टाटा मूलभूत अनुसंधान संस्थान हैदराबाद /
TATA INSTITUTE OF FUNDAMENTAL RESEARCH HYDERABAD
परमाणु ऊर्जा विभाग की स्वायत्त संस्था, भारत सरकार
Autonomous Institution of the Department of Atomic Energy, Government of India

सर्वेक्षण सं. 36/पी, गोपानपल्ली गांव, सेरिलिंगमपल्ली मंडल, रंगारेड्डी जिला, हैदराबाद - ५०० ०४६, तेलंगाना।
Survey No.36/P, Gopanpally village, Serilingampally Mdl., Rangareddy Dist., Hyderabad - 500 046, Telangana.

टेलीफोन / **Telephone: +91-40-2020-3009**
ई-मेल / **Email:krishnaae@tifrh.res.in**
वेबसाइट / **Website : www.tifrh.res.in**
तिथि / **Date: 22.05.2026**

NOTICE INVITING TENDER

निम्नलिखित कार्यों के लिए निविदा सह निविदा दस्तावेज (दो भाग सार्वजनिक निविदा) आमंत्रित करने की सूचना /
Notice Inviting Tender cum Tender Document (Two Part Public Tender) for the following works

Supply, installation, testing and commissioning of BMS for Laser Lab HVAC System in Plot-B at TIFR,Hyderabad	
निविदा सं. / **Tender No.**	**TIFR/PD/CF26-16/260090**
प्रकाशन की तिथि / **Date of Publishing**	**22.05.2026**
निविदा का प्रकार / **Type of Tender**	Two Bid System (Part-I: Technical cum eligibility Bid and Part-II: Financial Bid)
अनुमानित लागत / **Estimated Cost**	**Rs. 24,21,360/- (Inclusive of GST)**
Location	Tata Institute of Fundamental Research 36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy District, Hyderabad 500046
ईएमडी की लागत / **Cost of EMD**	**Rs.48,427/-** (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.48,427/-** (Demand Draft to be drawn in favor of "Tata Institute of Fundamental Research", Payable at Hyderabad. (To be enclosed with the Technical Bid Part – I).

बोली-पूर्व बैठक की तिथि और समय / **Pre-Bid Conference:** **(a) Date & Time:**	**25.05.2026 at 11:00 Hrs.**
(b) Zoom Link	For Pre-bid conference Zoom link, check TIFRH webpage-Tenders-TIFR/PD/CF26-16/260090
(c) Venue:	TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046. Phone: 040-2020-3001
निविदा प्रस्तुत करने की अंतिम तिथि / **Last Date for Submission of Tender**	**29.05.2026 by 13:00 Hrs.**
बोली खोलने की तिथि (केवल भाग-**I:** तकनीकी बिड) / **Date of Opening Bids (Only Part-I: Technical Bid)**	**29.05.2026 by 15:00 Hrs.**

टिप्पणी / **NOTE:**

- प्रतिष्ठित अनुसंधान संस्थानों, विश्वविद्यालयों, केंद्र सरकार / सार्वजनिक क्षेत्र के उपक्रम, निजी प्रयोगशालाओं, बहुराष्ट्रीय कंपनियों आदि में समान कार्य अनुभव रखने वाले ठेकेदारों से उपर्युक्त कार्यों के लिए सीलबंद आईटम दर निविदाएं आमंत्रित की जाती हैं। इच्छुक ठेकेदार जो टीआईएफआर, हैदराबाद द्वारा निर्धारित पात्रता मानदंडों को पूरा करते हैं, केवल अपनी बोलियां प्रस्तुत करेंगे। /
  Sealed Item Rate Tenders are invited for the aforementioned 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 eligibility criteria stipulated by TIFR, Hyderabad shall only submit their bids.

- तकनीकी सह पात्रता बोली (भाग-I) और वित्तीय बोली (भाग-II) दोनों को बोलीदाता द्वारा अलग-अलग लिफाफों में विधिवत रूप से लिखा हुआ सीलबंद किया जाना चाहिए और इन दोनों सीलबंद लिफाफों को एक बड़े लिफाफे में रखा जाना चाहिए, जिसे भी सीलबंद किया जाना चाहिए और उस पर निविदा संख्या, विवरण और नियत तारीख लिखी होनी चाहिए। /
  Both Technical cum eligibility Bid (Part-I) and Financial Bid (Part-II) should be sealed by the bidder in separate envelopes duly super-scribed and both these sealed covers are to be put in a bigger envelope which should also be sealed and duly super-scribed with the Tender No., Description and Due Date.

- यदि "भाग-I" और "भाग-II" बोलियां अलग-अलग लिफाफों में सीलबंद नहीं की जाती हैं तो निविदा अस्वीकार कर दी जाएगी। / In case, the "Part-I" and "Part-II" bids are not sealed in separate envelopes, the tender shall be rejected.

- तकनीकी बोली में मूल्य का कोई संकेत नहीं होना चाहिए। / Technical bid should not contain any indication of the price.

- बिना ईएमडी/अपर्याप्त ईएमडी के साथ प्राप्त तकनीकी बोली को सरसरी तौर पर अस्वीकार कर दिया जाएगा। / The Technical Bid received without EMD/with Insufficient EMD shall be summarily rejected.

- हाथ से डिलीवरी/कूरियर द्वारा भेजी गई बोलियां, टीआईएफआर, हैदराबाद सुरक्षा कार्यालय के सुरक्षा कर्मचारियों से मुहर, तारीख और हस्ताक्षर प्राप्त करने के बाद उन्हें सौंप दी जानी चाहिए। / Bids sent by hand delivery/courier are to be handed over to the security staff at TIFR, Hyderabad security office after obtaining stamp, date and signature from them.

- निविदा में उल्लिखित किसी भी तकनीकी या वाणिज्यिक शर्तों के स्पष्टीकरण के लिए श्री कृष्णा ए ई, टेलीफोन: **040-2020-3009**, ई-मेल: krishnaae@tifrh.res.in से संपर्क करें I / Contact Mr. **Krishna A. E.**, Tel: **040-2020-3009**, Email Id: krishnaae@tifrh.res.in for any technical or commercial terms clarifications mentioned in the tender.

- बोलियाँ प्रमुख, तकनीकी सेवाएँ, प्लॉट संख्या 36/पी, गोपनपल्ली गाँव, सेरिलिंगमपल्ली मंडल, रंगा रेड्डी जिला, हैदराबाद- ५०० ०४६, तेलंगाना, भारत को संबोधित की जानी चाहिए। / The Bids should be addressed to Head, Technical Services, Plot No.36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy District. Hyderabad- 500 046, Telangana, India.

- भविष्य में सभी शुद्धिपत्र/परिशिष्ट टीआईएफआर हैदराबाद वेबसाइट/सीपीपी पोर्टल पर प्रकाशित किए जाएंगे और इसके लिए कोई अलग विज्ञापन जारी नहीं किया जाएगा। सभी संभावित बोलीदाताओं से अनुरोध है कि वे ऐसे किसी भी अपडेट/शुद्धिपत्र के लिए नियमित रूप से हमारी वेबसाइट देखें। / All future corrigendum/addendum will be published on TIFR Hyderabad website / CPP portal and no separate advertisement will be released for the same. All prospective bidders are requested to visit our website regularly for any such updates/corrigendum.

- कृपया संलग्न बोली दस्तावेज देखें जिसमें विनिर्देश, निष्पादित की जाने वाली विभिन्न प्रकार की वस्तुओं की मात्रा की अनुसूची और अनुबंध की शर्तों का पालन किया जाना तथा अन्य आवश्यक दस्तावेज शामिल हैं जिन्हें टीआईएफआरएच वेबसाइट / सीपीपी पोर्टल से भी देखा और डाउनलोड किया जा सकता है। / Please see the attached bid document consisting of specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents which can also be seen and downloaded from TIFRH website / CPP portal.

- निविदा प्रस्तुत करने की अंतिम तिथि 29.05.2026 को 13:00 बजे तक है। / Last date for submission of the tender is 29.05.2026 by 13:00 Hrs.

(Rajasekhar R.)
Head-Technical Services
Technical Services Dept.
टीआईएफआर, हैदराबाद / **TIFR, Hyderabad.**

सूचकांक / INDEX

अध्याय / **CHAPTER**	विवरण / **DESCRIPTION**	पृष्ठ सं. / **PAGE NO.**
CHAPTER-I	INFORMATION AND INSTRUCTIONS TO BIDDERS	05-08
CHAPTER-II	TECHNICAL CUM ELIGIBILITY BID (Part-I): TENDER ELIGIBILITY CRITERIA & INSTRUCTIONS TO BIDDERS	09-17
CHAPTER-III	TERMS & CONDITIONS OF THE CONTRACT	18-31
CHAPTER-IV	SPECIFICATIONS AND ALLIED TECHNICAL DETAILS	32-69
CHAPTER-V	DRAWINGS	70-71
CHAPTER-VI	ANNEXURES	72-81
CHAPTER-VII	FINANCIAL BID (Part-II): SCHEDULE OF QUANTITIES (BOQ)	82-88

CHAPTER-I INFORMATION AND INSTRUCTIONS TO BIDDERS

1. INTRODUCTION: The Tata Institute of Fundamental Research (TIFR) 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.
Webpage: https://www.tifrh.res.in

2. DEFINITION OF TERMS: In constituting these general conditions and the annexed specifications, the following words shall have the meanings herein assigned to them unless there is something in the subject or context inconsistent with such construction.

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

2.2. The term 'Engineer' and 'Engineer-in-Charge' shall mean Engineer-in-Charge, TIFR, Hyderabad or such other officers as may be duly authorized and appointed in writing by the TIFR, Hyderabad to act as Engineer-in-Charge for the purposes of the Contract.

2.3. The term 'Bidder' shall mean any individual or organization that submits a proposal or offer in response to the invitation to tender for participating in a Tender Process.

2.4. The term "Contractor or Supplier" shall mean the tenderer whose tender has been accepted by the TIFR, Hyderabad for award of contract and shall include such tenderer's heirs, successors and assigns approved by the TIFR, Hyderabad.

2.5. The term `Sub-Contractor' shall mean the firm or person other than the contractor named in the contract for any part of the work or any person to whom any part of the work has been sublet by the contractor with the consent in writing of the Engineer-in-Charge and shall include such person's heirs, successors and assigns approved by the TIFR, Hyderabad.

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

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

2.7.1. Specifications

2.7.2. Drawing

2.7.3. Sealed Pattern denoting a pattern sealed and signed by the Inspector.

2.7.4. Proprietary make denoting the product of an individual firm.

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

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

2.9. The term ‘Site’ shall mean the whole of the premises, buildings and grounds in or upon which the work or works is / are to be provided, executed, erected, done or carried out.

2.10. The term `Equipment’ shall mean and include any equipment, stores and materials to be provided and work to be done by the contractor under the contract.

2.11. The term ‘Contract’ shall mean letter of Intent / Award, Letter of Acceptance of Tender and shall include the conditions of contract, specifications, schedules, tender, guarantee, drawings and any further conditions which may be specifically agreed to between the parties as forming a part of the contract.

2.12. The term 'Tests’ shall mean such tests as prescribed in the contract and as instructed by the Engineer-in-Charge to be performed by the contractor before the works are finally accepted by the TIFR, Hyderabad ready for commercial use complete with all items to the satisfaction of the Engineer-in-Charge.

2.13. The term ‘Writing’ shall include any manuscript, typewritten or printed statement under or over signature and / or seal as the case may be. Words importing singular shall also include plural and vice versa where context requires.

2.14. The term ‘Item Rate Tender' shall mean tenders in which the contractors are required to quote rates for individual items of work as given in the schedule of quantities.

3. SCOPE & OBJECTIVE:

3.1. The Objective of the tender is to execute **“Supply, installation, testing and commissioning of BMS for Laser Lab HVAC System in Plot-B”** at TIFR Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad – 500 046 as per the specifications and Bill of quantities mentioned in the Financial Bid.

3.2. Period of Completion of Work: **180 days** from the date of signing the work order and Contract / agreement.

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

4. INSTRUCTIONS:

4.1. Pre-Bid Conference: All prospective bidders are requested to attend a pre-bid conference for clarification on the Tenders' technical specifications and commercial conditions, besides discussions on any additional suggestion proposed by the bidders on the time, date and venue (in-person) / zoom meeting (online) mentioned in the NIT above & TIFRH Tenders webpage. If found necessary, a corrigendum to the tender documents would be issued and would be put up on TIFRH website for information of all contractors and thereafter no further query/condition shall be entertained.

4.2. Site visit by the tenderer: The tenderer is advised to visit the site of work, at his own cost, and examine it and its surroundings to himself collect all information that he considers necessary for proper assessment of the prospective assignment.

4.3. Sufficiency of Tender: The tenderer shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates and prices quoted in the Schedule of Quantities, which rates and prices shall, except as otherwise provided, cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the works.

4.4. 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 superscribed with Tender No. **TIFR/PD/CF26-16/260090**, Description: **"Supply, installation, testing and commissioning of BMS for Laser Lab HVAC System in Plot-B"** and Due **Date: 29.05.2026**, **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:

4.4.1. **"Technical cum eligibility Bid (Part-I)":** This will contain Technical part, Eligibility Documents along with testimonials and Earnest Money Deposit (EMD) which shall be submitted in the form of Demand Draft/Pay Order/Banker's cheque issued by a Scheduled Bank, drawn in favor of "Tata Institute of Fundamental Research", Payable at Hyderabad, (To be enclosed with the Technical Bid (Part-I)).

4.4.2. **"Financial Bid (Part-II)":** This will contain the complete financial bidding document duly filled in Schedule of Financial Quote & Tender Drawings.

4.5. Evaluation of Technical Bids: The technical bids received will be opened first and examined for EMD, Eligibility Criteria, Conditions, etc. Tenders without EMD shall be summarily rejected.

4.6. Evaluation of Financial Bids: Financial Bids of technically qualified bidders will only be opened. The financial bids should contain the complete financial bid document duly filled in Schedule of Financial Quote of Financial Bid and signed along with Tender drawings. Work will be awarded to the lowest bidder (L1) based on the financial evaluation.

4.7. Payment Schedule:

4.7.1. 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 (two Running Bill) shall be 35% of the work order value. All interim and final bills will be settled based on the joint measurements of each item of work and certified by TIFR Engineer. The bills for non-perishable materials on site may also be submitted and the payment by TIFR against the same shall be to the maximum extent of 90% of the value of these materials on production of sufficient documentary evidence i.e. Original invoice, Inventory, etc.

4.7.2. All interim bills will be paid within 30 days from the date of submission and Final Bill along with all relevant documents will be settled within 30 days from the date of submission with certification of TIFR Engineer.

4.8. Other Instructions:

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

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

4.8.3. This notice inviting bid document shall form a part of the contract document.

4.8.4. 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.

CHAPTER-II	TECHNICAL CUM ELIGIBILITY BID (Part-I): TENDER ELIGIBILITY CRITERIA & INSTRUCTIONS TO BIDDERS

TECHNICAL CUM ELIGIBILITY BID (PART-I)

(i) Earnest Money Deposit as stipulated.

(ii) "Eligibility Criteria" & "Schedules" for tender qualification.

1. Earnest Money Deposit (EMD):

1.1. EMD shall be submitted in the form of Demand Draft/Pay Order/Banker's cheque issued by a Scheduled Bank, drawn in favor of "Tata Institute of Fundamental Research", Payable at Hyderabad, (To be enclosed with the Technical Bid (Part-I)).

2. Eligibility Criteria: Contractors who fulfil the following requirements shall ONLY be eligible to apply:

2.1. The bidder should hold a valid labour license issued by appropriate authority and must be valid throughout the contractual period.

2.2. The bidder should provide copy of the following original certificates:

- PAN card from Income Tax Authority.
- GST registration document.

2.3. The bidder should submit IT Returns documents for the last three consecutive financial years ended on March 31, 2025 audited by the licensed Chartered Accountant.

2.4. Turnover: The bidder should have an average annual financial turnover (gross) of **Rs.7.26 Lakhs** during the immediate last three consecutive financial years ending March 31, 2025 (certificate from licensed Chartered Accountant to be provided, refer Annexure-VII enclosed with this tender document in 'Chapter-VI: Annexures). The value of annual turnover figures shall be brought to current value by enhancing the actual turnover figures at a simple rate of 7% per annum.

2.5. Profit/Loss : The bidder should not have incurred any loss (profit after tax should be positive) in more than two years during the immediate last five consecutive financial years ending 31st March, 2025 certified and audited by the Chartered Accountant.

2.6. The bidder should have a latest solvency certificate of **Rs.9.68 lakhs** from the scheduled bank.

2.7. Experience:

2.7.1. The bidder should have an experience of having successfully completed similar BMS works in Research Institutes, Universities, Private Laboratories, R & D institutes, etc. in any Government /PSU/Private organizations of repute during the last seven years ending last day of the month previous to the one in which tender is invited.

- Three similar completed works each costing not less than **Rs.9.68 Lakhs**, or
- Two similar completed works each costing not less than **Rs.14.53 Lakhs**, or
- One similar completed work costing not less than **Rs.19.37 Lakhs**.

  Note: The value of executed works shall be brought to 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 previous day of the last day of submission of tender.

2.7.2. The bidder should furnish copies of work orders along with BOQ and completion certificates in support of the aforementioned works information. 'Annexure-VIII' enclosed with this tender document in 'Chapter-VI: Annexures' for reference.

2.7.3. Important Notes:

a) 'Similar work' shall mean: "BMS works".
b) 'Cost of work' shall mean gross value of the completed work including the cost of materials supplied by the Client, but excluding those supplied free of cost. The applicant's performance for each work completed in the last seven years should be certified by an officer not below the rank of Executive Engineer or equivalent. Information.
c) The bidder should have a full-fledged in-house project management team to undertake the jobs.
d) Bidder's non-adherence to furnishing of information in the given format/schedule will lead to disqualification of the tender.

2.8. The bidder should submit the Local Content Certificate as per Annexure-III enclosed with this tender document in 'Chapter-VI: Annexures'.

2.9. The bidder should not be blacklisted by any office / department of Central / State Government / Public Undertaking etc. The bidder should submit the undertaking form as per 'Annexure-VI' enclosed with this tender document in 'Chapter-VI; Annexures'.

(On bidder/firm's letterhead)

SCHEDULE – A

PROFILE AND DETAILS OF THE BIDDER

1.	Name of the firm	:
2.	a) Address of the firm	:
	b) Telephone No.	:
	c) Mobile No. of Contact Person	:
	d) Valid email id:	
	e) Branch Office if any, in Hyderabad.	:
3.	Type of Organization (Proprietorships / Partnership) Ltd. Co. / Co-Operative) (Copy of relevant document to be enclosed)	:
4.	Firm Registration Details:	:
	a) Year of Establishment / Date of Incorporation	
	b) Registration No.	
	c) GST Registration No.	
	d) Income Tax No. (PAN)	
	e) Labour License Details	
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	:

SCHEDULE – B

DETAILS OF ELIGIBLE SIMILAR NATURE OF WORKS COMPLETED DURING THE LAST SEVEN YEARS ENDING PREVIOUS DAY OF LAST DAY OF SUBMISSION OF TENDERS

(I) Major Works: "BMS works" (Copies of work orders alongwith BOQ and completion certificates are to be provided)

- Three similar completed works each costing not less than **Rs.9.68 Lakhs**, or
- Two similar completed works each costing not less than **Rs.14.53 Lakhs**, or
- One similar completed work costing not less than **Rs.19.37 Lakhs**.

Sr. No.	Name of work/ project and location	Description of work in brief	Name of the Engineer with full postal address.	Name of the client, also specify whether Govt. / Semi Govt. / Pvt. body with full postal address	Contract Amount in (Rs.)	Year of commencement	Date of Completion		Whether work was completed /uncompleted/ the contract was terminated from either side? Give Details.	Any other relevant information
							Stipulated Date	Actual Date		
1.										
2.										

(II) List of works / projects under execution above **Rs.9.68 Lakhs**.

Sr. No.	Name of work/ project and location	Description of work in brief	Name of the Engineer with full postal address.	Name of the Client, also specify whether Govt. or semi Govt. or Pvt. Body with full postal address	Contract Amount in (Rs.)	Stipulated date of work completion	Present stage of work; Slow progress if any, and reasons thereof	Any other relevant information
1.								
2.								
3.								

SCHEDULE – C

TECHNICAL PERSONNEL AND THEIR SPECIFIC EXPERIENCE

1. List of technical personnel in your establishment and give details about their technical qualification and experience:

Sr. No.	Name	Age	Qualification	Project Experience	Nature of works handled	Name of the project Handled	Date of employment in your organization	Indicate specific experience in "BMS Works" which he/she was employed
1								
2								

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

(On bidder/firm's letterhead)

SCHEDULE – D

FINANCIAL POSITION AND WORKING RESULTS

				2022-23	2023-24	2024-25
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)			

(Authorised Signatory)

(On bidder/firm's letterhead)

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 officials of Organizations preferably Govt./Semi Govt/ Autonomous/ Public Sector Organization for whom you have executed important and major process chillers and related works 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.	:

CHAPTER- III TERMS & CONDITIONS OF THE CONTRACT

1. Validity Period of Tender:

1.1. The validity period for acceptance of tender shall be of 75 (Seventy Five) from the last day of receipt of technical bid, further

(a) If any tenderer withdraws his tender or makes any modification in the terms & conditions of the tender which is not acceptable to TIFR within 7 days after the last date of submission of bids, then the TIFR shall without prejudice to any other right or remedy, be at liberty to forfeit 50% of earnest money absolutely irrespective of whether a letter of acceptance for the work is issued or not.

(b) If any tenderer withdraws his tender or makes any modification in the terms & conditions of the tender which is not acceptable to TIFR after expiry of 7 days after last date of submission of bids, then TIFR shall without prejudice to any other right or remedy, be at liberty to forfeit 100% of the earnest money absolutely irrespective of whether a letter of acceptance for the work is issued or not.

2. Acceptance of Tender:

2.1. 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.

2.2. “Letter of Intent”: A “Letter of Intent (LOI)” will be issued as an intimation to the successful tenderer / contractor that his/her tender has been accepted and the successful tenderer / contractor should submit the requirements within the due date specified in the LOI.

3. Performance guarantee:

3.1. The successful tenderer / contractor shall submit an irrevocable Performance Guarantee (PG) amounting to 5% of the contract value within 7 (seven) working days from the date of issue of the “Letter of Intent (LOI)” in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement.

3.2. The performance guarantee shall be in the form of Demand Draft / Pay Order / Banker’s cheque / Government Securities / Fixed Deposit Receipt (FDR) or Guarantee Bonds 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.

3.3. The Performance Guarantee shall be initially valid up to the stipulated date of completion period plus 60 days beyond the date of completion of all contractual obligations of the contractor

including warranty obligations. 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.

3.4. The letter for commencement of work / work order shall be issued to the contractor only after he/she submits the performance guarantee in an acceptable form within 7 (seven) working days from the date of issue of the "Letter of Intent (LOI)".

3.5. 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.

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

(a) Failure by the contractor to extend the validity of the Performance Guarantee as described herein above (or) 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.

3.7. In the event of the contract being determined or rescinded 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.

4. Security Deposit:

4.1. The successful tenderer / contractor shall also be required to submit a Security Deposit (SD) amounting to 2.5% of the contract value within 7 (seven) working days from the date of issue of the "Letter of Intent (LOI)" in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement.

4.2. The Security Deposit shall be in the form of Demand Draft / Fixed Deposit Receipt (FDR).

4.3. Security Deposit shall be initially valid up to one year from the date of completion of work. 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.

4.4. 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.

5. Signing of Work Order and Contract / Agreement:

5.1. The Notice Inviting Tender (NIT) and all the documents including drawings, if any, forming the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto shall form a part of the work order / contract document.

5.2. A 'Work Order' will be issued to the successful tenderer / contractor fulfilling the provisions contained / issued in the "Letter of Intent (LOI)".

5.3. The successful tenderer / contractor within 7 days from receipt of 'Work Order' shall provide his/her acceptance by signing the work order and contract / agreement as per the provisions/requirements issued in the 'Work Order'.

5.4. Each page of the Work Order and Contract / Agreement and all the documents attached to it shall be signed by both the Engineer-in-Charge or his authorized representative and the contractor, as per the conditions of the NIT and Work Order.

5.5. The Contractor shall commence work immediately after signing the Work Order and Contract / Agreement.

5.6. No payment for the work done will be made unless the Work Order and Contract / Agreement is signed by the contractor.

6. Levy / Taxes payable by contractor:

6.1. GST or any other tax, levy or Cess in respect of input for or output by this contract shall be payable by the contractor and TIFR shall not entertain any claim whatsoever in this respect.

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

7. Deduction of Income Tax: Income Tax deductions shall be made from all payments made to the Contractor as per rules and regulations in force, in accordance with the Income Tax Act, 1961 under section 194-C prevailing from time to time.

8. Work at Site:

8.1. 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.

8.2. Work at the TIFR, Hyderabad's premises shall be carried out at such time as the TIFR, Hyderabad may approve but the TIFR, Hyderabad 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.

8.3. 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.

8.4. 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.

9. Delays: The Contractor/Supplier shall not be entitled to claim any compensation for any loss suffered by him on account of delays in commencing or executing the work, including delays in procuring Government controlled or other materials and delay in obtaining instructions and decisions from the Engineer-in-Charge.

10. Taking Over: The equipment when erected at site shall be deemed to have been taken over by TIFR, Hyderabad when the Engineer-in-Charge will have certified in writing that the equipment has fulfilled the contract conditions.

11. Extension of Time: The time allowed for the execution of works as specified in para "Scope & Objective" above shall be the essence of the contract. If the work is hindered by the Contractor by any reasons, the Contractor should immediately give notice thereof in writing to the Engineer-in-Charge seeking extension of time within 14 days of the happening of the event causing delay in prescribed forms i.e. A form of application by the contractor for seeking extension of time (Annexure –V) to the authority is appended with this tender in "Chapter-VI: Annexures". The authority/Engineer-in-Charge shall, if justified, give a fair and reasonable extension of time for completion of work after due consideration of the same within 30 days of the date of receipt of such request from the Contractor in prescribed form.

12. Liquidated Damages:

12.1. For all delays, which do not merit any extension of time, the Contractor/ Supplier shall pay penalty or Liquidated Damages (LD) to the TIFR, Hyderabad at the rate of 1% of the contract value per week for delay in completion of work subject to the maximum 10 per cent of the contract value.

12.2. 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. 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 TIFR, Hyderabad under clause: 'Termination of Contract by the TIFR, Hyderabad'. After that the same shall be completed by the TIFR, Hyderabad at the Contractor's/Supplier's risk and cost.

13. Other Damages and Insurance:

13.1. Contractor's workmen / employee's Insurance: The Contractor/Supplier/Manufacturer shall be responsible for providing insurance for his/her workmen / employees engaged in performance of the contract. TIFR, Hyderabad shall not be liable in respect of any damages or compensation payable at law in respect of or in consequence of any accident or injury to any workman or any other person employed by the contractor and the Contractor shall indemnify and keep indemnified TIFR, Hyderabad against all such damages and compensation and against all claims, demands, proceedings, costs, charges & expenses, whatsoever in respect of or in relation thereof.

13.2. The Contractor/Supplier/Manufacturer shall also indemnify the TIFR, Hyderabad against all claims which may be made upon the TIFR, Hyderabad 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. The contractor shall furnish a copy of the labor license before commencement of work. If the aforesaid are not applicable, the contractor should furnish declaration to this effect and shall indemnify TIFR, Hyderabad, for violation of any such compliances.

13.3. "Contractor's All Risk (CAR)" insurance: The Contractor shall insure the work for a sum equivalent to the Contract value together with materials and plants for incorporation therein, to the full replacement cost by providing the CAR policy document before the commencement of work.

13.4. Any other Insurance(s) and Evidence: The Contractor/Supplier/Manufacturer shall also at his own cost carry and maintain any and all other insurance(s) which may be required for the Contractor's Equipment and other things brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.

13.5. 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.

13.6. The Contractor/Supplier/Manufacturer shall indemnify the TIFR, Hyderabad against all claims which may be made against the TIFR, Hyderabad, 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'.

13.7. 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 Sub-Contractor 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 TIFR, Hyderabad 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.

13.8. The TIFR, Hyderabad, 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.

14. Guarantee and Defects Liability Period: 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 TIFR, Hyderabad. If the defects are not remedied within a reasonable time, the TIFR, Hyderabad may proceed to do so at the Contractor's/Supplier's risk and expense without prejudice to any other rights.

15. Terms of Payment:

15.1. BILL FORMAT

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

NOTE:

- All quantities in the bill should be cumulative.
- All measurements should be in the order of tender or work order sequence and should be recorded in the measurement book. The Measurement should be provided strictly in the below mentioned format only.
- The contractor will be paid only Two Running Account (RA) Bills 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.

15.2. MEASUREMENT FORMAT

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

NOTE:

- 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.

15.3. Final Payment:

Payments of Final bill shall be made 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.

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

16.1. Scope:

16.1.1. 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.

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

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

16.2. Inspection & Testing and commissioning of Material:

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

16.2.2. All the materials shall be tested at factory as per IS Specifications of material by TIFR, Hyderabad's Engineer-in-Charge/Engineers before dispatch at the cost of Contractor/Manufacturer/Supplier.

16.2.3. 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.

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

16.4. Taxes & Duty:

16.4.1. 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.

16.4.2. 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.

16.4.3. 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.

16.5. Delivery of Material:

16.5.1. 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 work order number and detail of the contents.

16.5.2. All the materials must be delivered at site i.e. 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.

16.5.3. Material must be delivered at site in all respects as mentioned in the work order prior approval of the respective technical data sheet /pre dispatch inspection report by TIFR, Hyderabad E.I.C.

16.6. 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.

16.7. 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 TIFR, Hyderabad or not.

16.8. 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.

16.9. 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.

16.10. Rejection of Defective Equipment:

16.10.1. 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 TIFR, Hyderabad, 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 TIFR, Hyderabad, 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 TIFR, Hyderabad 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 TIFR, Hyderabad 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 TIFR, Hyderabad 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 TIFR, Hyderabad readily procurable, such opinion being final, then with the nearest substitutes.

16.10.2. In the event of such rejection the TIFR, Hyderabad 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.

16.11. 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.

16.12. Intimation about Delivery:

If the TIFR, Hyderabad 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 TIFR, Hyderabad that he is ready to take delivery.

16.13. 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 TIFR, Hyderabad, the TIFR, Hyderabad 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 TIFR, Hyderabad may incur towards erection. The Contractor/Supplier shall, however not be entitled to any gain due to such an action by the TIFR, Hyderabad.

16.14. 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.

16.15. 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.

16.16. Termination of Contract by the TIFR, Hyderabad:

16.16.1. 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 TIFR, Hyderabad that the Contractor/Supplier –

16.16.1.1. has abandoned the Contract, or
16.16.1.2. 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
16.16.1.3. 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
16.16.1.4. 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
16.16.1.5. 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
16.16.1.6. 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 TIFR, Hyderabad 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.

16.16.2. 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 TIFR, Hyderabad 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.

16.16.3. If the Contractor/Supplier shall fail to comply with the requirements of said notice for seven days after such notice has been given, the TIFR, Hyderabad 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 TIFR, Hyderabad 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.

16.16.4. 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 TIFR, Hyderabad 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.

16.16.5. 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 TIFR, Hyderabad 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 TIFR, Hyderabad shall not be responsible for any loss sustained by the Contractor/Supplier from the sale of the equipment and material.

16.17. Contractor's Representative:

The Contractor/Supplier shall employ at least one qualified representative (i.e. Air compressor work supervisor License 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.

16.18. Completion Time:

Unless otherwise agreed in writing between the TIFR, Hyderabad 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 Order issued to Contractor/Supplier by the TIFR, Hyderabad.

16.19. 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.

16.20. 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.

16.21. Spare Parts & Manuals:
Manufacturer/Contractor/Supplier should submit operation, maintenance and spare part list and manuals for all equipment.

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

16.23. 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.

16.24. 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.

16.25. 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. TIFR, Hyderabad shall assist in providing required declarations. Statutory fees shall be paid by the TIFR, Hyderabad.

16.26. Guarantee (Equipment):
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 TIFR, Hyderabad.

CHAPTER-IV SPECIFICATIONS AND ALLIED TECHNICAL DETAILS

1. GENERAL

1.1. BMS GENERAL DESCRIPTION

1.1.1. The Building Management System (BMS) shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the BMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN. The Building Automation LAN Network shall be completely separate & independent to any other IT or LAN Network of the Building Services.

1.1.2. Any and all components of the BMS that are connected via field bus or IP network, including the network controllers, field controllers, application specific controllers, server and user interface software, system and controller programming tools and software applications shall be designed, engineered, and tested to work together as a complete building management system, and shall be manufactured by the same BMS manufacturer. Systems that use or require network controllers, field controllers, application specific controllers, server and user interface software, programming tools and software from more than one BMS manufacturer shall not be accepted.

1.1.3. All points of user interface shall be on standard PCs that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.

1.1.4. Where necessary and as dictated elsewhere in these Specifications, Servers shall be used for the purpose of providing a location for extensive archiving of system configuration data, and historical data such as trend data and operator transactions. All data stored will be through the use of a standard database platform: Microsoft SQL Server Express or Microsoft SQL Server as dictated elsewhere in this specification.

1.1.5. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.

1.1.6. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.

1.1.7. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.

1.1.8. Manage and coordinate the BMS work in a timely manner in consideration of the Project schedules. Coordinate with the associated work of other trades so as to not impede or delay the work of associated trades.

1.1.9. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:

a. Operator information, alarm management and control functions.
b. Enterprise-level information and control access.
c. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
d. Diagnostic monitoring and reporting of BMS functions.
e. Offsite monitoring and management access.
f. Energy management
g. Standard applications for terminal HVAC systems.
h. [Indoor Air Quality monitoring and control]

1.1.10. Communication between the BMS, the control panels and any work-stations shall be over a high speed TCP/IP network. All nodes on this network shall be peers. The operator shall not have to know the panel identifier or location to view or control an object. Application Specific Controllers shall be constantly scanned by the network controllers to update point information and alarm information.

1.1.11. The Utilities Scope and Integration -

The proposed Building Management System should be capable of controlling / monitoring of following major significant building utilities:

a) Heating, ventilation & air-conditioning (HVAC) system

The BMS system shall also able to map the other **third party System via integration for control and monitoring purpose,** wherever possible as per current Mechanical Services. Few are listed below:

1. VFDs
2. VRF Equipments

The Intelligent Building Management System software package shall equipped with minimum requirements as per mentioned below (SOFTWARE IS AVAILABLE WITH TIFR);

1. Complete system operation software.
2. Active graphics software.
3. Alarm indication software.

2. TECHNICAL SPECIFICATIONS

2.1. General Description

2.1.1. The Building Management System (BMS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third-party devices and applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.

2.1.2. The Building Management System shall consist of the following:

a. Standalone Network Automation / Supervisory Controller(s)
b. Field Level DDC Controller(s)
c. Input/ Output Module(s)
d. Local Display Device(s)
e. Portable Operator's Terminal(s)
f. Distributed User Interface(s)
g. Network processing, data storage and communications equipment
h. Other components required for a complete and working BMS

The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.

2.1.3. Use of any External dongle is strictly prohibited due to owner’s license protection & user rights. The BMS System Software should not get uploaded by any external dongle & Owners right shall not be dependent on any external dongle.

2.1.4. Soft points count shall be unlimited in the software. If any of the vendor have the limitation then the installing software shall have minimum 6000 nos of hard + soft point licenses to provide the future expansion without any extra cost implication.

2.1.5. The supplied software must support minimum 5 Nos of Concurrent Users.

2.1.6. Any software getting used for the project shall be installed locally in the supplied server only. Cloud based application will not be accepted.

2.1.7. The supplied software shall have the remote System Access via mobile or web shall be for unlimited no. of users. No add-on software shall be accepted for the same.

2.1.8. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

a. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
b. The System shall maintain all settings and overrides through a system reboot.

2.1.9. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

2.1.10. The System shall comply with (UL) 864 (UUKL) Ninth Edition Smoke Control Listing including the UL 864 Ninth Edition Standard for Control Units and Accessories for Fire Alarm Systems.

2.1.11. The System shall comply with the following NFPA Codes and Standards as applicable:

a. NFPA 70 National Electrical Code

b. NFPA 72 National Fire Alarm Code

c. NFPA 101 Life Safety Code

d. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilation Systems

e. NFPA 92B Guide for Smoke Management Systems in Malls, Atria, and Large Areas

2.1.12. The System shall comply with the following International Code Council (ICC) Codes:

a. Building Officials and code Administrators International (BOMA) model code

b. International Conference of Building Officials (ICBO) model code

c. Southern Building Code Congress International (SBCCI) regulations

d. Acceptable Manufacturers

2.2. BMS Server Hardware

The server hardware shall comply with the following hardware specifications given in the BOQ.

2.3. BMS SYSTEM - SOFTWARE & PRODUCT DESCRIPTION:

2.3.1. BMS SYSTEM ARCHITECTURE

The system architecture shall be as follows:

A. Automation Network

- The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard “off the shelf” products available through normal PC vendor channels.
- The BMS shall network multiple user interface clients, automation engines, system controllers and application-specific controllers. Provide application and data server(s) as required for systems operation.
- All BMS devices on the automation network shall be capable of operating at a communication speed of 100 Mbps, with full peer-to-peer network communication.
- Supervisory Engine / Controller shall reside on the automation network.
- The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

B. Control Network

- Network Controller shall provide supervisory control over the control network and shall support all three(3) of the following communication protocols:

i. BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9

(a) The Supervisory Controller shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.

(b) The Supervisory Controller shall be tested and certified as a BACnet Building Controller (B-BC).

ii. Lon Works enabled devices using the Free Topology Transceiver (FTT-10a).

a. Control networks shall provide either “Peer-to-Peer,” Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.
b. DDC Controllers shall reside on the control network.
c. Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135
d. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus
e. The PICS shall be submitted 10 days prior to bidding.
f. *The Control Network on single bus can go upto 1500 Mtr on 22AWG without repeater.*

C Integration

a. Hardwired

i. Analog and digital signal values shall be passed from one system to another via hardwired connections.

ii. There will be one separate physical point on each system for each point to be integrated between the systems.

b. Direct Protocol (Integrator Panel)

i. The BMS system shall include appropriate hardware equipment and software to allow bi-directional data communications between the BMS system and 3rd party manufacturers’ control panels. The BMS shall receive, react to, and return information from multiple building systems, including but not limited to the chillers, boilers, variable frequency drives, power monitoring system, and medical gas.

ii. All data required by the application shall be mapped into the Automation Engine’s database, and shall be transparent to the operator.

iii. Point inputs and outputs from the third-party controllers shall have real-time interoperability with BMS software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and Local Area Network Communications.

c. BACnet Protocol Integration - BACnet

i. The neutral protocol used between systems will be BACnet over Ethernet and comply with the ASHRAE BACnet standard 135-2008.
ii. A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.

iii. The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

D. User Interface

Dedicated Web Based User Interface

a. Where indicated on plans the BMS Contractor shall provide and install a personal computer for command entry, information management, network alarm management, and database management functions. All real-time control functions, including scheduling, history collection and alarming, shall be resident in the BMS Supervisory Controller to facilitate greater fault tolerance and reliability.

b. Dedicated User Interface Architecture – The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.

i. Microsoft Internet Explorer for user interface functions

ii. Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions

iii. Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports

iv. Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries

c. All features and functions of the dedicated user interface previously defined in this document shall be available on any computer connected directly or via a wide area or virtual private network (WAN/VPN) to the automation network and conforming to the following specifications.

d. The software shall run on the Microsoft Internet Explorer (6.0 or higher) browser supporting the following functions:

i. Configuration

ii. Commissioning

iii. Data Archiving

iv. Monitoring

v. Commanding

vi. System Diagnostics

E. Site Management User Interface Application Components

1) OPERATOR INTERFACE

i. An integrated browser based client application shall be used as the user operator interface program.

ii. The System shall employ an event-driven rather than a device polling methodology to dynamically capture and present new data to the user.

iii. All Inputs, Outputs, Set-points, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.

iv. The user interface software shall provide help menus and instructions for each operation and/or application.

v. The system shall support customization of the UI configuration and a home page display for each operator.

vi. The system shall support user preferences in the following screen presentations:

- Alarm
- Trend
- Display
- Applications

vii. All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: set-points, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.

viii. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:

· User access for selective information retrieval and control command execution
· Monitoring and reporting
· Alarm, non-normal, and return to normal condition annunciation
· Selective operator override and other control actions
· Information archiving, manipulation, formatting, display and reporting
· BMS internal performance supervision and diagnostic
· On-line access to user HELP menus
· On-line access to current BMS as-built records and documentation
· Means for the controlled re-programming, re-configuration of BMS operation and for the manipulation of BMS database information in compliance with the prevailing codes, approvals and regulations for individual BMS applications

ix. The system shall support a list of application programs configured by the users that are called up by the following means:
· The Tools Menu
· Hyperlinks within the graphics displays
· Key sequences

x. The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.

2) NAVIGATION TREES

- The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.
- Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.
- The navigation trees shall be “dockable” to other displays in the user interface such as graphics. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar. A simple keystroke will reattach the navigation to the primary display of the user interface.

3) ALARMS

i. Alarms shall be routed directly from Supervisory Controller to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:

· Log date and time of alarm occurrence.
· Generate a “Pop-Up” window, with audible alarm, informing a user that an alarm has been received.

· Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.

· Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.

· Configuration of which Supervisory Controller offline alarms are seen by each user

· Any attribute of any object in the system may be designated to report an alarm.

ii. The BMS shall annunciate diagnostic alarms indicating system failures and on-normal operating conditions.

iii. The BMS shall allow a minimum of 4 categories of alarm sounds customizable through user defined wav.files.

iv. The BMS shall annunciate application alarms at minimum, as required by Part 3.

4) REPORTS AND SUMMARIES

i. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:

- All points in the BMS
- All points in each BMS application
- All points in a specific controller
- All points in a user-defined group of points
- All points currently in alarm
- All points locked out
- All user defined and adjustable variables, schedules, interlocks and the like.

ii. Summaries and Reports shall be accessible via standard UI functions and not dependent upon custom programming or user defined HTML pages.

iii. Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.

iv. Provide the capability to view, command and modify large quantities of similar data in tailored summaries created online without the use of a secondary application like a spreadsheet. Summary definition shall allow up to seven user defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported. Summary viewing shall be available over the network using a standard Web browser.

v. Energy reports shall be configurable from predefined, preconfigured templates. Required includes but shall not be limited to:

- Energy Overview

- Load Profile
- Simple Energy Cost
- Consumption
- Equipment Runtime
- Electrical Energy
- Energy Production

vi. Reports shall be selectable by date, time, area and device. Each report shall include a color visual summary of essential energy information.

5) SCHEDULES

i. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:

- Weekly schedules
- Exception Schedules
- Monthly calendars

ii. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.

iii. It shall be possible to define one or more exception schedules for each schedule including references to calendars

iv. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.

v. Changes to schedules made from the User Interface shall directly modify the Supervisory Controller schedule database.

vi. Schedules and Calendars shall comply with ASHRAE SP135/2008 BACnet Standard.

vii. The Calendar object supports an option to add a reference to another Calendar Object that is designated to be the master for the facility. Any Supervisory and BAC calendars can be configured to reference a single master Global Calendar. Changes to the master global calendar are automatically synced with all calendars that are referenced.

Viii. Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.

ix. Software shall be provided to configure and implement optimal start and stop programming based on existing indoor and outdoor environmental conditions as well as equipment operating history

x. The system Solar Clock shall support the scheduling and energy management functions. The Solar Clock will calculate the sunrise, sunset, and sun angle values for a specified latitude and longitude. A time offset can also be specified. An example would be to use the Solar Clock object as a master to an interlock to turn lights on 30 minutes after sunset and off 30 minutes before sunrise.

6) SECURITY/PASSWORDS

i. Multiple-level passwords access protection shall be provided via roles and permissions. The feature will allow the system to base access on a user's job title or role and allow the user/manager access interface control, display, and database manipulation capabilities based on an assigned password.

ii. Roles may be copied and altered to meet specific roles and permissions based on the particular policies.

iii. Each user shall have the following: a (Local) user account name (with a maximum of 30 characters), a complex password or passphrase (with a min of 8 characters and a max of 50 characters), other user account policies (such as session timeout), timesheet access based on day of the week and time of day, and specific user view.

iv. The system shall allow each user to change his or her password at will.

v. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.

vi. A maximum of 150 categories may be used to determine or assign areas of responsibilities to each user account. A maximum of 13 (of the 150) named categories which are specifics such as "No Access, View, Advanced Review, Operate, Intervene, Diagnostic, Manage Item Events, Manage Every, and Configure Items".

vii. A minimum of 100 unique passwords shall be supported.

viii. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.

ix. Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility. Provide a minimum of 100 categories of systems to which individual operators may be assigned.

x. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.

xi. The system shall have the ability to provide a Department of Defense (DoD) specific warning banner for applicable sites that warns the user they are accessing a restricted site.

xii. After successful login to the Site Management Portal (SMP) the last time and date that user name was previously logged in is shown on the screen.

xiii. Each login attempt is recorded in the system Audit Log with the option to record the IP address of the PC that made the login.

7) SCREEN MANAGER

i. The system will allow a customized image on the login screen (i.e. organization name, logo).

ii. User View navigations can be displayed as either a set of tabs or a drop down list.

iii. Allows user preference for assigning of a background color for when an object is Out of Service which will enable the operator to quickly distinguish points that have been commanded to this state.

iv. The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.

8) DYNAMIC COLOR GRAPHICS

i. The graphics application program shall be supplied as an integral part of the User Interface. Browser or Workstation applications that rely only upon HTML pages shall not be acceptable.

ii. The graphics applications shall include a create/edit function and a runtime function. The system architecture shall support an unlimited number of graphics documents (graphic definition files) to be generated and executed. The graphics shall be able to display and provide animation based on real-time data that is acquired, derived, or entered.

iii. Graphics runtime functions – A maximum of 16 graphic applications shall be able to execute at any one time on a user interface or workstation with 4 visible to the user. Each graphic application shall be capable of the following functions:

- All graphics shall be fully scalable
- The graphics shall support a maintained aspect ratio.
- Multiple fonts shall be supported.
- Unique background shall be assignable on a per graphic basis.
- The color of all animations and values on displays shall indicate the status of the object attribute.
- Graphics that represent buildings or systems shall allow natural links and transitions between related detailed tabular views of data that complement the graphic.

iv. Operation from graphics – It shall be possible to change values (set-points) and states in system controlled equipment directly from the graphic.

v. Floor Plan graphics – The user interface shall provide graphic applications that summarize conditions on a floor. Floor plan graphics shall indicate thermal comfort using dynamic colors to represent zone temperature deviations from zone set-point(s). Floor plan graphics shall display overall metrics for each zone in the floor.

vi. Aliasing – Many graphic displays representing part of a building and various building components are exact duplicates, with the exception that the various variables are bound to different field values. Consequently, it shall be possible to bind the value of a graphic display to aliases, as opposed to the physical field tags.

vii. Graphic editing tool – A graphic editing tool shall be provided that allows for the creation and editing of graphic files. The graphic editor shall be capable of performing/defining all animations, and defining all runtime binding.

- The graphic editing tool shall provide a library of standard HVAC equipment, floor plan, lighting, security and network symbols.

- The graphic editing tool shall provide for the creation and positioning of library symbols by dragging from tool bars or drop-downs and positioning where required.

- The graphics editing tool shall permit the importing of AutoCAD drawings for use in the system.

- The graphic editing tool shall be able to add additional content to any graphic by importing images in the SVG, PNG or JPG file formats.

9) HISTORICAL TRENDING AND DATA COLLECTION

i. Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:

- Any point, physical or calculated, may be designated for trending. Two methods of collection shall be allowed:

1. Defined time interval

2. Upon a change of value

- Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.

ii. Trend and change of value data shall be stored within the engine and uploaded to a dedicated trend database or exported in a selectable data format via a provided data export utility. Uploads to a dedicated database shall occur based upon one of the following: user-defined interval, manual command, or when the trend buffers are full. Exports shall be as requested by the user or on a time scheduled basis.

iii. The system shall provide a configurable data storage subsystem for the collection of historical data. Data can be stored in SQL database format.

iv. The system shall provide data to enable optimization capabilities including fault detection and diagnostics, advanced analytics and central plant optimization without the need of a gateway or additional hardware.

10) TREND DATA VIEWING AND ANALYSIS

i. Provide a trend viewing utility that shall have access to all database points.

ii. It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.

iii. The trend viewing utility shall have the capability to define trend study displays to include multiple trends

iv. Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.

v. Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.

vi. Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.

vii. The Display shall support the user's ability to change colors, sample sizes, and types of markers.

11) DATABASE MANAGEMENT

i. Where a separate SQL database is utilized for information storage the System shall provide a Database Manager that separates the database monitoring and managing functions by supporting two separate windows.

ii. Database secure access shall be accomplished using standard SQL authentication including the ability to access data for use outside of the Building Automation application.

iii. The database managing function shall include summarized information on trend, alarm, event, and audit for the following database management actions:

- Backup
- Purge
- Restore

iv. The Database Manager shall support four tabs:

- Statistics – shall display Database Server information and Trend, Alarm (Event), and Audit information on the BMS System Databases.

- Maintenance – shall provide an easy method of purging records from the BMS System Server trend, alarm (event), and audit databases by supporting separate screens for creating a backup prior to purging, selecting the database, and allowing for the retention of a selected number of day's data.

- Backup – Shall provide the means to create a database backup file and select a storage location.

- Restore – shall provide a restricted means of restoring a database by requiring the user to log into an Expert Mode in order to view the Restore screen.

v. The Status Bar shall appear at the bottom of all BMS Software Database Manager Tabs and shall provide information on the current database activity. The following icons shall be provided:

- Ready
- Purging Record from a database
- Action Failed
- Refreshing Statistics
- Restoring database
- Shrinking a database
- Backing up a database
- Resetting internet information Services
- Starting the BMS System Device Manager
- Shutting down the BMS System Device Manager
- Action successful

vi. The Database Manager monitoring functions shall be accessed through the Monitoring Settings window and shall continuously read database information once the user has logged in.

vii. The System shall provide user notification via taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

viii. The Monitoring Settings window shall have the following sections:

- General – Shall allow the user to set and review scan intervals and start times.

- Email – Shall allow the user to create and review e-mail and phone text messages to be delivered when a Warning or Alarm is generated.

- Warning – shall allow the user to define the Warning limit parameters, set the Reminder Frequency, and link the e-mail message.

- Alarm – shall allow the user to define the Alarm limit parameters, set the Reminder Frequency, and link the e-mail message.

- Database login – Shall protect the system from unauthorized database manipulation by creating a Read Access and a Write Access for each of the Trend, Alarm (Event) and Audit databases as well as an Expert Mode required to restore a database.

ix. The Monitoring Settings Taskbar shall provide the following informational icons:

- Normal – Indicates by color and size that all databases are within their limits.

- Warning - Indicates by color and size that one or more databases have exceeded their Warning limit.

- Alarm - Indicates by color and size that one or more databases have exceeded their Alarm limit.

x. The System shall provide user notification via Taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

BMS System User Interface

i. BMS Contractor shall provide and install all computer hardware and software required for the purpose of configuration and consolidation of information and programs required for the delivery of a Task Focused, Web Based Portal to the BMS. The BMS System User Interface shall provide a natural, complementary extension to the B site management user interface previously described.

ii. The user interface architecture shall be implemented to conform to industry standards, so that is can accommodate the required applications provided by the BMS Contractor as well as communicate information to and from any size control system.

iii. The exact same user interface shall be accessible from any type of personal computer or mobile device running any type of operating system (ex. iOS, Android, Windows).

iv. The interface shall automatically adapt and optimize the information displayed to fit the screen size of the client device and shall also be touch friendly.

v. The user interface shall organize and display information using customer specific locations and spaces. At a minimum, the user interface shall provide:

· Organization of all space, equipment and point information in a familiar way, reducing the need for extensive training prior to use.

· A navigation mechanism for users to select the specific location or space to display information for – only spaces and locations in the navigation tree, nothing more.

· The ability to search for and/or bookmark any location or space by name for quick access to critical or troublesome areas.

· The same navigation mechanisms apply across any client device (ex. Smart phone, tablet, personal computer) for consistency and ease of use.

vi. Plug-ins and special native app software (ex. Downloaded and installed from an app store) shall not be required to conduct daily operations of buildings and equipment.

vii. The user interface shall clearly display equipment relationships without custom graphic generation.

viii. The user interface shall provide a single display of all potential issues in a facility including items currently in alarm, warning, override, out-of-service and offline.

ix. The user interface shall provide a single display of all activity related to a specific piece of equipment including user changes, discarded user changes, pending alarms, discarded alarms and acknowledged alarms.

x. The user interface shall provide support for up to 100 concurrent users from an unlimited number of individuals with defined password access to the system.

xi. Provide the capability to view, command and modify large quantities of similar data in tailored summaries without the use of a secondary application, like a spreadsheet. These summaries shall be automatically generated or user defined. User defined summaries shall allow up to seven user defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported.

D. READY ACCESS PORTAL USER INTERFACE

i. BMS Contractor shall provide and install all computer hardware and software required for the purpose of configuration and consolidation of information and programs required for the delivery of a Task Focused, Web Based Portal to the BMS. The Ready Access Portal shall provide a natural, complementary extension to the BMS site management user interface previously described.

ii. Ready Access Portal Architecture – The architecture of the system shall be implemented to conform to industry standards, so that it can accommodate the required applications provided by the BMS Contractor as well as communicate information to and from the BMS system Site Director.

E. User Interface Application Components

a. The ready access portal shall provide an intuitive user interface to key BMS Software functions and tasks via web browser.

b. Plug-ins or special software shall not be required for access to alarm, summary, schedule and trend data.

c. The portal shall include the ability to view full graphical representations of systems and equipment on PC platforms

d. The control system shall provide Secure Sockets Level (SSL) and Active Directory service support. If the Active Directory service and Single Sign-On features are enabled and the user is logged in to the Windows desktop, the login screen does not appear and access to the system is automatic.

e. Provide a common tool for graphics creation, schedule creation, custom programming, user access and hardware definition

f. Information shall be accessible on both personal computer and handheld device platforms as follows:

· Personal computers – Internet Explorer Version 7.0 recommended

· Handheld devices – Internet Explorer for Window Mobile Version 5.0 or 6.0 recommended, as well as Apple i-Phone, i-Touch, or i-Pad. UI is optimized for devices with a 240 x 320 pixel screen size (QVGA).

F. Operator Interface

g. Password access shall be as described previously for management portal UI

h. Once logged in, the System shall display a pre-selected screen tailored to the task requirements of the individual user.

i. The User Interface shall utilize an intuitive navigation and display method designed for operators who access the system for casual information and control or on an infrequent basis. It shall feature three basic components.

· Radio buttons for selection of the type of information to be displayed including Alerts, Summary, Schedules and Diagnostics

· Navigation tree for selection of the specific data to be displayed on screen for the selected type. The navigation tree may be hidden and expanded by the operator to optimize the display of information

- A display window that provides the selected information by type in a pre-configured tabular format

j. The user interface software shall provide help menus and instructions for each operation and/or application.

k. The system shall provide support for up to 100 concurrent users from an unlimited universe individuals with defined password access to the system

l. The system shall utilize Secure Sockets Level (SSL) support as required to allow the ready access portal to communicate across a network in a way designed to prevent eavesdropping, tampering, and message forgery. It provides endpoint authentication and communications privacy over the network using cryptography

m. The system shall have the capability to display multiple navigation trees that correspond to the user views configured in the management portal UI.

n. The alert summary of the ready access portal shall, at the minimum, provide the following information

- Alert (Alarm) type
- Date and time of alert occurrence
- Priority (color coded to level)
- Item name.
- Item value (if applicable)
- Message
- Any attribute of any object in the system may be designated to report an alarm

o. A standard summary on the ready access portal shall, at the minimum, provide the following information

- Point type graphic icon
- Item name
- Item value
- Item status
- Access to the Change Value window (if applicable) for the purpose of setting, holding or releasing an item value

p. A custom summary on the ready access portal shall display user-specified summaries of key data sets that can be quickly filtered and sorted. Items within these custom summaries can be commanded.

q. A graphic view on the ready access portal shall display as described previously for management portal UI.

r. The schedule detail summary of the ready access portal shall, at the minimum, provide the following information

- Scheduled occurrences including time and value
- Scheduled overrides including start time, end time and value
- A list of all scheduled items including name and attribute, value, status and priority
- Access to the Add Temporary Override window for the purpose of adding a temporary override to the schedule

s. The diagnostic (trend) summary of the ready access portal as viewed on a personal computing device shall provide the following information.

- Item name
- Item status
- Trend name
- Trend status
- Full path name
- Access to trend detail summary including trended value, time and date arranged in a user selectable format of 1 hour, 12 hours, 24 hours, 48 hours or 72 hours

G. Integration Controller for 3rd party system:

a. The Network Integrator Controller shall be a fully user-programmable, supervisory controller. The Integration Controller shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Supervisory Controller.

b. Network Integration for Third-Party Device and Equipment - Integration Controller shall able to integrate power and energy meters, lighting, HVAC, security, access control, and many proprietary systems that communicate over Backnet protocol, M-Bus (EN1434-3) and KNX Bus.

c. Integration Controller shall leverage standard building management communication technologies, including:

. BACnet® protocol – The Integration Controller shall support the BACnet services and objects typically used by a workstation and a field controller device, including:

· BACnet alarm

· Scheduling

· Trend

· Event services.

ii. MS/TP FC Bus – The BACnet MS/TP Field Controller (FC) Bus is a standard peer-to-peer, multiple-master protocol in which each master device takes turns originating messages to pass to any device on the bus.

iii. LONWORKS® protocol – Integration Controller shall able to supervise LONWORKS devices if:

· The network interface follows current LONMARK® guidelines

· Uses the Free Topology Transceiver (FTT10).

iv. N2 Bus protocol –Integration Controller shall able to supervise N2 Bus as well.

v. Modbus® – Integration Controller shall support both Modbus RTU (RS-485, RS-232) and Modbus TCP/IP connectivity.

vi. M-Bus (EN 1434-3) M-Bus (Meter Bus) is a European standard (EN 1434-3) that applies to heat meters.

vii. KNX protocol – KNX Bus is used to control lighting, blinds and shutters, heating, and attendance systems.

· KNX (KONNEX) was created from the EIB (European Installation Bus), BatiBUS, and EHS (European Home System) protocols.

· A KNX IP Gateway is required to connect an Integration Controller to a KNX network.

d. User Interface – Each Integration Controller shall have the ability to deliver a web based User Interface (UI) as previously described. All computers connected

physically or virtually to the automation network shall have access to the web based UI.

i. The web based UI software shall be imbedded in the Integration Controller. Systems that require a local copy of the system database on the user's personal computer are not acceptable.

Ii. The Integration Controller shall support a minimum of two (2) concurrent users.

iii. The Integration Controller shall have the capability of generating web based UI graphics. The graphics capability shall be imbedded in the Integration Controller.

iv. Systems that support UI Graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.

v. The web based UI shall support the following functions using a standard version of Microsoft Internet Explorer:

- Configuration
- Commissioning
- Data Archiving
- Monitoring
- Commanding
- System Diagnostics

vi. Systems that require workstation software or modified web browsers are not acceptable.

vii. The Integration Controller shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.

e. The Integration Controller shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.

f. The Integration Controller shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only, shall not be acceptable.

g. The Integration Controller shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

H. DDC System Controllers

1. Field DDC Controller

a. The DDC Controller shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol.

i. The DDC Controller shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.

· The DDC Controller shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.

· The DDC Controller shall be tested and certified as a BACnet Application Specific Controller (B-ASC).

· A BACnet Protocol Implementation Conformance Statement shall be provided for the DDC Controller.

· The Conformance Statement shall be submitted 10 days prior to bidding.

b. The DDC Controller shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.

c. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.

d. The DDC Controller shall include troubleshooting LED indicators to identify the following conditions:

i. Power On

ii. Power Off

iii. Download or Startup in progress, not ready for normal operation

iv. No Faults

v. Device Fault

vi. Field Controller Bus - Normal Data Transmission

vii. Field Controller Bus - No Data Transmission

viii. Field Controller Bus - No Communication

ix. Sensor-Actuator Bus - Normal Data Transmission

x. Sensor-Actuator Bus - No Data Transmission

xi. Sensor-Actuator Bus - No Communication

e. The DDC Controller shall accommodate the direct wiring of analog and binary I/O field points.

f. The DDC Controller shall support the following types of inputs and outputs:

i. Universal Inputs - shall be configured to monitor any of the following:

· Analog Input, Voltage Mode

· Analog Input, Current Mode

· Analog Input, Resistive Mode

· Binary Input, Dry Contact Maintained Mode

· Binary Input, Pulse Counter Mode

ii. Binary Inputs - shall be configured to monitor either of the following:

· Dry Contact Maintained Mode

· Pulse Counter Mode

iii. Analog Outputs - shall be configured to output either of the following

· Analog Output, Voltage Mode

· Analog Output, current Mode

iv. Binary Outputs - shall output the following:

· 24 VAC Triac

v. Configurable Outputs - shall be capable of the following:

· Analog Output, Voltage Mode

· Binary Output Mode

g. The DDC Controller shall have the ability to reside on a Field Controller Bus (FC Bus).

i. The FC Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.

ii. The FC Bus shall support communications between the DDC Controller and the Supervisory Controller.

iii. The FC Bus shall also support Input/ Output Module communications with the DDC Controller and with the Supervisory Contoller.

iv. The FC Bus shall support a minimum of 100 IOMs and DDC Controllers in any combination.

v. The FC Bus shall operate at a maximum distance of 15,000 Ft. between the DDC Controller and the furthest connected device.

h. The DDC Controller shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus).

i. The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard Protocol SSPC-135, Clause 9.

ii. The SA Bus shall support a minimum of 10 devices per trunk.

iii. The SA Bus shall operate at a maximum distance of 1,200 Ft. between the DDC Controller and the furthest connected device.

i. The DDC Controller shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the FC Bus or the SA Bus.

j. The DDC Controller shall support, but not be limited to, the following applications: Chilled water/central plant optimization applications including but not limited to:

· Selection and sequencing of up to eight chillers of different sizes

- Selection and sequencing of up to eight (each) primary and secondary chilled water pumps of varying pumping capacities
- Selection and sequencing of up to eight condenser water pumps
- Selection and sequencing of cooling towers and bypass valve, including single speed, multi-speed, and Vernier control
- Selection and sequencing of up to four heat exchangers, of different capacities
- A proven and documented central cooling plant optimization program that incorporates custom equipment efficiency profiles, without rewriting software code, in order to meet the building load using the least amount of energy as calculated.
- The use of advanced control algorithms that apply equipment specific parameters, including operational limits and efficiency profiles, in order to determine equipment start and runtime preferences
- Identification of the most efficient equipment combination and automatic control of state and speed of all necessary equipment to balance runtime, optimize timing and sequencing and ensure the efficiency and stability of the central cooling plant
- Control definition for the chiller plant in a single DDC Controller, as supported by available memory and point Input/ Output (I/O), or capable of being split across multiple DDC Controllers

i. Heating central plant applications

ii. Built-up air handling units for special applications

iii. Terminal & package units

iv. Special programs as required for systems control

k. BMS vendor shall furnish quantity for each type of controller (DDC/Supervisory Controller/Third party Integrator) considered.

l. The DDC panel shall be a vandal proof, lockable & secure MS powder coated Cabinets.

m. For Outdoor installations DDC panel should be IP65 rated weather proof housing

n. All Controller shall run on the UPS Power provided by Electrical Contractor as per design & instruction of BMS Contractor.

1.2 SENSORS & FIELD DEVICES:

A. Temperature Sensors:

General Requirements:

i. Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.

ii. The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.

iii. The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:
Accuracy given in the BOQ shall be followed. Type of sensor shall be selected accordingly. *Temperature Sensor enclosure/ cover should meet UL 1995 plenum requirements if applicable.*

Duct Temperature Sensors:

a. Room sensors shall be constructed for either surface or wall box mounting.

b. Room sensors shall have the following options when specified:

i. Set-point warmer/cooler dial or reset slide switch providing.

ii. Individual heating/cooling set-point slide switches.

iii. A momentary override request push button for activation of after-hours operation.

iv. Analog thermometer.

Duct Temperature & Humidity Sensors:

i. Duct sensors shall be provided with a sampling chamber.

ii. The Sensor shall tested and calibrated with equipment certified to be in compliance with National Institute of Standards and Technology (NIST) guidelines.

iii. 14-30 VDC or 20-30VAC @ 50Hz power supply, ambient temperature rating of 50 deg. C, protection class 65 and Pt 1000 sensing element.

iv. All Polymer Humidity Sensor shall provide Humidity Element accuracy better or equal to ±2% RH for 20 to ±80% RH at 77 deg F.

v. The Sensor shall also provide Temperature accuracy of ±0.2 deg C at 70 Deg F or better.

vi. Survival Operating Conditions range for the sensor shall -20 deg F to 140 deg F & 0-100% RH, 85 Deg F – Max Dew Point. Whether Ambient Range shall be 32 deg F to 140 deg F & 0-100% RH, 85 Deg F – Max Dew Point.

B. Differential Pressure Switch for blowers & filters:

a. IP 54 rated DP Switch shall cover in Polycarbonate housing with Glass reinforced polycarbonate case. The Diaphragm with Nitrile butadiene rubber & Switch shall be of Brass, Phosphor bronze, and Silver nickel material.

b. The DP Switch shall senses a change in the (differential) pressure (either velocity pressure or pressure drop across a restriction) as the airflow changes.

c. Pressure Set Point range should 10mbar with the differential of 0.5 mbar shall sustain on maximum continuous overpressure of 300mbar.

d. Storage Temperature range -35 to 40 Deg C & Humidity range 10 to 95% RH, non-condensing.

C. CABLING & CONDUIT:

i) SIGNAL / POWER CABLE

The cable running between DDC controllers to the field devices shall be termed as signal cabling. This FRLS Armored & shielded cable along shall be lay on I/O point mentioned in Data Point Summary basis. The Signal cable of 2C x 1Sqmm, 4C x 1Sqmm & 8C x 1Sqmm cable shall be of the following specifications:

Wire:	Annealed Tinned Copper
Size:	Minimum 1 sq. mm
No. of conductors:	Two (One pair), Four (two pair), Eight (Four Pair)
Jacket:	Chrome PVC
Nominal DCR:	17.6 ohm/km for conductor 57.0 ohm/km for shield
Nominal capacitance:	130 pF/m between conductors

ii) COMMUNICATION CABLE:

The cabling running between the system integration units to the DDC controllers & Sensors, Valves EM etc. This Armored & shielded cable shall be lay on I/O point mentioned in Data Point Summary basis. The

Communication Cable of 3C x 1Sqmm cable shall be of the following specifications:

Nominal capacitance:	130 pF/m between conductors
Wire:	Annealed Tinned Copper
Size:	Minimum 24 AWG stranded
No. of conductors:	Three (3 conductor)
Shielding:	Overall beld foil Aluminum polyester shield.
Jacket:	Chrome PVC
Nominal DCR:	78.7 ohm/km for conductor ohm/km for shield
Nominal capacitance:	131 pF/m between conductor

iii) CAT-6 UTP CABLE:

a) Cables should be dressed and terminated in accordance with the manufacturer's recommendations and/or best industry practices

b) Pair untwist at the termination should not exceed one-half an inch.

c) Bend radius of the cable in the termination area should not be less than 4 times the outside diameter of the cable.

d) The cable jacket should be maintained as close as possible to the termination point.

e) Cables should be neatly bundled and dressed to their respective panels or blocks. Each panel or block should be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

f) The distance between UTP data cable and any power cable should be more than 4 inches.

g) Each cable should be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view should not be acceptable.
Cables should be installed in continuous a) lengths from origin to destination (no splices).

IO SUMMARY

TIFR LAB - BMS SCHEME - IO SUMMARY												
S.No.	DESCRIPTION	Qty	DATA POINT TYPE					FUNCTION				
			DI	AI	DO	AO	SW	STATUS	ALARM	CONTROL	MONITOR	FIELD DEVICE
A	Air Cooled Chiller	2					20					
1	Chiller On/Off command				2							Chiller Panel
2	Chiller Run status		2					*				Chiller Panel
3	Chiller Fault/Alarm status		2						*			Chiller Panel
4	Chiller CHW Temperature Reset Set point					2				*		Chiller Panel
5	Chiller Current Limit Set point					2		*				Chiller Panel
6	Cooler outlet isolation valve Open/Close command				2			*				NO/NC Relay Command to Valve
7	Cooler outlet isolation valve Open/Close status		2					*				NO/NC Potential free contact from Valve
8	Common CHW supply header temperature			2				*				Temperature sensor
9	Common CHW return header temperature			2				*				Temperature sensor
B	Primary Chilled Water Pumps	2										
1	Pump Auto/Manual status		2					*				NO/NC Potential free contact from MCC Panel
2	Pump On/Off command				2							NO/NC Potential free contact from MCC Panel/Pump VFD

3	Pump run status		2					*				From DP Sensor / DP Switch
4	Pump trip status		2					*				NO/NC Potential free contact from MCC Panel
C	Secondary Variable Speed Pumps	2					20					
1	Pump Auto/Manual status							*				NO/NC Potential free contact from MCC Panel/Pump VFD
2	Pump On/Off command											NO/NC Potential free contact from MCC Panel/Pump VFD
3	Pump run status							*				From DP Sensor / DP Switch
4	Pump trip status							*				NO/NC Potential free contact from MCC Panel/Pump VFD
5	Pump VFD						*				*	Pump VFD
6	Pump Logic Controller						*				*	Pump Logic Controller
	Total for Chiller Plant		12	4	6	4						
	20% SPARE IN INDIVDIUAL IO'S & DDCs		2.4	0.8	1	1						
	GRAND TOTAL		14.4	4.8	7	5						
D	Air Handling Unit with EC Fans (Laser Hall - 3 no., Plasma Room - 2 no. & Service Corridor - 2 no.)	7										
1	AHU Enable/Disable				7							Command to

	Command											AHU Panel From BMS
2	AHU EC Fan Speed Control & Feedback			7		7	*				*	AHU Panel
3	AHU Auto/Manual Status		7					*				Auto /Manual Switch
4	AHU Run Status		7					*				Air Differential Pressure Switch
5	AHU Trip Status		7					*				From AHU Panel
6	AHU Pre Filter Status		7						*			Air Differential Pressure Switch
7	AHU Fine Filter Status		7						*			Air Differential Pressure Switch
8	Room HEPA Filter Status - 1 No.		7						*			Air Differential Pressure Switch
9	AHU Supply Air Temperature & RH			14					*		*	Duct Temperature Sensor
10	Room Air Temperature & RH - Hi Accuracy									*	*	Room Temperature & RH Sensor
11	Modulation of chilled water two way valve & feedback			7		7				*	*	Two way chilled water valve
12	Modulation of hot water three way valve & feedback			7		7				*	*	Three way hot water valve
13	Pan humidifier			7		7						Pan Humidifier
14	Motorised VCD at inlet and outlet on and off & feedback		14		14			*				Motorised VCDs
	Total for AHUs		56	42	21	28						
	20% SPARE IN INDIVDIUAL IO'S & DDCs		11.2	8.4	1	1						
	GRAND TOTAL		67.2	50.4	22	29						

E	Air Handling Unit with EC Fans (Diag Area)	1										
1	AHU Enable/Disable Command				1							Command to AHU Panel From BMS
2	AHU EC Fan Speed Control & Feedback			1		1	*			*	*	AHU Panel
3	AHU Auto/Manual Status		1					*				Auto /Manual Switch
4	AHU Run Status		1					*				Air Differential Pressure Switch
5	AHU Trip Status		1					*				From AHU Panel
6	AHU Pre Filter Status		1						*			Air Differential Pressure Switch
7	AHU Fine Filter Status		1						*			Air Differential Pressure Switch
8	AHU Supply Air Temperature & RH			2					*		*	Duct Temperature Sensor
9	Room Air Temperature & RH			2					*	*	*	Room Temperature & RH Sensor
10	Modulation of chilled water two way valve & feedback			1		1			*	*	*	Two way chilled water valve
11	Modulation of hot water three way valve & feedback			1		1			*	*	*	Three way hot water valve
	Total for AHUs		5	5	1	1						
	20% SPARE IN INDIVDIUAL IO'S & DDCs		1	1	1	1						
	GRAND TOTAL		6	6	2	2						
F	Hot Water Pumps	2										
1	Pump Auto/Manual		2					*				NO/NC

	status											Potential free contact from MCC Panel
2	Pump On/Off command				2							NO/NC Potential free contact from MCC Panel/Pump VFD
3	Pump run status		2					*				From DP Sensor / DP Switch
4	Pump trip status		2					*				NO/NC Potential free contact from MCC Panel
G	Others											
1	Room Air Temperature, RH & Room Differential Pressure - Hi Accuracy - With sensors inside and Display outside the room	2				6			*	*	*	Room Temperature & RH Display
2	Monitoring of Fire Damper Status	14										Soft Integration with fire damper panel
3	Hot Water Generators	2	2				20					Hot Water Generator
4	Circuit Breakers - On / Off / Trip	15	30									From Circuit Breakers
	Total for Hot Water Pumps & Others		38	0	2	6						
	20% SPARE IN INDIVDIUAL IO'S & DDCs		7.6	0	1	1						
	GRAND TOTAL		45.6	0	3	7						
H	Third Party Integration											
1	EC Fans	28					196				*	
2	VFDs	3					21				*	
3	Secondary Pump Logic Controller	1					20				*	
4	Integration of Chillers	3					45					

6	**Energy Meters**	**10**					**80**				*	
	Total IO Points		**111**	**51**	**30**	**39**	**362**					
	20% SPARE		**22.2**	**10.2**	**4**	**4**	**72.4**					
	GRAND TOTAL		**133.2**	**61.2**	**34**	**43**	**434.4**					

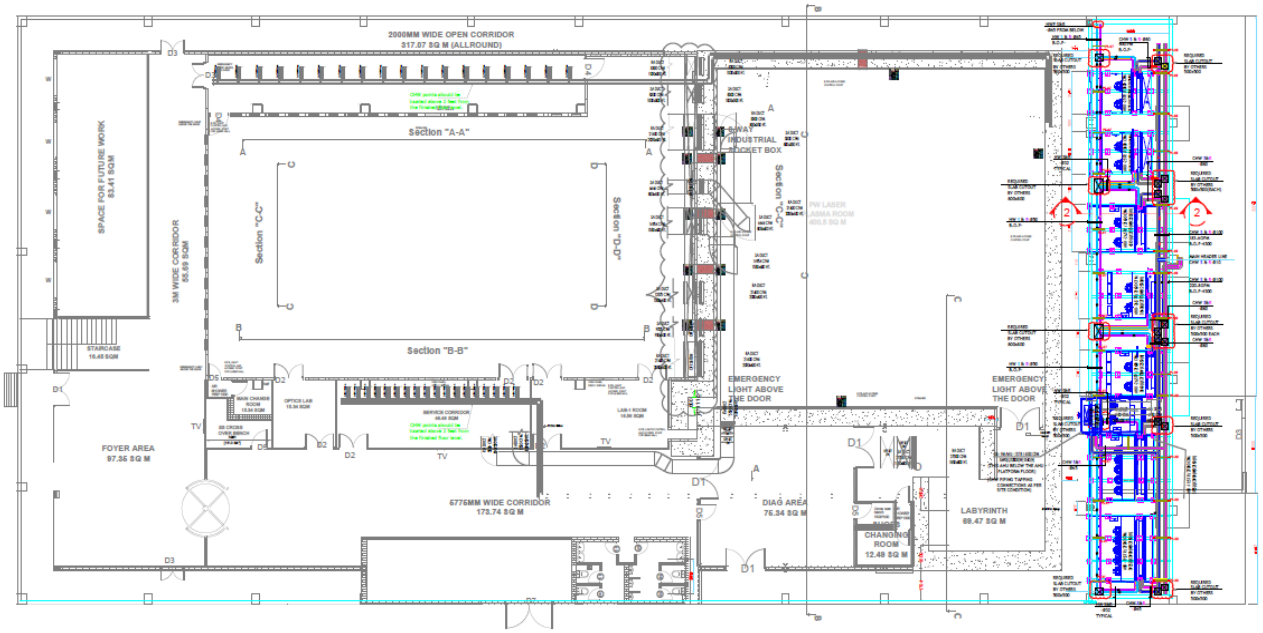
APPROVED LIST OF MAKES FOR BUILDING MANAGEMENT SYSTEM

CENTRAL CONTROL STATION	Compaq IBM HP DELL
BUILDING MANAGEMENT SYSTEM WEB-BASED SERVER SOFTWARE	Johnson Siemens Honeywell Sauter Schneider
PROGRAMMABLE & APPLICATION SPECIFIC CONTROLLER (DDC)	Johnson Siemens Honeywell Sauter Schneider
WEB SERVER ENGINES (NETWORK)	Johnson Siemens Honeywell Sauter Schneider
INTEGRATORS	Johnson Siemens Honeywell Sauter Schneider
Differential Pressure Switch (blowers & Filters & Pump)	Johnson Siemens Honeywell Sauter Schneider OMicron Radix Greystone
Duct mount temperature & RH sensor	Johnson Controls Siemens Honeywell Sauter OMicron Radix Greystone

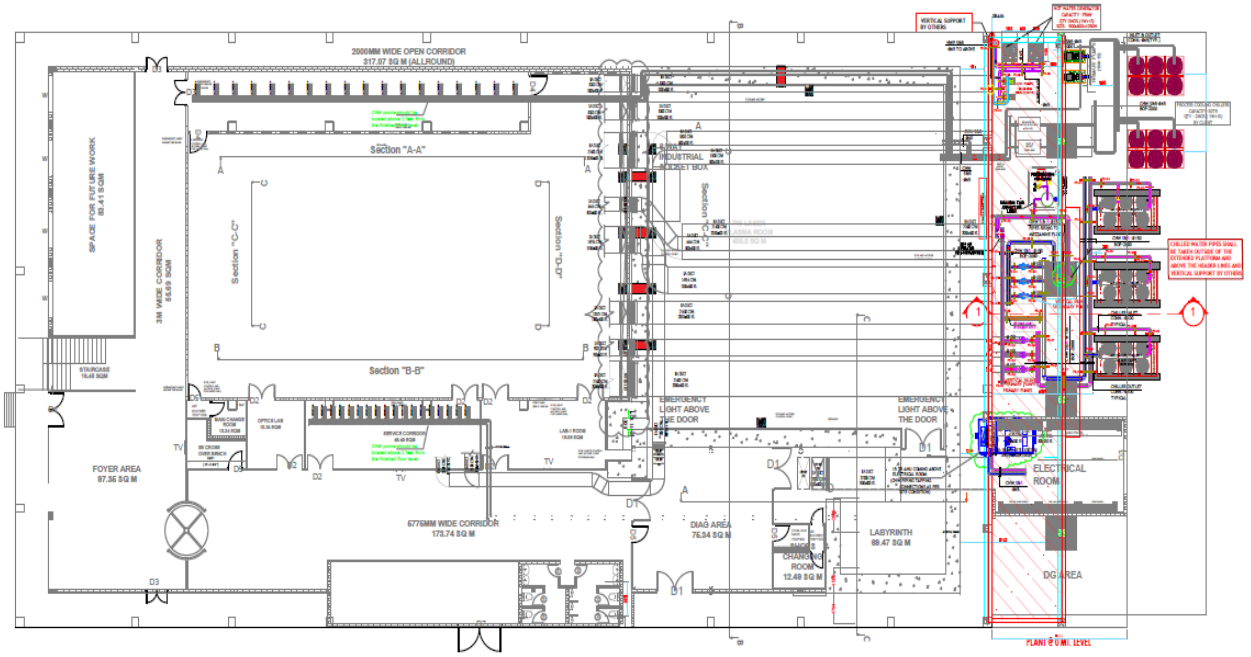
Duct mount temperature sensor	Johnson Controls Siemens Honeywell Sauter OMicron Radix Greystone
Room Differential Pressure Sensor	Johnson Controls Siemens Honeywell MSR (Germany) GE Sauter OMicron Radix Greystone
Communication Cables / Signal Cable/ Control Cable	Varsha Deepanjan Technoflex
Cable Trays	Profab Pushpak VIP
CA 6 cable	Dlink Amp Beldon

CHAPTER-V	**DRAWINGS**

AHU'S LAYOUT



CHILLER PLANT LAYOUT



CHAPTER-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") Hereby 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

(To be submitted on bidder / firm's letter head)

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

(To be submitted on bidder / firm's letter head)

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

Site Visit Declaration Certificate (To be submitted on bidder / firm's letter head)

CERTIFICATE OF TENDERER'S VISIT TO SITE

1. This is to certify that I _____(Name of bidder or his Representative) am from _____(Name of Firm of tendering) visited the site at TIFR, Hyderabad in connection with the Tender for Construction of AHU Support Structure for Petawatt Building, TIFR, Survey No. 36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad-500046, Telangana, India.

2. Having previously studied the contract documents, I carefully examined the site.

3. I have made myself familiar with all the local conditions likely to influence the works and the cost thereof.

4.I further certify that I am satisfied with the description of the work and the explanations given by the said Representative and that I understand perfectly the work to be done as specified and implied in the execution of the contract.

Signed by tendering firm representative and name:

Signed by tenderer and name:

Date:

ANNEXURE-V

(To be submitted on bidder / firm's letter head)

FORM OF APPLICATION BY THE CONTRACTOR FOR SEEKING EXTENSION OF TIME

1. Name of contractor: _____

2. Name of work as given in the work order: _____

3. Work Order No. & Date: _____

4. Work Order Value: _____

5. Period allowed for completion of work as per the work order: _____

6. Date of commencement of work: _____

8. Period for which extension of time if has been given by authority previously:

S. No.	Letter No. and Date	Reasons for which extension have been previously given (copies of the previous applications should be attached)	Extension granted	
			Months	Days
(a) 1st extension				
(b) 2nd extension				
Total extension previously given				

10. Period for which extension is applied for at present : _____ and Reason: _____

Submitted to the Authority with a copy to the Engineer-in-charge.

Signature of Contractor: _____

Dated: _____

ANNEXURE-VI

(To be submitted on bidder / firm's letter head)

UNDERTAKING REGARDING BLACKLISTING / NON – DEBARMENT

To

The Head,
Department of Technical Services.
TATA INSTITUTE OF FUNDAMENTAL RESEARCH
Plot No.36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy District. Hyderabad - 500046,
Telangana, India.

We hereby confirm and declare that we, M/s ----------, is not blacklisted/ De-registered/ debarred by any Government department/ Public Sector Undertaking/ Private Sector/ or any other agency for which we have Executed/ Undertaken the works/Services during the last 5 years.

Authorised Signatory

Date:

ANNEXURE-VII

(To be submitted on bidder / firm's letter head)

Audited Annual Turnover

S.No.	Financial/ Accounting Year	Profit (Rs.)	Loss (Rs.)	Annual Turnover (in INR)
1.				
2.				
3.				

Authorized Signatory with Seal

Note:

(i) This Audited Annual Turnover for the last 3 years should be certified by Chartered Accountant (CA) as per the format given above duly signed and stamped by the CA on their letterhead.

(ii) The bidder should have an average annual financial turnover (gross) of Rs.7.26 Lakhs during the immediate last three consecutive financial years ending March 31, 2025.

ANNEXURE-VIII

CLIENT's CERTIFICATE REG. PERFORMANCE OF CONTRACTOR

Date:

TO WHOM IT MAY CONCERN

This is to certify that M/s. _____

has executed the following works at _____ (Name & address of the Client)

1	**Name of work with brief particulars**	
2	**Work order No. and Date**	
3	**Work Order Value (Rs.)**	
4	**Date of Commencement of Work**	
5	**Stipulated Date of Completion of Work**	
6	**Actual Date of Completion of Work**	
7	**Details of compensation levied for delay (indicate amount), if any**	
8	**Name and address of the authority under whom works executed**	
9	**Amt. of work paid on reduced rates, if any.**	
10	**Did the contractor go for arbitration? (Yes/No)** **If yes,** **i) Total amount of claim**	

	iii) Total amount awarded	
11	**Comments on the capabilities of the contractor:**	
	a) Quality of Work	**Outstanding / Very Good / Good / Satisfactory / Poor**
	b) Financial Soundness	**Outstanding / Very Good / Good / Satisfactory / Poor**
	c) Technical Proficiency	**Outstanding / Very Good / Good / Satisfactory / Poor**
	d) Mobilization of adequate T&P	**Outstanding / Very Good / Good / Satisfactory / Poor**
	e) Mobilization of manpower	**Outstanding / Very Good / Good / Satisfactory / Poor**
	f) General behaviour	**Outstanding / Very Good / Good / Satisfactory / Poor**

"Countersigned"

Signature of the Reporting Officer with Office Seal

Note:

i) All columns should be filled in properly.

ii) Signing Authority: Officer of the rank of Superintending Engineer or equivalent.

ANNEXURE-IX

(To be submitted on bidder / firm's letter head)

List of Documents to be enclosed along with the bid submission:

Sr. No.	Documents	Attached (Yes / No)
1	Proof of Firm Registration	
2	GST & PAN of the Firm	
3	A valid Labour License	
4	EMD	
5	A valid Solvency Certificate	
6	Annual Turnover during three previous financial years ending March 31, 2025 duly certified by the licensed Chartered Accountant. (as per ANNEXURE-VII)	
7	Income Tax returns for the last three consecutive financial years ended on March 31, 2025 audited by the licensed Chartered Accountant.	
8	Profit/Loss statements for the last five consecutive financial years ending March 31, 2025 duly certified by the licensed Chartered Accountant.	
9	'Undertaking by the Tenderer as per the specified format in Annexure-II	
10	'Site Visit Declaration Certificate' as per the specified format in Annexure-IV	
11	'Undertaking by the Tenderer' regarding Blacklisting / Non-Debarment as per the specified format in Annexure-VI	
12	'Local Content Certificate' by the Tenderer as per the specified format in Annexure-III	
13	Work Completion Certificates along with Work Orders and BOQs as specified the eligibility criteria and annexures. Annexure-VIII: Work Completion Certificate	
14	Acceptance of Terms and Conditions of the tender by the tenderer by signing every page of the tender document with stamp.	

CHAPTER-VII	FINANCIAL BID(Part-II) SCHEDULE OF QUANTITIES(BOQ):

FINANCIAL BID (PART-II)

Tender No. _____

Work: Supply, installation, testing and commissioning of BMS for Laser Lab HVAC System in Plot-B

Location: TIFR, Survey No.36/P, Gopanpally (Village), Serilingampally (Mandal), Ranga Reddy Dist., Hyderabad – 500 046.

INSTRUCTIONS:

1. Tenderer needs to submit the signed copy of the Financial Bid quoting amount in the stipulated format and signed copies of the tender drawings.

2. Rates must be filled both in words and figures. The amount should be worked out for all the items.

3. The bidder shall quote his rates keeping in mind the specifications, terms & conditions, additional and special conditions etc. and nothing extra shall be payable unless otherwise specified.

SCHEDULE OF QUANTITIES (BOQ)

Work: "Supply, installation, testing and commissioning of BMS for Laser Lab HVAC System in Plot-B"

Sr. No.	Description	Unit	Qty (A)	Unit Rate (B)	Total Amount (C=A*B)
1	Supply, installation, testing and commissioning of True IP-Based DDC Standalone 32 Bit Intelligent, peer-to-peer communication, interoperable DDC for CHILLER PLANT - DDC for 3 Chiller, 3 Pumps as per the specification. The compact controller shall have an inbuilt 2-port Ethernet switch. The controller shall have min 16 inputs/outputs inbuilt and can be expandable with min 40 points by Input/Output Modules. DDC Controller shall be equipped with a battery-free real-time clock with backup for min 7 days using a super capacitor. The controller shall be housed in vandal-proof lockable MS cabinets. For equipment, the controller selection shall be such that the distance from the controller to the field devices should not go beyond 40 Mtrs. Proprietary Protocol shall not be accepted Note:- Commissioning tool should not be dependent on any license/dongle and no extra cost should be charged.	NO	1		
2	Supply, installation, testing and commissioning of True IP-Based DDC Standalone 32 Bit Intelligent, peer-to-peer communication, interoperable DDC for Air Handling Unit with EC Fans for Laser Hall as per the specification. The compact controller shall have an inbuilt 2-port Ethernet switch. The controller shall have min 16 inputs/outputs inbuilt and can be expandable with min 40 points by Input/Output Modules. DDC Controller shall be equipped with a battery-free real-time clock with backup for min 7 days using a super capacitor. The controller shall be housed in vandal-proof lockable MS cabinets. For equipment,the controller selection shall be such that the distance from the controller to the field devices should not go beyond 40 Mtrs. Proprietary Protocol shall not be accepted Note:- Commissioning tool should not be dependent on any license/dongle and no extra cost should be	NOS	3		

	charged, should be able to be provided to the client on request.				
3	Supply, installation, testing and commissioning of True IP-Based DDC Standalone 32 Bit Intelligent, peer-to-peer communication, interoperable DDC for Air Handling Unit with EC Fans for Plasma Room as per the specification. The compact controller shall have an inbuilt 2-port Ethernet switch. The controller shall have min 16 inputs/outputs inbuilt and can be expandable with min 40 points by Input/Output Modules. DDC Controller shall be equipped with a battery-free real-time clock with backup for min 7 days using a super capacitor. The controller shall be housed in vandal-proof lockable MS cabinets. For equipment, the controller selection shall be such that the distance from the controller to the field devices should not go beyond 40 Mtrs. Proprietary Protocol shall not be accepted Note:- Commissioning tool should not be dependent on any license/dongle and no extra cost should be charged.	NOS	2		
4	Supply, installation, testing and commissioning of True IP-Based DDC Standalone 32 Bit Intelligent, peer-to-peer communication, interoperable DDC for Air Handling Unit with EC Fans for Service Corridor as per the specification. The compact controller shall have an inbuilt 2-port Ethernet switch. The controller shall have min 16 inputs/outputs inbuilt and can be expandable with min 40 points by Input/Output Modules. DDC Controller shall be equipped with a battery-free real-time clock with backup for min 7 days using a super capacitor. The controller shall be housed in vandal-proof lockable MS cabinets. For equipment, the controller selection shall be such that the distance from the controller to the field devices should not go beyond 40 Mtrs. Proprietary Protocol shall not be accepted Note:- Commissioning tool should not be dependent on any license/dongle and no extra cost should be charged.	NOS	2		

5	Supply, installation, testing and commissioning of True IP-Based DDC Standalone 32 Bit Intelligent, peer-to-peer communication, interoperable DDC for Hot Water Generator, Pumps & Others as per the specification. The compact controller shall have an inbuilt 2-port Ethernet switch. The controller shall have min 16 inputs/outputs inbuilt and can be expandable with min 40 points by Input/Output Modules. DDC Controller shall be equipped with a battery-free real-time clock with backup for min 7 days using a super capacitor. The controller shall be housed in vandal-proof lockable MS cabinets. For equipment, the controller selection shall be such that the distance from the controller to the field devices should not go beyond 40 Mtrs. Proprietary Protocol shall not be accepted Note:- Commissioning tool should not be dependent on any license/dongle and no extra cost should be charged, should be able to be provided to the client on request.	NO	1		
6	SYSTEM INTEGRATION UNITS FOR 3RD PARTY SYSTEM SOFTWARE INTEGRATION: Supply, installation, testing and commissioning of True IP-based UL Listed for third-party integrator. It should support a real-time clock with backup of up to 7 Days using a super capacitor, and also should have an option for an external battery if required. It should support the major communication protocols: BACnet,/IP, BACnet MS/TP, Modbus IP and Modbus RTU. Modbus-based system integration unit consisting of microprocessor-based controller units as required to communicate between the BMS Software & the individual 3rd party microprocessor system controllers as per the distribution given below. All converters required for third-party integration shall be considered. The controller shall be housed in vandal proof, lockable MS cabinets. Please refer to the IO Summary for Equipment Qty & Point Details 1. EC Fans- Modbus 2. Fire Alarm System - BACnet/IP 3. Room Displays - Modbus 4. Chillers & VFDs - Modbus	JOB	1		

7	Supplying, installing, testing and commissioning of Differential pressure switches across the blowers, Filters for indicating status. Measurement Range: (0-250-500-1000Pa) Accuracy: ±5% of full scale Switching Output: SPDT (Single Pole Double Throw) NO/NC contacts shall be available Contact rating: 5A @ 230V AC / 2A @ 24V DC Enclosure Material: ABS / Polycarbonate Protection: IP54 / IP65 Operating Conditions Temperature: -10°C to +60°C Humidity: 10–90% RH (non-condensing) Make: Dwyer / Honeywell/ Siemens/ Danfoss	NOS	31		
8	Supplying, installing, testing and commissioning of Room Temp & RH Sensor Range 0–50°C & 0–100% RH, High Accuracy - +/- 0.2 deg.C and +/- 2% RH, output 4–20 mA / 0–10V, IP65 enclosure, complete with probe and mounting flange. Make: Honeywell/ Siemens/ Danfoss	NOS	10		
9	Supplying, installing, testing and commissioning of Immersion Type Water Temperature Sensor with Pt100 RTD element, range 0–100°C, SS probe with thermowell, ½" BSP connection, 3-wire configuration, IP65 enclosure, suitable for chilled/hot water applications. Make: Dwyer / Honeywell/ Siemens/ Danfoss	NOS	4		
10	Supplying, installing, testing and commissioning of Water Pressure Transmitter. 0–10 bar, Output Signal: 4–20 mA, Power Supply: 24 V DC Accuracy: ±0.5% Full Scale	NOS	2		
11	Supplying, installing, testing and commissioning of duct Type T&Rh Sensor for Measuring room air Temperature & Humidity. Make: Dwyer / Honeywell/ Siemens/ Danfoss	NOS	4		

12	Supplying, installing, testing and commissioning of Water DP Switch range 0.5–5 bar, Accuracy: ±5 to ±10% of full scale, adjustable set point, SPDT output, brass/SS wetted parts, ½" BSP connection, IP65 enclosure, suitable for chilled/hot water systems Make: Dwyer / Honeywell/ Siemens/ Danfoss	NOS	4		
13	Supplying, installing, testing and commissioning of Duct air DP Transmitter range 0–500 Pa, accuracy ±1% FS, output 4–20 mA / 0–10V, 24V supply, with static pressure probe and tubing, IP65 enclosure, suitable for HVAC/BMS applications. Make: Dwyer / Honeywell/ Siemens/ Danfoss	NOS	8		
14	Supplying, laying, termination, testing and commissioning of signal cables. (2 core x 1 Sqmm), FRLS copper conductor cable Armoured & shielded cable	MTR	3000		
15	Supplying, laying, termination, testing and commissioning of signal cables. (4 core x 1 Sqmm), FRLS copper conductor cable Armoured & shielded cable.	MTR	1500		
16	Supplying, laying, termination, testing & commissioning of CAT6 Cable with accessories for BMS integration Network	MTR	650		
				Sub-Total (D)	
				GST 18% (E)	
				GRAND TOTAL (D+E)	
Total Amount in Words Rs ....**Only**					

Note:

1. 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.

2. Payment will be made as per actual quantities executed at tender rates.

3. Unit rate must be quoted in figures as well as in words.

4. Rates are all inclusive of profit, Transport, Loading & Unloading, Shifting Taxes, Etc.

5. The site must be clean and remove all the debris after completion of work.

6. Manufacturer's warranty of respective supply items are to be provided, If applicable

7. For any deviating items, the contractor shall take prior approval from TIFR Engineer-in-Charge with proper rate analysis.