where an electrically non-conductive medium is essential or desirable; where clean-up of other agents present a problem; or where the hazard is normally occupied and requires a non-toxic agent.

The system provided must be 300Bar with constant discharge technology.
The Contractor shall design, supply, install, test and commission the complete automatic analogue addressable inert gas total flooding central bank system, fully complying with NFPA 2001(Latest Edition). The system provided must be with constant discharge technology (Latest technology) which reduces the cylinder pressure from 300bar to 60bar before the manifold and not the conventional orifice regulated system (where the pressure is reduced after the manifold is not acceptable). The system shall be approved by either VdS/LPCB/CE.

The type of inert gas selected shall have the following characteristics: -
Zero ozone depletion potential.
Minimum global warming potential.
Suitable for use in human occupied rooms i.e. the gas at its design concentration shall be safe for human to stay in the protected room for a time duration specified by the codes.
The gas is widely used in around the world.

The inert gas system shall be designed to provide the quantity of inert gas required to achieve a design concentration stipulated in NFPA 2001 or recommended by the manufacturer. The inert gas shall be discharged within 120 seconds to achieve 95% of the design concentrations. Pressure vents/reliefs to be provided considering a design overpressure of the room as 3mbar.

Inert gas cylinders shall be appropriately located within the building. Upon detection of fire, the cylinders shall be discharged to put out the fire with the designed inert gas concentration. The Extinguishing Panel shall send detailed fire and fault signals to the Main Alarm Panel appropriately.

All components of the inert gas system shall be specifically listed or acceptable and must be interchangeable.

The automatic inert gas total flooding system shall be capable of being operated automatically and shall comprise of but not limited to the following equipment: -
a) Extinguishing Panel with built-in battery charger, visible warning indicator, supervisory buzzer, auxiliary contacts and relays etc. Extinguishing Panel shall be provided with visible warning indicators, supervisory buzzer and etc.
b) Fire and Smoke detection system.
c) Aspiration type detection system.

d) Audible warning system - alarm bells and sirens.
e) Visible warning system - flashing and warning signs.
f) Standby battery.
g) Manual release (break glass) units.
h) Discharge nozzles and pipe work.
i) Inert gas cylinders associated with equipment mounting brackets and accessories.
j) Positive gas pressure/flow switch, Gas Fired and Evacuation signs.
k) Warning signs.
l) Cylinder pressure monitoring device - electrically and visual.
m) Master and slave cylinders.
n) Electrical and/or manual lever actuator.
o) Over pressure relief damper.

The Contractor shall be responsible for the final system performance/hydraulic calculations c/w isometric diagrams based on the characteristics of the pipe work system and equipment installed. The contractor shall submit calculations to verify the pipe sizes for Engineers acceptance prior to commencement of work.
The same institution providing the listing for the system components shall list or provide the hydraulic calculation software.

The Contractor shall liaise with the civil contractors who will provide self-closing doors, opening outwards of the gas protected rooms.

Review Enclosure Integrity
The total flooding system shall have the enclosure examined and tested to locate and then effectively seal any significant air leaks that could result in a failure of the enclosure to hold the concentration level for the specified holding period.

The preferred method is using a blower door fan unit and smoke pencil.

Automatic Operation of System
a. The automatic inert gas total flooding system shall operate automatically via a smoke detection system connected in a dual-risk configuration or cross- zoned arrangement, in the inert gas protected room to minimize false discharges.
b. When one detector in the protected room has been activated, the following functions shall be executed simultaneously.
1 The alarm bells within the protected area shall sound.
2 The alarm buzzer at the Extinguishing Panel shall be activated and sound continuously. The first alarm indicator light shall be lighted up.

3 The EVACUATE AREA IMMEDIATELY sign(s) at all exits within the protected area and warning beacon lights(s) provided to the protected area shall illuminate and flash.
4 Alarm signal shall be sent to the Main Alarm Panel. The signal from the Extinguishing Panel shall then be transmitted to the Main Fire Alarm Panel. The Extinguishing Panel shall have a signal contact for the HVAC panel to shut down the ventilation fan/air conditioning unit of that particular protected room. The signal shall keep the motorized fire dampers of all gas protected rooms closed, served by the same common mechanical ventilation duct. The Contractor shall state clearly the pressure relief requirement during gas discharge. Electrical wiring for all shut down signals shall be provided by others.

c. When another detector of the same protected zone within the same protected room is activated, the following functions shall be executed simultaneously.
1 The second Alarm indicator light of the Extinguishing Panel shall illuminate.
2 The siren inside/outside the protected room shall sound.
3 A signal shall be transmitted from the Extinguishing Panel to the Main

Fire Alarm Panel. The Extinguishing Panel shall transmit a signal to activate the system. After 30 seconds, a signal will be sent to the master cylinder to release the inert gas.

4 After the second detector is activated, the inert gas shall be discharged after a 30-second time delay. The discharge time shall not exceed 120 seconds to achieve 95% of the design concentration as recommended by the Manufacturer and NFPA 2001.
5 The GAS FIRED sign(s) of the inert gas protected area shall flash upon receipt of the signal from the Extinguishing Panel. The LED on the control panel shall light up to give a positive indication of inert gas discharged when the pressure switch is activated.

Shut Down Signals For Air-conditioning Units, Fans, Automatic Closures To Openings.
a. The Contractor shall provide signal contacts for de-energizing the fans, air- conditioning units and activating the motorized fire dampers serving the inert gas protected rooms. The interface point between the automatic inert gas total flooding system and other trades shall be provided at the Extinguishing Panel. The necessary wiring and relays between the Extinguishing Panel and other trades panels shall be by others.
b. The ventilation fan can only run when the fire alarm signal at the Extinguishing Panel and Main Alarm Panel are reset.
c. Should any of the alarm signal lines be isolated, an indication light together with buzzer shall be registered at the Extinguishing Panel and Main Alarm Panel.

Inert Gas Live Discharge Test

a. The Contractor shall carry out dry discharge test to demonstrate that the system functions in accordance with the Specification.
b. Should the dry discharge tests prove that the equipment/interfacing do not comply with the Specification, the Contractor shall be responsible for the cost of rectification, modification or replacement of the equipment and/or system as required by the Engineer.
c. The main contractor shall provide all measures and equipment to protect the equipment/fixtures during a live discharge test.

Storage Containers / Cylinders

- The inert gas shall be stored in containers designed to storage pressure of 300 bars at 15 o C. The maximum working temperature is expected to be 50 o C. The container assembly shall be suitable for both automatic and manual control.
- Containers shall be tested to pressure stated in the relevant code for pressure vessel.
- The containers shall be designed, constructed, tested and marked in accordance with PESO/CCEO for seamless steel cylinders.
- Each cylinder shall have a permanent nameplate specifying the agent, tare and gross-weight in addition to the super-pressurization level. The date of charging shall also be indicated.
- The cylinder assembly shall be able to mount in vertical and also horizontal position and suitably supported in a purpose made rack, which provides for convenient individual servicing. Cylinders shall be so installed as not to obstruct the swing of the inert gas room doors.
- A reliable graduated pressure indicator, which accounts for variation of cylinder pressure with temperature, shall be provided for each container. Markings shall be provided to indicate when the pressure in the cylinder has dropped below the normal acceptable working pressure. The pressure
- indicators shall be installed for easy and accurate reading and shall not be obstructed. The pressure gauge shall be able to remove/replace at any time without having to empty the gas in the cylinder. Each pressure gauge assembly shall include a low pressure switch to monitor the bottle storage pressure electrically.
- Each cylinder shall be fitted with an automatic pressure release device, which provides relief at less than the test pressure defined in NFPA2001.
- Check valve shall be provided for manifold system,
- A manual lever actuator stackable type shall be provided at the inert gas master storage cylinder
- The inert gas cylinders shall be painted signal red or following international color code for pure inert gas.

The cylinders are factory filled with IG541 agent and fitted with a hand wheel valve. Hand wheel valve outlet threads: 200 bar system W24.32 (Black hand wheel) 300 bar system M25×1.5 (Green hand

wheel) Each hand wheel valve is fitted with a burst disc to prevent cylinder explosion if the cylinder is left in a fire or exposed to elevated temperatures. Hand wheel valves are installed in accordance with ISO 13341. The cylinders are transported with a protective cap, which is not to be removed before installation.

Installation:
The cylinder is fixed to the cylinder rail by using the cylinder brackets. For land systems, minimum 1 rail/bracket for each cylinder. For marine, 2 are required. If nozzles are placed directly on the discharge valve, 2 brackets must be used. Other types of fixations are acceptable under the condition that they can hold the forces from the cylinders.

Cylinder rail & Brackets
For fixing the cylinder a rail and cylinder bracket are used. The length of the rail is determined by the quantity of cylinders. Cylinders are to be floor supported.

Installation
Cylinder rails are fixed to a construction using either screws, rivets or welding. Fixing should be at intervals sufficient to carry the load from the cylinders. Fasteners must be in accordance with section 54. For marine installations, minimum 2 brackets are required per cylinder in order to prevent displacement of the cylinder when the ship is at sea. For cylinders in multiple rows, there must be sufficient brackets to support the load from the cylinders. Typically 1 bracket per 2 cylinders + one at the end.

Cylinder Discharge Valve
Each Cylinder shall be fitted with a quick action discharge valve. Cylinder valve must be PESO and VdS approved. Pressure Gauge provided must have an in-built low-pressure supervisory switch.
The low-pressure switch must not be connected to the valve. The system pressure from 300bar to 60bar must be reduced before the manifold and not at the manifold level.

The discharge valve is supplied (depending on type ordered) complete with a combined pressure gauge and pressure switch, the switches can be connected in a daisy chain. It is a quick opening valve, which requires manual resetting. The discharge valve is installed on site after the cylinder has been securely fixed. The actuator is fitted to the discharge valve after installation and pressurization of the valve. The valve has a builtin actuator that operates by back pressure. Valves connected to a manifold will open once the master cylinder connected to the manifold is activated.

Installation

After the cylinder is fixed, the valve protection cap is removed and the discharge valve is screwed to the hand wheel valve. After fitting the discharge valve, the hand wheel valve must be opened and sealed in open position. Attention should be made to the system pressure, as different valve connection treads are used. 200 bar Black hand wheel Chamfered hex union nut 300 bar Green hand wheel Rounded hex union nut.

Discharge valve Accessories

Accessories for the discharge valves are Manoswitch start kits, the difference between the item numbers is the resistance of the end of line resistor, which has to match the control panel specification. This is used when multiple zones are protected by a common IG541 cylinder. (It is used for the same purpose as the Selector valves, but is more feasible for small systems).

Installation

The valve is fitted to the cylinder before the discharge valves are installed. Each outlet of the valve must have a discharge valve fitted. The Manoswitch start kit is used for connecting the first man switch to the control panel and a terminator to use on the last man switch (ending the daisy chain). Cables and connectors are standard industrial M8-3 connectors used for extending the reach of the M8 cable supplied with the man switch.

Actuators

All actuators are screwed on to the actuator connection of the valve by hand (tightening torque of 10 Nm should not be exceeded). The Pneumatic actuator has an actuator connection on the top allowing for stacking of another actuator.

Installation

Actuators should be fitted by hand (max 10Nm), Actuators may be screwed back max ½ turn to achieve correct position. Before installing the electrical actuator the NFPA switch must be fitted to the master cylinder/valve but slipping it onto the valve and tighten the screw to prevent it from coming loose. Special tools are required to test and reset the actuators. When a system consists of more than one manifold, the hose is used to feed pressure from a discharge valve to activate a discharge valve on the next manifold. This principle is continued for additional manifolds. As each activated discharge valve supplies its own pressure, the number of cylinders activated this way is unlimited. The Junction box features duplicate terminals for wire connections, for connecting the solenoid, solenoid switch, low pressure switch and manifold pressure to the control panel. If other arrangements are made they must have Duplicate terminals or leads, or an equivalent arrangement, shall be provided for circuits of products intended to be connected to initiating-device circuits of a releasing control unit; one for each incoming and one for each outgoing wire.

Discharge hoses

The discharge hose is a flexible connector between the discharge valve and the manifold. It has 2 functions, one is to lead IG541 from the discharge valve to the manifold, the second one is to supply pressure from the manifold to activate the discharge valves. A number of different lengths of the discharge hose is available as standard.

Installation

Hoses are connected and tightened at the discharge valve first and then connected to the manifold. The Hose must be tightened until metallic contact is achieved and then an additional 15°.

Pilot hoses

The pilot hose is a flexible connector used for activating the discharge valve by pneumatic pressure. It is used when more than one manifold is used or when the back-pressure function is disabled, it may also be used when a remote pneumatic activation system is used. A number of different lengths of the discharge hoses are available as standard.
The hose must be tightened until metallic contact is achieved and then additional 15°.

Manifold & Orifice

The manifold features built-in check valves which are opened once the discharge hose is connected to ensure proper activation of all connected discharge valves. The manifold is supplied complete with orifice and pipe system interface. The pipe system interface is supplied as standard with ISO 7 -1”. Other threads are available on request. The maximum orifice of the standard manifold is ø22mm. The maximum number of cylinder connections is 10. If more than one manifold is used, the Next kit must be used to connect from one discharge valve on one manifold to a discharge valve on the next manifold.

Installation

The orifice with union is fitted to the pipe system, using thread sealant. The manifold is fitted to the orifice using an O-ring seal. The union should be tightened to prevent it from coming loose. The pipe system must be sufficiently supported to carry the load from the manifold.

Pipe system

- The piping of the inert gas system shall be of ASTM A-106/A53 Grade B seamless galvanized pipes, schedule 80 or schedule 40 for downstream of the pressure reducer respectively. All pipes upstream of the pressure reducer shall be provided by the equipment manufacturer.
- All pipe work shall conform to the requirements of NFPA 2001.
- Welded manifolds shall be hot-dipped galvanized and shall be tested to 1.5 times of maximum bottle storage pressure. The Manufacturer shall issue a pressure test certificate.

- Flexible piping, tubing or hose (including connections) used shall be of approved materials and shall have a minimum bursting pressure not less than that of the manifold pipe.
- Suitable provisions such as flexible hose shall be provided between the cylinder discharge valve and fixed pipe system to compensate for tolerance in container height and to allow easy removal and installation of container. Tools shall be supplied for the removal and dismantling of all special fittings.
- The piping system shall be securely supported with allowance made for agent thrust forces, thermal expansion and contraction. White arrows shall be painted on the pipe to indicate the direction of discharge from the cylinders.
- The piping system inside all the inert gas protected room shall be suitably earthed to the nearest equipment terminal.

The pipe system is used for distributing the IG541 to the protected enclosures. Typically the pipe is EN10220/10217 P235TR1, rated for the applicable working pressure (standard 80bar) and has material Charpy V test performed at -40oC. Typically the fittings are EN 10242/ 10226/ 1562 with special requirement per VdS standard. Fittings are type tested to 30MPa (300bar) and marked with a red dot and the letter “D” stamped into it. Fittings are suitable for use in installations with clean agent fire extinguishing systems and the low temperature generated during discharge of such system. Pipes to ASTM Sch40, 80, 160 may also be used. Fittings ASME 3000lb and above may also be used. Pipes should be threaded and screwed or welded. If other type of assembly is used, the manufacturer of the pipe components must declare that it is suitable for use in fire suppression system using inert gas (here taken into consideration pressure and temperature during use and discharge). Pipes and fittings may be Black, Galvanized or Stainless steel.

Installation
The pipe system must be installed in accordance with local authorities’ requirements. Galv pipe and fittings for details regarding item numbers etc. Installation must be pressure tested in accordance with the requirements in EEC 97/23 (PED) or in accordance with the authority having jurisdiction

Fasteners & Pipe hangers
All fasteners used must be of good quality and made from material suitable for the environment they are being used in. Installation hardware for the pipe system must be able to support the pipe system as well as the forces from nozzles during the discharge. General requirements are: Pipe must be allowed to move within the brackets due to length contraction during discharge due to the temperature change. If the temperature rises from +20°C to +200°C, the ultimate tensile strength of the material used shall not be reduced by more than 25%. Combustible materials shall not be used. Pipe supports shall be designed so that under extreme load there is no danger of the installation being damaged. Pipe brackets shall completely surround the pipe and be closed. The material from which a pipe support is manufactured shall be at least 3mm thick. If galvanized, a thickness of 2,5mm

will suffice. This does not, however, apply to a pipe support made from hot-dip galvanized material, which may have a minimum size of 25mm x 1,5mm for pipes up to DN50 (12mm x 1,5mm, if type approved). Pipe supports shall connect the pipe work directly to the building structure. Building members, to which primary supports are attached, shall be strong enough to carry the load. If not, additional links to load-bearing members shall be created.

All pipe runs longer than 1m shall be fixed with supports. The maximum distance between two supports along the pipe shall not exceed the values given below

Pipe diameter (mm)	Maximum distance between supports (m)
< 25	2
> 25 < 50	3
> 50	4

The distance between a support and the last nozzle shall be as short as possible and shall not exceed:
> 0.1m for pipe with a diameter < DN25,
> 0.25m for pipe with a diameter >DN25.

Installation
The pipe-system must be installed in accordance with local authorities' requirements.

Discharge Nozzles

- The discharge nozzles used shall be VdS/LPCB/CE listed.
- The discharge nozzle shall be of corrosion resistant metal and shall not be obstructed by other installations and/or equipment. The nozzles shall be installed in such a manner that the discharge of the inert gas shall not cause any damages to the installed equipment and fixtures, etc within the
- protected room.
- The nozzle should have a specific linear design that smoothes the inflow of the inert gas into the protected area and therefore reduces the noise.
- The nozzles shall be selected and located such that design concentration will be established in all parts of the inert gas protected area, and that the discharge will not unduly create dust clouds that might extend the fire, create an explosion, or otherwise adversely affect the contents of the protected area. Nozzles shall cover a maximum height of 5m.
- Permanent markings shall be provided on the nozzles to facilitate the identification of the type, size and orifice diameter.

The nozzles are calibrated individually by drilling the orifice fixed in the nozzle. A range of standard orifice nozzles are available. The nominal diameter of the orifice must be marked on the outside of the nozzle.

Installation
The nozzle is screwed on to the pipe system and tightened using a suitable draw bar. Silencer base plate is screwed on the nozzle or pipe prior to fitting nozzle to the pipe work, the silencer body is then fitted to the base plate. When nozzle is fitted directly to the discharge valve, the cylinder must be secured with 2 brackets to hold the forces from the nozzle. Silencers are used in installations where sensitivity to high sound pressures is critical (hard discs etc.) or if reduced turbulence is desired.

Pressure relief (Fire Dampers)
To ensure sufficient area of ventilation to the protected room, these pressure reliefs are ideal.
Installation
The pressure relief must be installed into the open or to a room significantly larger than the protected enclosure so that unintended pressure build-up is avoided and low oxygen concentration is avoided. In general, a room to which pressure is relieved should be 10 times larger than the protected room.

Signs & Labels
Signs should be placed outside the protected room to inform about the fire suppression system. Additional signs should also be placed on the entry door to the cylinder storage room. Some authorities require a system identification sign, which must be placed on the cylinders.

Alarm Bells
Alarm bells complying with the local requirement and shall be provided within the inert gas protected area.

Siren
Siren shall be corrosion proof, 24V dc operated, high quality pattern conforming to the authority requirements.

Beacon Light
A flashing beacon light operating on 24 V dc shall be provided outside each entrance to the inert gas protected room and inside the inert gas protected room. The beacon light shall be visible when operated within a lighted room.

Evacuate Area Immediately; and Gas-Fired Signs.
a. EVACUATE AREA IMMEDIATELY; and;GAS FIRED flashing indication signs conforming with the requirements of NFPA 2001 and acceptable by the authority shall be provided.

b. A sample of these signs shall be submitted for Engineers acceptance before manufacture.
c. The;EVACUATE AREA IMMEDIATELY; signs shall be provided at all exits within the inert gas protected area.
d. The GAS FIRED sign shall be provided outside the entrance to the inert gas protected area.
e. All indicating lights used shall be LED type.

Warning Signs
Warning signs complying with the requirements of NFPA 2001 shall be provided at all entrances and within the area protected by inert gas system to inform persons entering the protected area that an inert gas system has been installed. The signs shall be adhered using good quality adhesives suitable for use in both indoor and outdoor conditions. All signs shall be subject to acceptance by the Engineer before fabrication.

Inert Gas Release Sign
A Warning inert gas release sign, containing warning and instruction complying with the requirements of NFPA 2001 shall be provided at the manual gas release station. All signs shall be subject to acceptance by the Engineer before fabrication.

Accessories
Components used to complete the installation. To seal actuators, use “fine” sealing wire; to seal hand wheel valves, use “coarse” sealing wire.

Installation
The sealing wire must be installed so that it is not possible to change the position without breaking the wire. The seal is pressed on the sealing wire using special pliers with identity mark of the technician performing the operation. Ø6 tube can be used for remote pneumatic actuation and other control functions

Extinguishing Panel / Control panels

- The Extinguishing Panel shall be located outside adjacent to the entrance of each inert gas protected room. The panel shall have local authority approval.
- The Extinguishing Panel including the battery cabinet shall be wall mounted or recessed type and shall be of a dustproof construction. The Contractor shall liaise with the civil contractor for them to provide the necessary recesses and access doors. Control panels installed outside the building
- shall be of a weatherproof construction, and provided with an awning to protect it from the elements, and shall be at least rated to IP55.
- Paints used shall be durable and color fast, compatible with use in external environments.

- The Extinguishing Panel shall be fabricated from minimum 2mm thick electro-galvanized steel sheet, epoxy powder coated signal red in color.The cabinet shall be fitted with a lockable door. All alarm zone indicators and associated switches shall be visible behind the locked door without opening the door.
- The Manufacturers name, together with any other appropriate means of identification of the alarm system, shall be clearly and permanently marked on the control panel.
- The Contractor shall co-ordinate with the respective civil contractors to ensure that the Extinguishing Panel are installed such that they are not damaged as a result of the swing of the doors.
- System and Components
  1 All components of the control panel shall be compatible with the Main Alarm Panel.
  2 The design of the panel shall be for maximum reliability with minimum and easy maintenance.
  3 The Extinguishing Panel shall control but not limited to, the operation of the electrical actuators, solenoid valves, pneumatic valves, sirens, beacon lights, alarm bells, evacuate signs and gas discharge signs. It shall monitor and display the status with LEDs but not limited to the selector valves OPEN/CLOSED bottle storage pressure, batteriesHIGH/LOW main ON/OFF charger ON/FAILURE. It shall be provided with switches for but not limited to TRICKE /BOOST CHARGE "FAULT BUZZER ISOLATE; and TEST LAMP
  4 A signal from the Extinguishing Panel to Main Alarm Panel shall be provided to identify which protected room is activated during inert gas alarm. This signal shall then send to HVAC panel to initiate the ventilation / exhaust mode operation of the particular inert gas protected room.

The addressable signals from the Extinguishing Panel shall include the following:
i. Fire Alarm
ii. Common fault
iii. Low pressure in inert gas cylinder banks by pressure monitoring device installed at each cylinder.
iv. Inert gas discharged in gas-protected rooms.

a. One Extinguishing Panel shall be located outside each inert gas protected room. The panel shall have local authority approval.
b. The Extinguishing Panel shall monitor but not limited to the detectors and manual inert gas release break glasses serving the respective gas protected rooms.
c. The Extinguishing Panel shall monitor and display with LEDs but not limited to the mode of operationAUTOMATIC/MANUAL, first and second alarm, fault, gas discharge and power ON.
d. The Extinguishing Panel shall be provided with but not limited to a silence switch and abort switch.

Indicator and Control Function

a. All indicators shall be long-life LEDs.
b. The control panel shall provide the control functions complying with the requirements of local authority and NFPA 2001.

The Control Inert system may be used with any control panel capable of supplying sufficient activation current/voltage for the actuator and which complies with the requirements for which approval the system is used. Eg. UL & FM: Standard for Control Units for Fire-Protective Signaling Systems, UL 864 and also must be UL Listed.

Power Supply

- The inert gas system shall operate on 24V dc supply. The supply shall be drawn from heavy-duty long life batteries, which are kept fully charged by a suitable automatic charger operating on mains supply. The supply shall be capable of operating the system under maximum normal load for 24 hours and then continue to operate the system for the full design discharge period.
- The capacity of the battery shall be such that in the event of mains failure or charging disconnected power, the battery shall be capable of maintaining the standing load condition for not less than 24 consecutive hours and, after the 24 hour period, shall have sufficient capacity to transmit a full alarm
- including all bells, sirens and illuminated warning signs for a period of 1 hour. The battery shall be housed in a well ventilated, dust and vermin proof and weatherproof enclosure and shall be at least rated to IP55.
- The Contractor shall provide power supply to Extinguishing Panel through fuse connection units
- Power supply indicators and controls shall be provided to include Mains On (green light) and Battery Fail; (amber light). A voltmeter and ammeter shall be provided on the panel to measure the battery voltage and current.

Battery Charger

- The battery charger shall be provided at the Extinguishing Panel of constant potential with current limiting and automatic boost charging features and must be capable of fully recharging the battery within 12 hours after a full discharge. Visual indicators for battery charging and charger fault shall be
- provided. The criteria on charger design with respect to battery selection shall be submitted for acceptance by the Engineer. All power transistors, rectifiers and associated components shall be integral parts of the charger unit, with adequately sized heat sinks for all heat-dissipating components.

- The control panel shall be capable of operating continuously at 110% of the rated voltage in supervisory condition without damage, and operate successfully during alarm conditions at 110% or 85% of rated voltage.
- Isolating switches shall be provided within the control panel for cutting off the mains and battery power supplies during maintenance and repair.

Electrical Works

- All electrical Works must comply with the local codes.
- All wiring shall be minimum 1.5mm 2 600/1000V grade copper conductors. 2.5mm 2 cables for power circuit. All cables shall be installed enclosed in galvanized threaded metal conduits.

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SECTION-VI **ANNEXURES**

ANNEXURE I

FORM OF PERFORMANCE GUARANTEE (BY BANK GUARANTEE)

1. In consideration of the TIFR-Hyderabad, Hyderabad having agreed under the terms and conditions of Letter of Intent / Agreement No…… dated..... made between and……..…… (Here in after..... called " the said Contractor{s}") .for the work ….....…… (Here in after called "the said Letter of Intent / Agreement") having agreed to production of a irrevocable bank Guarantee for Rs..... (Rupees …….. only), as a security / guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement, we …...……..…..(Indicate the name of the Bank) (hereinafter referred to as "the Bank") Here by undertake to pay to TIFR an amount not exceeding Rs. ……..... (Rs only) on demand by TIFR.

2. We..... (indicate the name of Bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from TIFR stating that the amount claimed is required to meet the recoveries due or likely to be due from the said Contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs…… (Rupees..... only).

3. We, the said bank, further undertake to pay to TIFR any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment made by us under this bond shall be a valid discharge of our liability for payment thereunder and the Contractor(s) shall have no claim against us for making such payment.

4. We (indicate the name of Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of TIFR under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-charge on behalf of the TIFR certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.

5. We (indicate the name of Bank) further agree with TIFR that TIFR shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by TIFR against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of TIFR or any indulgence by TIFR to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7. We,..... (indicate the name of Bank) lastly undertake not to revoke this guarantee except with the previous consent of TIFR in writing.

8. This guarantee shall be valid up to ....., unless extended on demand. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs (Rupees ……..…….. only) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee, all our liabilities under this guarantee shall stand discharged.

Signed and sealed
Dated the ……..... day of……..…… for..... (indicate the name of Bank) *(Note: The Letter of Intent shall form part of the Agreement)

ANNEXURE II

UNDERTAKING BY THE TENDERER

I / We have read and examined the Tender document including terms & conditions, specifications, Schedule of quantities, drawings and designs, general rules & directions, General Conditions of Contract, Special Conditions of Contract and all relevant other documents, publications and rules referred to in the Conditions of Contract and all other contents in the tender documents for the work.

I / We, hereby tender for execution of the work specified for the TIFR-Hyderabad, Hyderabad within the time specified and in accordance in all respects with the specifications, designs, drawings and instructions in writing.

We agree to keep the tender open for seventy five (75) days from the last date of its submission and not to make any modifications in its terms and conditions. A sum of Rs..... has been deposited in cash / receipt treasury challan / deposit at call receipt of scheduled bank / fixed deposit receipt of scheduled bank / demand draft of a scheduled bank / Bank Guarantee issued by a Scheduled Bank as earnest money. If I / we, fail to furnish the prescribed performance guarantee within prescribed period, I / we agree that the said TIFR-Hyderabad, Hyderabad or its authorized officer shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I / we fail to commence work as specified, I / we agree that the TIFR-Hyderabad, Hyderabad shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by TIFR- Hyderabad, Hyderabad towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein.

Further, I / We agree that in case of forfeiture of earnest money or both Earnest Money & Performance Guarantee as aforesaid, I / We shall be debarred for participation in the re-tendering process of the work.

I / We hereby declare that I / We shall treat the tender documents, drawings and other records connected with the work as secret / confidential documents and shall not communicate information derived there-from to any person other than a person to whom I / We am / are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Seal & Signature of Contractor Postal Address

Dated

Witness Address Occ

ANNEXURE-III

CERTIFICATE OF LOCAL CONTENT

***We [name of manufacturer] hereby confirm in respect of quoted item(s) that local Content is equal to or more than 50% and come under 'Class-I Local Supplier' Category. As being 'Class-I Local Supplier', we are eligible for Purchase Preference under '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)**

OR

***We [name of manufacturer] hereby confirm in respect of quoted items(s) that Local Content is more than 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 made is / are under:

1. ……

2. ……

Date: **Seal & Signature of the Bidder**

NOTE:

Self-certification that the item offered meets the minimum local content (as above) giving details of the location(s) at which the local value addition is made in case the bidder wishes to avail the benefits under the make in India policy, if applicable.

In cases of procurement for a value in excess of Rs.10 crores, the local supplier shall be required to provide a certificate from the 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 to avail the benefits under the make in India policy, if applicable.

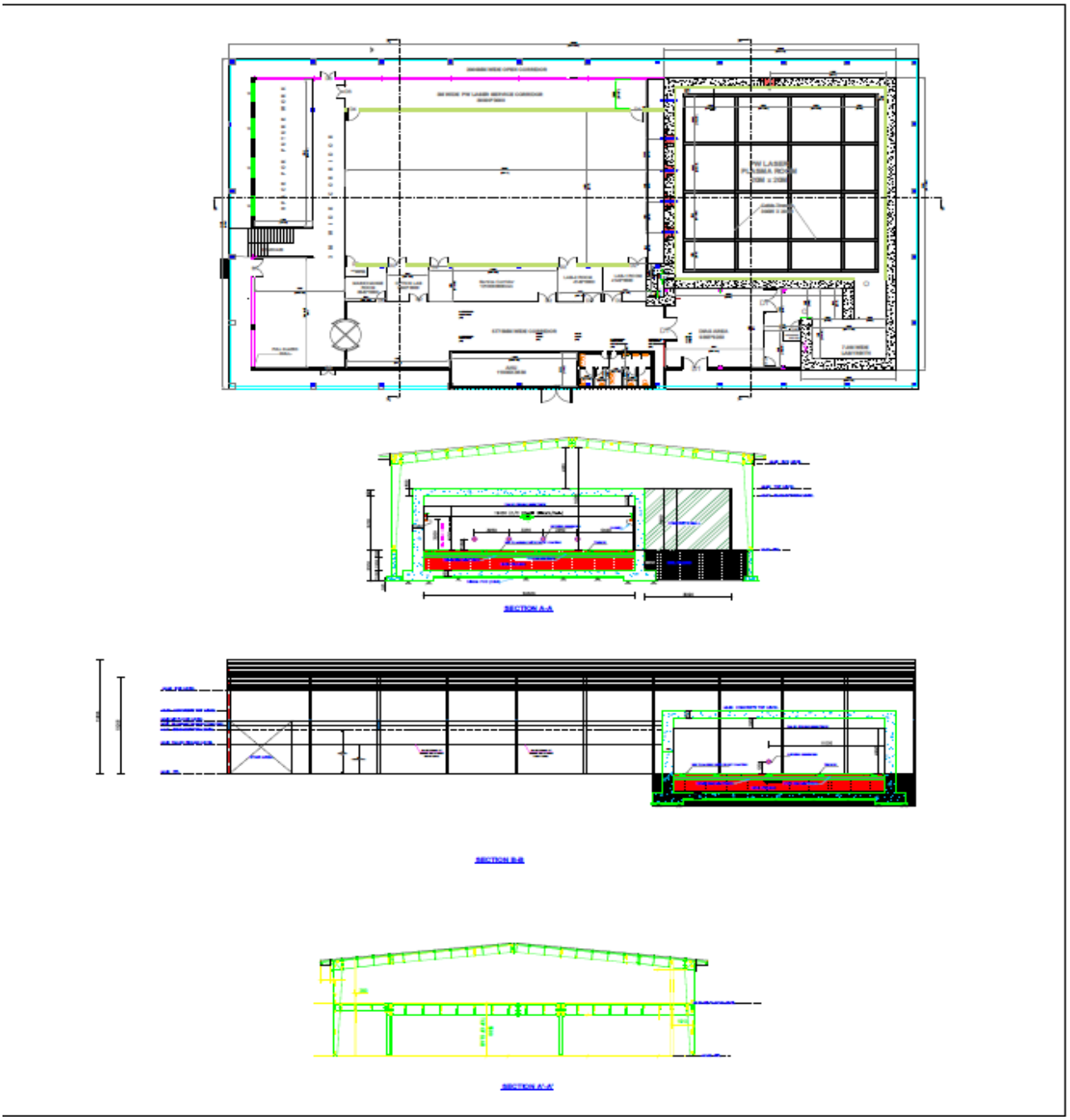
ANNEXURE-IV

TECHNICAL DATA SHEET

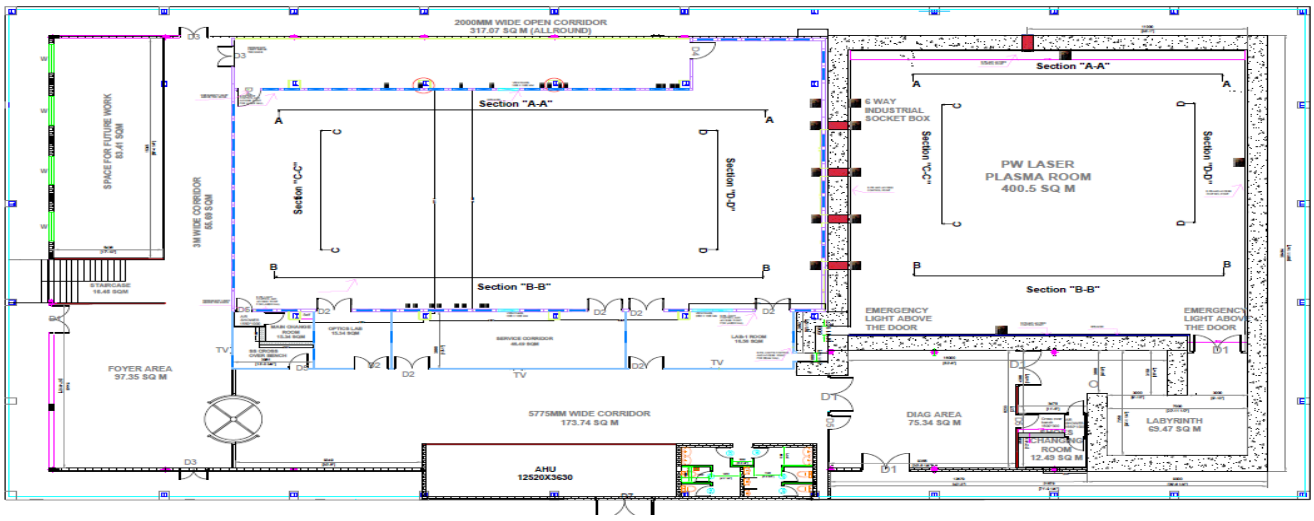
S.No.	Description	Compliances	Remarks
1	Inert gas total flooding system, Fire alarm and VESDA shall be the same make only. Please mention the make & model		
2	Systems design shall be as per IS 2189 / NFPA 2001-2015 and all items shall be UL/VDS/FM/LPCB listed.		
3	FDA Panel 4 loop 320 characters Please mention the model		
4	Factory inspection shall be arranged		

ANNEXURE-V

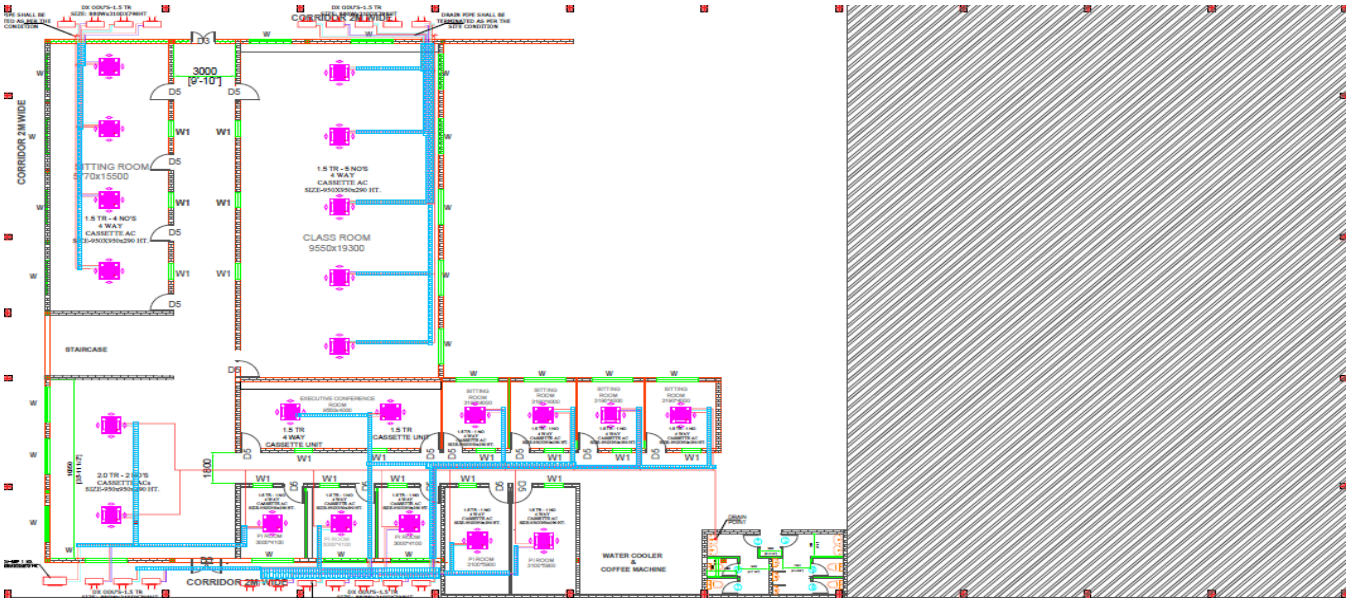
Petawatt Laser Facility Building layout



Petawatt Laser Facility Ground Floor Layout



Petawatt Laser Facility First Floor layout



SECTION-VII	**FINANCIAL BID**

INVITATION OF BIDS FOR

Supply, Installation, Testing and commissioning of fire detection & alarm system, VESDA and total flooding clean agent IG 541 gas fire suppression system for Petawatt Laser Facility, TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046.

PART II

FINANCIAL BID

SCHEDULE OF QUANTITIES

S.No.	Description	Qty	Unit	Price	Amount
1	Charges for designing the entire system of inert gas IG-541 total flooding system for a 10000 class cleanroom made up of PUF panels and having volume of approximately 1450 Cu. M. The design shall be as per the Original Equipment Manufacturer's (OEM) guidelines and all other related standards. The charges are inclusive of site survey, design Qualification, Documentations, etc.	1	Job		
2	Supply, Installation, Testing and Commissioning of UL Listed & PESO Approved IG541 Cylinder - 300 Bar as per technical specifications with Safety Bust Disc Assembly, Discharge Valve , Low Pressure switch, Pressure gauge and other required accessories in complete in order to perform the function as per OEM with filling of 140 Ltr agent of IG 541 Inert Gas .	18	Set		
3	Supply, Installation, Testing and Commissioning of Tank Bracket Assembly as per technical specification complete with C- Rail and Supports for Sr No .2 Cylinders (18 No.s) .	1	Set		

4	Supply, Installation, Testing and Commissioning of UL Listed Approved Flexible Discharge Hoses of suitable lengths as per technical specifications for connections between IG 541 cylinder to cylinder and other cylinder bank	18	No.s		
5	Supply, Installation, Testing and Commissioning of UL /FM Approved Brass, Stainless steel, EPDM Manifold as per technical specifications for 18 no cylinders ,non-return valve to prevent actuation of the connected discharge valve, suitable for the operating pressure, for connection from cylinder(s) to directional valves (Manifold)	1	Set		
6	Supply installation Testing & commissioning of UL/FM Listed Electromagnetic solenoid actuator & solenoid removal kit	1	No.s		
7	Supply installation Testing & commissioning of UL/FM Listed Manual actuator	1	No.s		
8	Supply, Installation, Testing and Commissioning of Pressure Switch KIT for common Manifold	1	Set		
9	Supply, Installation, Testing and Commissioning of UL Listed Brass Nozzles , 360 Deg Throw as per technical specifications, selection as per approved hydraulic flow calculations.	18	No.s		

10	Supply, Installation, Testing and Commissioning of Fire Rated Pressure Relief Vents. The size & Quantity of Pressure Relief vent shall be as per flow calculation & shall be done by OEM Factory Engineer. Vendors need to submit this size calculation to the consultant.	1	No.s		
11	"Dump test: Proving Dump test with 2 Nos of Cylinders with required accessories and releasing the agent in to room to prove how the system will work at the time of actual emergency. Which includes the refilling of the cylinders after performing dump test including transportation"	1	Job		
12	Supply, Installation, Testing and Commissioning of Warning Sign Board with Marking "GAS DISCHARGE. DO NOT ENTER". Shall Operate on 24 V DC, Driven Through Gas Release Panel. (for use outside room)	1	No.		
13	Supply, Installation, Testing and Commissioning of Warning Sign Board with Marking "GAS DISCHARGE. EVACUATE IMMEDIATELY". Shall Operate on 24 V DC, Driven Through Gas Release Panel. (for use inside room)	1	No.s		
14	Supply, Installation, Testing and Commissioning of Grade B seamless galvanized pipeof size DN15 as per technical specifications.	1	Rmt		

15	Supply, Installation, Testing and Commissioning of Grade B seamless galvanized pipe of size DN20 as per technical specifications.	21	Rmt		
16	Supply, Installation, Testing and Commissioning of Grade B seamless galvanized pipeof size DN25 as per technical specifications.	14	Rmt		
17	Supply, Installation, Testing and Commissioning of Grade B seamless galvanized pipe of size DN32 as per technical specifications.	47	Rmt		
18	Supply, Installation, Testing and Commissioning of Grade B seamless galvanized pipeof size DN40 as per technical specifications.	31	Rmt		
19	Supply, Installation, Testing and Commissioning of Grade B seamless galvanized pipe of size DN65 as per technical specifications.	7	Rmt		
20	Supply, Installation, Testing and Commissioning of Grade B seamless galvanized pipeof size DN80 as per technical specifications.	37	Rmt		
21	Supply installation Testing & commissioning of 4 Loop Addressable Fire Alarm Control Panel cum gas release panel with 320 Characters display ,BACnet/Modbus card to be included, UL Listed & FM Approved, with 10 Independent hazards releasing function including required batteries.	1	No.s		

22	Supply installation Testing & commissioning of UL Listed & FM Approved Dual Action Agent Release Station. The Abort Switch & Release Switch will be monitored by the Fire Alarm System. Including 2 Nos Monitor Module and 2 Nos Relay Module.	1	No.s		
23	Supply installation Testing & commissioning of UL Listed &FM Approved Releasing Control Module	1	No.s		
24	Supply installation Testing & commissioning of UL Listed Horn Strobe with control module	1	No.s		

25	Supplying, installing, testing and commissioning approved make Addressable Multi-criteria Photo-Thermal Above False Ceiling Detector with sensitivity range of 0.5 to 4.0% obs/ft.The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena. The detector shall have twin bi-colour LED for 360 deg viewing. Addressing shall be with user friendly rotary decimal switches. The detector sensitivity (day & night) shall be controlled from the panel to get accustomed to the local environment.The detector shall comply UL268, 7th Edition guidelines. The device shall comply UL Listed & FM Approved.Quoted rate shall be with the necessary back-box for mounting.	210	Nos		
26	Supplying, installing, testing and commissioning approved make Addressable Duct Smoke Detector.The High Sensitivity Duct Smoke Detectors capable of 0.02% obs/ft sensitivity with Smoke Prove/Tubes and Addressable detectors including the cost of mounting accessories complete as per specifications and as required. Product Shall be listed under UL Listed to standard 268A-7th edition & FM approved	16	Nos		

27	Supplying, installing, testing and commissioning approved make Addressable Manual Call Point (Break Glass Type). The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. The device shall comply UL Listed & FM Approved.Quoted rate shall be with the necessary back-box for mounting	5	Nos		
28	Supplying, installing, testing and commissioning approved make Sounder cum Strobe rated at 80 dBA @ 3m for Audible annunciation and 115cd flashing at 1 Hz for visual indication. UL Listed.Quoted rate shall be with the necessary back-box for mounting	5	Nos		
29	Supplying, installing, testing and commissioning approved make Isolator Module for Isolating short / dewired / loose circuits with automatic resetting arrangement. Isolator Base can also be proposed, however in that case needs to be considered with each detector & module. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance. The device shall comply UL Listed & FM Approved.Quoted rate shall be with the necessary fixing accessories	12	Nos		

30	Supplying, installing, testing and commissioning approved make Addressable Control Module for Sounders / Strobes / Sounder cum Strobes. The control module shall provide supervised NAC output rated at 24v DC, 2A. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance. The device shall comply UL Listed & FM Approved.Quoted rate shall be with the necessary fixing accessories	5	Nos		
31	Supplying, installing, testing and commissioning approved make Addressable Monitor Module for Sprinklers, Panic Bars & other Third Party Inputs. The monitor module shall monitor potential free contacts. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance. The device shall comply UL Listed & FM Approved.Quoted rate shall be with the necessary fixing accessories	2	Nos		

32	Supplying, installing, testing and commissioning approved make Addressable Relay Module for AHU, Access Control, Lifts, Staircase Pressurization, Fire Suppression & other Third Party Outputs. The relay module shall provide contact rated at 24v DC, 2A. The device shall have an LED which shall blink in normal state & get steady on activation to monitor the heath status of the device. Addressing shall be with user friendly rotary decimal switches. Module shall be supplied with mounting plate from OEM for ease of installation & maintenance. The device shall comply UL Listed & FM Approved.Quoted rate shall be with the necessary fixing accessories	16	Nos		
33	Supplying, installing, testing and commissioning of response indicator, single LED type with all fixing accessories.	105	Nos		
34	Supplying, installing, testing and commissioning of power supply units (SMPS) with battery backup and MS powder coated enclosure, considered for hooter cum strobe & conventional detectors power supply. 24V, 6Amps. Input UPS power socket of 6Amps shall be provided by the client near each SMPS. Quoted rate shall be with the necessary fixing accessories.	1	Nos		

35	Supplying, installing, testing and commissioning of PVC insulated, PVC sheathed armoured FRLS cable 2C x 1.5 sq.mm copper as per IS: 1554 part-I. Cable shall be rated for a voltage rating of 650/1100 Volts & insulated with suitably compounded PVC. Cables shall be properly supported to ceiling through suitable clamps/saddles at an interval of 300mm. Cables shall be measured on the basis of linear measurements from gland to gland. Colour code FA cable shall be "RED".	1400	Nos		
36	Supply, installation, testing & commissioning of Addressable Aspiration Detectors UL 268 7th Edition Applications : Absolute Smoke Detection system using dual detection technology of laser imaging with single pipe inlet, 1000 m2 coverage; Wide dynamic sensitivity range - 0.001%–20% obs/m; 4 alarm levels ; High efficiency aspirator; Clean air barrier optics protection; Easy to replace dual stage filter with memory; 7Nos of inbuilt potential free relay outputs;supports linear pipe length of 100m or branched pipe up to 130m per pipe; supports 30 Nos of EN54 Class A sampling points, AutoLearn for automatic setup of alarm threshold, Referencing & Event log; TCP/IP & VESDANet connectivity for central monitoring. The AD detector have an integrated SignalingLine Circuit (SLC).odule to communicate with Fire Alarm Control Panels (FACP) directly over the SLC loop - so that the complete monitoring & controlling shall be carried out through FACP. Approvals-UL, ULC, FM, ActivFire, VdS, CE , EN54-20	1	No		

37	Supply, installation, testing & commissioning of Capillary Sampling Points - Cone type as per technical specifications	20	Nos		
38	Supply, installation, testing & commissioning of EN approved power supply unit with 110/230VAC input and 18 to 29 VDC output. The power supply unit has the following indications: OK - Green LED and Fault - Yellow LED	1	Nos		
39	Supply, installation, testing & commissioning of Sampling Pipe - 25mm OD, 18 to 21mm ID smooth bore UPVC Pipe	200	Mtrs		
40	Supply, installation, testing & commissioning of suitable UL Listed Horn Strobe	1	Nos		
41	Charges for Design verification and approval by third party Fire consultant.	1	Job		
				Sub Total	
				GST@18%	
				Total Amount	-
	Amount in words Rs				

NOTE:

- Please mention the item rate in figures and also in words.
- Rates are all inclusive of profit, Transport, Loading & Unloading,Shifting Taxes, Etc.
- TIFR, Hyderabad has the right to delete any of the above items from scope of work or may increase/reduce quantities as per its requirement during execution of work. No claim or compensation for such deletion/increase/decrease will be accepted/paid to the contractor. Payment will be made as per actual quantities executed at tender rates.
- Manufacturer's warranty of respective supply items to be provided.
- For any above item quantity exceeding more than 10% of projected qty, contractor shall take prior approval from TIFR Engineer in writing.
- For any deviating items, the contractor shall take prior approval from TIFR Engineer In charge with proper rate analysis.

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