Centre for Development of Advanced Computing

A Scientific Society of Ministry of Electronics & Information Technology,
Government of India
Innovation Park, PANCHAVATI, Pashan Road, Pune - 411008
Tel: +91-20-25868086 / 25503673-675, Fax: +91-20-25694004
www.cdac.in / mmg@cdac.in

Tender No: CDACP/NSM-20PF-DC/22-23/357

CDAC, Pune invites `ONLINE' bids for Construction, Design, Site Preparation, Supply, Installation, Testing, Commissioning, and AMC services of Basic Infrastructure for the establishment of a Data Center at CDAC, Bangalore

Prospective Bidders may download the Tender Document from www.cdac.in / https://eprocure.gov.in/eprocure/app. Bidders are advised to go through instructions provided at `Instructions for online Bid Submission' and submit duly filled bids online on the website https://eprocure.gov.in/eprocure/app as per the schedule given in the Tender Document.

TENDER SCHEDULE
Tender No: CDACP/NSM-20PF-DC/22-23/357

Name of the Institute:	Centre for Development of Advanced Computing, Pune 411008.
Place of Supply, Installation & Commissioning, Support etc.	Center for Development of Advance Computing, Electronic City, Bangalore.
Date of Release of Tender	November 25, 2022
Site Visit – with prior appointments	December 01 to 08, 2022 – 1030hrs to 1600hrs. Contact Person: Sh. Hari Babu P / Ms. Divya M, Associate Director, hari@cdac.in / divyam@cdac.in
Date & Time of Pre-bid meeting (online)	**December 12, 2022-1100hrs**. (The link to join online meeting will be informed upon request for joining and submission of queries, doubts, clarifications etc., if any)
Last date of submission of bids	January 05, 2023 – 1500 hrs.
Date of opening of Technical bids	January 06, 2023 – 1500 hrs.
Place of opening of technical bids	C-DAC, Pune 411008.
Tender Document Fee	Rs. 5000/- in the form of DD drawn in favour of C-DAC, Pune OR through on-line Transfer
Bank Account Details for Tender Fee	BANK OF INDIA, PASHAN ROAD BRANCH, PUNE: 411008, PHONE NO. +91-20-25697247, IFSC CODE: BKID0000516 SAVING ACCOUNT NUMBER: 051610110002660.

Instruction for Online Bid Submission:

The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal. More information useful for submitting online bids on the CPP Portal may be obtained at: https://eprocure.gov.in/eprocure/app. For any technical related queries, please call the Helpdesk. The 24 x 7 Help Desk Number 0120-4200462, 0120-4001002, 0120-4001005. Mobile: 91 8826246593. Note- Bidders are requested to kindly mention the URL of the Portal and Tender Id in the subject while emailing any issue along with the Contact details. E-Mail: support-eproc@nic.in.

Section I – Invitation of Bids

1 Introduction

Under National Super Computing mission (NSM) Phase-3, C-DAC plans to build Supercomputing system with compute capacity of 20 PF at C-DAC Bangalore. This RFP is being floated to select the most appropriate vendor to build the civil building, utility block, and land development, Data Center utility including Electrical, Cooling and I-BMS for Data Center. The Selected Bidder needs to operate the Data Center for a period of two years. The model of the proposed Data Center (DC) should be capable of enhancing capacities by incrementally augmenting the infrastructure. The monitoring of the proposed DC is planned through an Integrated Building Management System (IBMS) and therefore, the equipment's to be installed in the proposed Data Centre should be BMS compliant. As a part of this project, C-DAC invites on-line bids from eligible bidders for supply, installation, commissioning and AMC Services of Data Centre Solutions, as per the requirements stipulated in this document, at the Locations given below.

Center for Development of Advance Computing, Electronic City Bangalore, Karnataka

2 Contact information

Materials Management Group (MMG)
Centre for Development of Advanced Computing (C-DAC)
Innovation Park, Panchavati Pashan Road,
Pune - 411008, Maharashtra India
E-mail: mmg@cdac.in

3 Two Bid (ePacket) System:

The bids must be uploaded on-line through https://eprocure.gov.in/eprocure/app, as explained below:

3.1 e-Packet No. 1: TECHNICAL BID (pdf format)

3.1.1 Section-I

a. **Annexure G**: The contents must be organized & submitted as per the Annexure G with proper page nos containing the required information/data etc.

b. Covering Letter, as per **Annexure – A.**

c. Authorization letter (on Lead bidder's letterhead) issued by the competent authority of bidder, authorizing the signatory to sign on behalf of the bidder, as per **Annexure – B.**

d. Scanned copy of Demand Draft/On-line receipt towards payment of tender fee (non-exempted/Non-refundable). If paid by DD, the original DD must reach

physically at the place of opening of the Tender on or before the Due Date & Time of the Tender.

e. The Undertaking on (Lead) bidder's letterhead, towards EMD as per format given in **Annexure - F**

3.1.2 Section-II:

a. A copy of Certificate of Incorporation, Partnership Deed / Memorandum and Articles of Association / any other equivalent document showing date and place of incorporation, in India as applicable.

b. A copy of GST registration certificate.

c. Copies of at least one purchase orders or contract having completed and successful installation and completion reports in the name of bidder from the end client / end user, during last three years for Data Centre work, as per para. 3.3 of Section II.

d. Copy of at least one purchase order from the end client/ end user for data centre facility management / O & M activities completed / ongoing as per eligibility para. No 3.3.1 of Section III.

e. In case of bidder who has established Data Centre for their own use needs to have eligibility criteria as stated in the document.

f. The self-certified copies of audited balance sheets or the certificate/s from a Chartered Accountant for last three financial years indicating the annual sales turnover.

g. A photo copy of the commercial bid actually submitted **without prices** (prices masked) and copy of commercial terms and conditions (in detail) as included in the commercial bid. C-DAC reserves the right to reject the bid in case of any discrepancy observed in the un-priced commercial bid and the actual commercial bid.

h. Manufacturer authorization certificate as per **Annexure-C** for HT Breaker, Transformer, HT RMU Panel, UPS and batteries, LT panels, Bus Bar and associated component, Adiabatic Dry Cooler, PAC,PAHU, PHE, Air Cooled Chiller, In-Row, RDHX, BMS Systems and Software, Pumps, etc., issued by respective OEMs.

i. The copy of registration certificate or a declaration in compliance with the provisions stipulated in office memorandum F/No/6/18/2019-PPD dated 23 July 2020 issued by public procurement Division, Dept. of Expenditure, Ministry of Finance, GoI. (Annexure-I)

j. Certificates from respective OEMs declaring the country of OEM, country of manufacture and percentage of local contents for UPS and batteries, LT panels and associated components, Chiller, PAC/PAHU, RDHX, BMS Software, Pumps, InRow, VFD Drives etc.(Refer order No. P-45021/2/2017-PP (BE-II). Dated 4th

June, 2020 issued by Public Procurement Division, Department of Investment and Internal Trade, Ministry of Commerce, GoI.) (Annexure-I)

k. All the necessary documents in support of eligibility criteria stipulated in Section–II, Para-3 (Eligibility Criteria).

3.2 Section-III:

a. The executive summary of the bid submitted.

b. Duly filled Technical Bid (covering the details of solution, detailed bill of material, bill of quantities, technical specifications, makes and models of items, diagrams, layouts, all drawings etc.)

c. The details of electrical power consumption, foot-print, ambient temp, temperature range targeted, cable schedule along with voltage drop calculations, battery sizing and back up calculations etc.

d. Details of water consumption on various loading conditions.

e. Design Basic Report along with annual average Power Usage Effectiveness (PUE) calculations for 25%, 50%, 75% and 100 % of IT load.

f. Design basis and analysis of cooling solution at full and partial load conditions including complete details, assumptions made and the specific references/standards used for the same. Applicable derations while selecting the dry cooler and bidder to submit selection of the product considering site ambient conditions as per ASHRAE.

g. Technical Compliance matrix against all details requested as per Para. 9 of Section IV.

h. The printed catalogue / leaflet/brochures published by the principal manufacturer of the items quoted to be submitted along with the Technical Bid.

i. Legal / statutory permissions from respective authorities required, if any.

3.3 e-Packet 2: FINANCIAL BID : (in BOQ.xls format – online)

The Financial Bid complete in all respects with all details filled in the `Name of the Bidder' column with name, designation and contact no. as per BOQ.xls format given in SECTION-VI.

Note:

All the documents listed in e-packet-1 (Section-I, II & III) and e-packet-2 must be arranged in the flow / in sequence as mentioned as per **Annexure-G** strictly.

C-DAC reserves the right to reject the bid, if any of the above listed documents are not submitted.

4 Pre-Bid Meeting – Date/ Time/ Venue / Online:

The pre-bid meeting will be held Online as given in schedule to sort out/resolve queries raised by the prospective bidders regarding the tender scope, conditions, terms & conditions etc. The prospective bidders requiring any clarification of the bidding document may send their queries in writing through e-mail in the format given below. C-DAC, Pune will respond to these queries during the pre-bid meeting. The queries/doubt/clarifications etc. must be sent at least two days prior to the date of pre-bid meeting.

Name of the bidder:			
Sr.	**Section / Page / Clause Reference**	**Query from bidder**	**C-DAC Response**
1			
2			

5 Last Date of submission of bids:

Last date for submission of e-bids through http://eprocure.gov.in/eprocure/app shall be as per given in Tender Schedule.

6 Opening of on-line e-bids

The technical e-bids will be opened as per through www.eprocure.gov.in/eprocure/app as per the schedule given.

7 Opening of commercial e-bids:

Commercial e-bids of the qualified bidders only will be opened. The decision of C-DAC's bid evaluation committee in this regard will be final and binding on bidders. C-DAC's bid evaluation committee will be authorised to take appropriate decision on minor deviations, if any.

The date, time and venue of opening of commercial bids will be informed later to the qualified bidder. The financial bids will be opened `on-line' through www.eprocure.gov.in/eprocure/app.

The bidder's name, bid prices and other appropriate details will be displayed after the opening of the commercial bids.

(END OF SECTION I)

Section II – Instructions to Bidders (ITB)

1 Locations for Supply, Installation, Commissioning, Warranty Services & AMC Services

The entire data center solutions as described in Schedule of Requirements must be supplied, installed, commissioned & supported at CDAC, Electronic City, Bangalore - details as per the Tender Schedule.

2 Order Placements & Payment by

The orders will be placed and payments shall be released by
Centre for Development of Advanced Computing (C-DAC),
Innovation Park, Panchavati, Pashan
Pune 411008, Maharashtra, INDIA

3 Eligibility Criteria

Only the bidders complying with following eligibility criteria will qualify for opening of commercial bids and for further processing.

3.1 The bidder must submit all the documents listed at para 3 Section – I above, along with the technical bid.

3.2 The bidder can submit the bid as a single (sole) bidder or on behalf of a consortium of maximum two entities including the bidding entity subject to the conditions stipulated below. Definition of Consortium - Consortium shall have specific meaning and purpose that is specific to this tender only. This will have tenure till completion of project and shall have no financial terms. Bidders can have their own arrangement / understanding on financial transactions between them.

3.2.1 The bidding entity carrying out the business activity of supply, installation, erection and commissioning of Data Centres can submit the bid in consortium with a bidding entity described at 3.2.2 below

OR

3.2.2 The bidding entity carrying out the business of construction of civil infrastructures like the buildings for industrial use / office use or the construction of buildings for academic, IT spaces activities can submit the bid in consortium with a bidding entity described at para 3.2.1 above. (It may please be noted that the entities having the experience only in one or more areas of construction of roads, dams, irrigation or similar works, water supply/filtration work, piping work, metal fabrication will not be eligible to bid)

OR

3.2.3 The same legal entity carrying out both the business activities of erection of Data Centres and Civil constructions (except entities having the experience only in one or more areas of construction of roads, dams, irrigation or similar works, water supply/filtration work, piping work, metal fabrication) can submit the bid as a sole bidder. Here the group companies, subsidiary companies, sister concerns etc. will be considered as separate entities. However, the bidder may form a consortium with any of these companies, for the purpose of bidding.

3.3 If the bidder is submitting the bid as a sole bidder,

3.3.1 The bidder should be an entity registered in India, before the date of publication of this tender document, under appropriate Indian Laws. Certificate for the same, issued by the competent authority should be submitted along with the bid.

3.3.2 The bidder must have a cumulative turnover of at least Rs. 75.0 Cr (Rs. Seventy five crore) from the civil construction activities, for the last three financial years ending March -2022. In addition, the bidder must have successfully completed the erection of Data Centres amounting to at least Rs. 75.0 Cr (cumulative) in the last three financial years ending March-2022. In case of Bidder having experience of establishing Data Centre infrastructure for own consumption (Like Colocation Data Centres service providers) the cumulative turnover for last three financial years ending Mar-2022 should be minimum 150 crores.(Covering certificate of CA with supporting audited balance sheets should be submitted in support of this condition.)

3.3.3 The Bidder shall have positive net- worth in the last three (03) Financial Years.(FY-2019-20,2020-21,2021-22). (Covering certificate of CA with supporting audited balance sheets should be submitted in support of this condition)

3.3.4 The bidder must have successfully completed at least one civil construction building / project with following features/specifications, in the last three years.

3.3.4.1 On Own company direct payroll employee of minimum 50 nos. Bidder should submit certificate issued by authorized signatory or Head of Human resources of the bidder, on bidder's letter head and copies of valid PF challan/Form-16 in the name of said employee in support of this condition.

3.3.4.2 Design and Construction of RCC framed IT /DC-Colocation/Office building of minimum built up area of 1500 sq.mt. and civil construction value of minimum 10 crore rupees. (Submit the copy of work order, satisfactory work completion certificate in the name of the bidder and other statutory supporting documents such as Municipal approval copy or Occupancy certificate copy etc. in support of this condition. The order must be placed by end client directly in the name of the bidder. In case of DC co-location service provider firm, Certification by Company Secretary of the firm along with other supporting documents in support of this document should be submitted)

3.3.5 The bidder must have successfully completed at least ONE Data Centre with following features/specifications, in the last three years .

3.3.5.1 UPS installed Capacity- means supplied, installed and commissioned at one site single rating or in size of multiple ratings (installed total) of minimum 1500 KVA or Chiller installed capacity means supplied installed and commissioned chillers at one site single rating or in size of multiple ratings (installed total) of minimum 450 Tons.

3.3.5.2 Fire- alarm and suppression systems with high end integration of building management system and all the allied works required for successful installation & completion of the Data Centre

3.3.5.3 Minimum total 3 nos. of qualified and certified CDCP professions + minimum 1 nos. CDCS/CDCE/ATD professional with minimum one years' post certification experience in Data Centre designing and implementation. All 4 employees should be employed with the bidder for a minimum of 12 months as on last date of Bid submission. PF challans /Form -16 for such employees need to be submitted. Bidder should submit certificate issued by authorized signatory or Head of Human resources of the bidder, on bidder's letter head and copies of valid PF challan/Form-16 in the name of said employee in support of this condition

3.3.5.4 Operation and Maintenance experience of minimum one data centre for at least one year in last five years.

(Submit the copy of work order, satisfactory work completion certificate in the name of the bidder and other supporting documents in support of this condition. The order must be placed by end client directly in the name of the bidder. In case of DC co-location service provider firm, Certification by CS of the firm along with other supporting documents in support of this condition should be submitted)

3.4 If bidding on behalf of a consortium:

3.4.1 Each consortium member should be an entity registered in India, before the date of publication of this tender document, under appropriate Indian Laws. Certificates for the same, issued by the competent authority should be submitted along with the bid.

3.4.2 The bidder must have entered into an agreement (as per format given in Annexure - J) with the consortium partner, before the date of submission of bid.

3.4.3 One of the members of consortium must have a cumulative turnover of at least Rs. 75.0 Cr (Rs. Seventy five crore) from the civil construction activities, for the last three financial years ending March -2022. (Covering certificate of CA with supporting audited balance sheets should be submitted in support of this condition)

3.4.4 In addition, one of the members of consortium must have successfully completed the erection of Data Centres amounting to at least Rs. 75.0 Cr (cumulative) in the last three financial years ending March-2022. (Covering certificate of CA with supporting audited balance sheets should be submitted in support of this condition)

3.4.5 Each members of the consortium shall have positive net- worth in the last three (03) Financial Years. (FY-2019-20,2020-21,2021-22) (Covering certificate of CA with supporting audited balance sheets should be submitted in support of this condition)

3.4.6 Each members of the consortium shall have minimum 25 staffs on their direct payroll. Bidder should submit certificate issued by authorized signatory or Head of Human resources of the bidder, on bidder's letter head and copies of valid PF challan**/**Form-16 in the name of said employee in support of this condition

3.4.7 One of the members of the consortium must have successfully completed at least one civil construction building / project with following features/specifications, in the last three years.

3.4.7.1 Design and Construction of RCC frame IT /DC-Colocation/Office building of minimum built up area of 1500 sq.mt. and civil construction value of minimum 10 crore rupees. (Submit the copy of work order ,satisfactory work completion certificate in the name of the bidder and other statutory supporting documents such as Municipal approval copy or Occupancy certificate copy etc. in support of this condition. The order must be placed by end client directly in the name of the bidder. In case of DC co-location service provider firm, Certification by CS of the firm along with other supporting documents in support of this condition should be submitted)

3.4.8 One of the members of the consortium must have successfully completed at least ONE Data Centre with following features/specifications, in the last three years.

3.4.8.1 UPS installed Capacity- means supplied, installed and commissioned at one site single rating or in size of multiple ratings (installed total) of minimum 1500 KVA or Chiller installed capacity means supplied installed and commissioned chiller at one site single rating or in size of multiple ratings (installed total) of minimum 450 Tons.

3.4.8.2 Fire Alarm and suppression systems with high end integration of building management system and all the allied works required for successful installation & completion of the Data Centre

3.4.8.3 Minimum total 3 nos. of qualified and certified CDCP professions + minimum 1 nos. CDCS/CDCP/ATD professional with minimum one years' post certification experience in Data Centre designing and implementation. All 4 employees should be employed with the bidder for a minimum of 12 months as on last date of Bid submission. PF challans/Form-16 for such employees need to be submitted. Bidder should submit certificate issued by authorized signatory or Head of Human resources of the bidder, on bidder's letter head and copies of valid PF challan/Form-16 in the name of said employee in support of this condition

3.4.8.4 Operation and Maintenance experience of minimum one data centre for at least one year in last five years

(Submit the copy of work order, satisfactory work completion certificate in the name of the bidder and other supporting documents in support of this condition. The order must be placed by end client directly in the name of the bidder. In case of DC co-location service provider firm, Certification by CS of the firm along with other supporting documents in support of these conditions should be submitted)

3.5 The Sole bidder or any member of the consortium should not have blacklisted/banned/debarred due to non-performance by the buyer, by any Department/Office of the Government of India (GoI) or of any State Government, PSU, Autonomous Organization of GoI, in the last three years as on the date of submission of the bids and that there should have been no regulatory actions initiated /pending against the sole bidder or any of the consortium member, as on the date of release of this tender.

3.6 A summary of the projects implemented covering all the details must be enclosed with the Technical Bid.

3.7 If the bidder is not a principal manufacturer of Data Centre components, the undertaking/s (in original) from the respective OEMs/principal manufacturers (on the letterhead), as per format given in **Annexure-C** must be submitted for the components such as UPS and Li ION battery, LT and HT panels and associated component, Adiabatic Dry Cooler, PAC and PAHU, PHE, Air Cooled Chillers, In Row Units , DG Sets ,Transformer, RMU, Bus Bars,BMS Software and Pumps (in e-packet – 1- Section-II).

3.8 The principal manufacturers/ original equipment manufacturer (OEM) of Data Centre components viz. UPS, PAC, Chiller, PAHU, Dry Cooler, In Row should have service centre in the state of site location. Documentary evidence for the same to be provided.

3.9 The bidder must submit all the documents as per Document Checklist – **Annexure-G**, with appropriate page nos for the same. The flow of the submitted documents must be in the same order.

3.10 The bidder must not be blacklisted by any Central / State Govt. Organizations of India as on date of submission of the bids. A certificate or undertaking to this effect must be submitted (Annexure – A).

3.11 The bidder must comply with the provisions of Office Memorandum: F/No/6/18/2019-PPD dated 23rd July, 2020, issued by Public Procurement Division, Department of Expenditure, Ministry of Finance, GoI. and subsequent orders issued from time to time in this regards (Annexure-I).

3.12 The solution offered must comply with the provisions of Order No P-45021/2/2017-PP (BE-II). Dated 4th June, 2020 issued by Public Procurement Division, Department of Investment and Internal Trade, Ministry of Commerce, GoI, read with order number W-43/4/2019-IPHW- MeitY, dated 7th September, 2020 issued by IPWH division of MeitY, GoI and subsequent orders issued from time to time in this regards. (Annexure-I).

Note: The bidder should provide sufficient documentary evidence to support the eligibility criteria and exemptions mentioned. C-DAC reserves the right to reject any bid not fulfilling the eligibility criteria.

4 Exemptions

If in the view of bidder, any exemption / relaxation is applicable to them from any of the eligibility requirements, under any Rules / process/ Guidelines/ Directives of Government of India, bidder may submit their claim for the applicable exemption /relaxation, quoting the valid Rule/ process/ Guidelines/ Directives. In this case the bidder must submit necessary and sufficient documents along with the technical bid, in support of his claim. The decision about granting the exemption/ relaxation will be taken by the bid evaluation committee which is empowered to grant exemption/relaxation.

5 Local Conditions

It will be incumbent upon each bidder to fully acquaint himself with the local conditions and other relevant factors at the proposed Data Centre site which would have any effect on the performance of the contract and / or the cost. The Bidder is expected to make a site visit to the proposed Data Centre facility to apprise them self and obtain all information that may be necessary for preparing the bid and entering into contract.

Failure to obtain the information necessary for preparing the bid and/or failure to perform activities that may be necessary for the providing services before entering into contract, will in no way relieve the successful bidder from the responsibility of performing any work in accordance with the Tender documents. It will be imperative for each bidder to diligently be informed of all legal conditions and factors which may have any effect on the execution of the contract as described in the bidding documents. C-DAC Pune shall not entertain any request for clarifications from the bidder regarding such conditions. It is the responsibility of the bidder that such factors have properly been investigated and considered while submitting the bid proposals and that no claim whatsoever including those for financial adjustment to the contract awarded under the bidding documents will be entertained by C-DAC Pune and that neither any change in the time schedule of the contract nor any financial adjustments arising thereof shall be permitted by the C-DAC Pune on account of failure of the bidder to appraise himself of local laws and site conditions or otherwise.

6 C-DAC Right to amend / cancel

6.1 At any time prior to the deadline for submission of bids, C-DAC may, for any reason, whether on its own initiative or in response to the clarification request by a prospective bidder, modify the bid document.

6.2 The amendments to the tender documents, if any, will be notified by release of Corrigendum Notice on www.eprocure.gov.in/eprocure/app / www.cdac.in/ tender against this tender. The amendments/ modifications will be binding on the bidders.

6.3 C-DAC at its discretion may extend the deadline for the submission of bids if it thinks necessary to do so or if the bid document undergoes changes during the bidding period, in order to give prospective bidders time to take into consideration the amendments while preparing their bids.

6.4 C-DAC reserves the right to cancel the entire RFP without assigning any reasons thereof

7 Precautions while preparing the Bids

Bidder should avoid, as far as possible, corrections, overwriting, erasures or postscripts in the bid documents. In case however, any corrections, overwriting, erasures or postscripts have to be made in the bids, they should be supported by dated signatures of the same authorized person signing the bid documents. In case of discrepancies and/ or calculation errors, if any, the lower of the unit prices and/or amounts shall only be considered for comparison of bids. Only Single technical solution to be submitted.

8 Earnest Money Deposit (EMD)

8.1 The bidder must submit the undertaking towards Earnest Money Deposit (EMD / bid security), as per format given in **Annexure-F subject** to the conditions stipulated therein

9 Period of validity of bids

9.1 Bids shall be valid for minimum 180 days from the date of submission. A bid valid for a shorter period shall stand rejected.

9.2 C-DAC may ask for the bidder's consent to extend the period of validity. Such request and the response shall be made in writing only. The bidder is free not to accept such request. A bidder agreeing to the request for extension will not be permitted to modify their bid.

10 Submission of Bids- Online

The Bid documents shall be neatly arranged and all pages should be numbered. They should not contain any terms and conditions, printed or otherwise, which are not applicable to the Bid. The conditional bid will be summarily rejected. Insertions, postscripts, additions and alterations shall not be recognized, unless confirmed by bidder's signature.

11 Late Bids

C-DAC shall not be responsible and liable for the delay in receiving the valid bid for whatsoever reason. C-DAC will not be responsible for any issues arising/pertaining with CPP Portal (www.eprocure.gov.in/eprocure/app) for non-submission, failure in submission of bids on-line. Bidders are advised to submit e-bids well in advance of the last date and time of submission so the bids. C-DAC will not be responsible for failure in submission/upload of bids for non-working of the on line portal at last day/hours of submissions of bids.

12 Evaluation criteria: The evaluation will be based on a scoring criteria.

Only technical bids receiving a score greater than or equal to a cut-off score of 80 marks out of maximum 100 marks will be processed further.

Sr.No	Evaluation Factor Points	
1	Technical Ability	
	Evaluate this factor based on review of the technical proposals.	
	Qualifications based on eligibility criteria as Turn Over, experience in similar project as defined in Tender	5
	Understanding of the project based on Technical documents and drawing. Justify the Strengths that make the bidder is Technically Superior. Bidder has understood objective of the project.	10
	Innovativeness -Any value added solution without changes in the specifications	5
	Proposed Project Plan Quality and methodology should be in line with Requirements. Does the bidder address the timeliness which are relevance to the tender Requirement specially to the Data Center Project. Deployment of quality and experienced technical manpower at site including Project manager and experts in the field of Electrical, Mechanical, I- BMS, Controls and Automation. Bidder to indicate number of such man power getting deployed at site and submit the resume of such expertise.	10
	Risks and Added Value Assessment	5
	Proposed Operation and Maintenance Plan in line with Tender Requirement	5
	Subtotal -	**40**
2	Past Performance	

Sr.No	Evaluation Factor Points	
	Evaluate this factor based on Past Experience of Work Carried out either with CDAC or other similar work experience with other clients by reference check. Experience in delivering the Data center and building construction in-line with timelines stipulated for this tender shall be given weightage.	
	Subtotal – Past Performance	**20**
3	Financial Ability and Risk Ranking	
	Evaluate this factor based on finical report/ balance sheet, Turn Over.	
	Subtotal-	**10**
4	Presentation	
	Presentation by the bidder along with the Key management team, Key Technical team Staff, holding owner/employee position in the organization. Presentation should cover bidders in depth understanding of the project for the Electrical , Mechanical, I - BMS, Civil etc. related work, execution Competency and Project execution Plan for this project with timelines(Critical Path timeline), Human Resource Demographics and Deployment for this project (Manpower Deployment Chart), Testimonials & Site ref, Approvals capability, List of Completed and Ongoing Projects, Tools & technology etc. The person responsible for the supervision of the contract performance shall be present during this presentation. The proposed Senior Executive are also expected to be the part of this presentation and must, at a minimum, answer questions directed to him/her during the question-and-answer session. In case of a Consortium, all Senior Executive of members of the Consortium Firm must be also present during the presentation	
	Sub Total -	**30**
	Total	100

13 Evaluation of Bids

The bids will be evaluated in two steps.

13.1 The bids will be examined based on eligibility criteria stipulated at para 3, Section – II of this document, to check the eligibility of the bidders. The technical bids of only the eligible bidders will be evaluated based on technical requirements stipulated in the RFP along with scoring criteria.

13.2 Only the bidders, whose technical bid is found to meet the requirements as specified as above will qualify for opening of the commercial bid and will be informed about the date and time of the opening of the commercial bid.

13.3 The decision of the TEC with respect to complete technical evaluation is final and binding on all the bidders.

13.4 During evaluation of the bids C-DAC at its discretion may ask the Bidder for clarification of its Bid. The request for clarification and the response shall be in writing, and no change in the prices is permitted. If required C-DAC may invite the

Bidders for technical presentation on the solution offered. During the process of evaluation of bids, if any discrepancies are observed in the bid submitted, the bidders may be given an opportunity to clarify on same. If in the view of bidder, any change in quantity, make or model is required or any additional items are required, for clearing the said discrepancy, the bidder has to arrange for said change and/or addition of material without any increase in the prices quoted.

13.5 If the information provided by the bidder is found to be incorrect/misleading at any stage/time during the Tendering Process, C-DAC reserves the right to reject all such incomplete bids**.**

14 Comparison of Bids

14.1 Only the technically qualified bids as per terms and conditions stipulated in this document shall be considered for opening and evaluation of price bid as per formula given above .

14.2 The total price including the GST amounts, along with the comprehensive warranty support and Operation & maintenance charges for first two years as per price bid format will be considered for the purpose of comparison of bids and for calculating the L1 bidder(GST @rates quoted by the bidder or tariff rates or lump sum whichever are less) . (Please refer para 1, Section- III).

14.3 The date and venue for opening of price bids will be communicated to bidders.

Note: Operation and Maintenance and comprehensive maintenance for 3rd, 4th and 5th Years will not be considered in evaluation of L 1

15 Award of Contract

C-DAC reserves the right to award the contract to the qualified bidder whose technical bid has been accepted and determined as the lowest evaluated price bid.

15.1 However, C-DAC reserves the right and has sole discretion to reject the lowest evaluated bid.

15.2 If more than one bidder happens to quote the same lowest price, C-DAC reserves the right to place the order with the bidder who has installed a Data Centre with more IT Electrical load at single site. The decision of C-DAC shall be final for awarding the contract.

16 Purchaser's Right to amend / cancel

16.1 C-DAC reserves the right to amend the eligibility criteria, commercial terms & conditions, Scope of Supply, quantities, technical specifications etc. The same shall be published on the Portals.

16.2 C-DAC reserves the right to cancel the entire or partially tender without assigning any reasons thereof.

16.3 C-DAC reserves the right to reject the bid submitted by the lowest evaluated bidder.

(End of Section - II)

Section III – Special Conditions of Contract

1 Prices

a. The prices quoted shall remain firm and no price escalation will be permitted till completion of order.

b. Bidder must quote in INR only.

c. The prices quoted must be inclusive of packing & forwarding, freight, insurance, loading, unloading charges /entry tax/road permit charges and allied charges till destination at site.

d. The group-wise prices must be quoted for all the items as per format given in **Section – V**.

e. Over and above the comprehensive warranty for first two years, the successful bidder is required to quote for the following services:

   i. Operation and Maintenance for first two years.

   ii. Operation and Maintenance for 3rd, 4th and 5th Years.

   iii. Comprehensive Annual Maintenance services (CAMC) for 3rd, 4th and 5th Years.

   The order for items 1-e (i) will be placed by C-DAC. The orders for item Sr. No 1-e (ii & iii) may be placed separately, after expiry of comprehensive warranty and O & M period of first two years.

f. Before the placement of order, the successful bidder must submit the detailed Bill of Material, giving price for each individual line item, keeping the total price quoted un-changed. The order will be placed on the basis of this BoM. The supplier must ensure that their invoice exactly matches this BoM, so as to avoid any payment complications

2 Taxes and Duties:

Bidder must indicate applicable GST amounts/rate separately. The bidder should exercise utmost care to quote the correct amounts/rate of GST on each item. Any revision in statutory tax /duty structure as on date of supply/ invoice, shall be considered, as applicable.

2.1 In case of any error/ oversight in GST amount/rate quoted by the bidder, the bidder will not be permitted to rectify the error/oversight. The orders/ contract will be placed with the GST amounts/rates quoted by the bidder or actual applicable amount (as on date of placement of order), whichever is **LOWER.** The difference amount payable, if any, between the quoted GST amount/rate and applicable amount shall be borne by the bidder.

2.2 Notwithstanding the para 1.5 to 1.8 mentioned above, if the GST is not quoted separately and the bid is silent whether GST is included or excluded in price, for the purpose of evaluation of bids, the prices shall be taken as quoted with GST. In this case, the order will be placed with the quoted price. The GST applicable, if any will be borne by the bidder/contractor

2.3 The prices will be compared on the basis of GST rates quoted/calculated by the bidder. In case of errors, the bidders will not be permitted to change the GST percentage/amount.

3 Project Timeline

All the items covered in the Schedule of Requirements (**Section – IV**) must be constructed, supplied, installed and commissioned within 9 months (Thirty Six Weeks) from the date of award of Contract / placement of order. Being critical and important project, the timelines needs to be followed strictly.

4 Payments (In INR only)

4.1 Payment Terms for Building Civil Related Work

a. 30% against completion of plinth .(Foundation to floor finish level)

b. 20% against completion of RCC slab and Brick work

c. 15% against completion of external development works like storm water gutter, roads, drainage line, paving block, Underground water tank, equipment foundations etc.

d. 20% against finishing work like plastering, flooring, painting, plumbing, sanitary fixtures etc.

e. 5% against overall testing and commissioning, statutory approvals from authorities like Local Corporation, local PWD, local bodies, state and central government agencies etc.

4.2 Payment Terms for Data Center Related Work

a. 70% amount of the cost of HT Breakers, RMU Unit, Transformer, UPS and batteries, LT Panels, Adiabatic Dry Cooler and Pumps, PAC, PAHU, PHE, Chiller and pumps, NOVEC Cylinders with Gas, Bus Bars, DG Sets etc., will be released within 30 days of on receipt of these components at site along with tax invoice and against physical verification and acknowledgement by C-DAC - with 30 days credit period.

b. 20% amount of the cost of HT Panel, Transformer, UPS and batteries, , LT Panels, Adiabatic Dry Cooler and Pumps, PAC,PAHU, PHE, Chillers , Novec Cylinder with Gas, Bus Bar, DG Sets and 90% cost of the remaining supplied items and 90% charges towards installation and commissioning of the system will be released on successful installation, commissioning of the solution. This portion of payment

shall be subject to acceptance and submission of Integrated System Acceptance Test (ISAT) report to C-DAC. In case of delay in integration and commissioning of the DC with HPC system for the reasons attributed to C-DAC beyond 60 days, this portion of payment will be released against submission of bank guarantee of equivalent amount. This Bank Guarantee will be released on successful completion of installation, commissioning and ISAT of the solution.

4.3 Balance 10% payment above 4.1 and 4.2 will be released on successful installation & commissioning of total solution against submission of PBG. The PBG must be submitted within 30 days from the date of successful installation(s) and ISAT.

4.4 The proportionate payments towards Operation and Maintenance charges for first two years will be released on post quarterly basis within 15 days.

4.5 The penalties - if any, towards SLA will be deducted from the quarterly payments payable or from the performance bank guarantee if exceeds the payments payable.

4.6 The applicable TDS will be deducted.

4.7 The payments shall be remitted through NEFT/RTGS only.

4.8 Payment will be released after deducting/ collecting all taxes including (Labour cess in case not deposited by the contractor) as applicable.

4.9 CDAC has the right to appoint PMC for the project and payment will be released after due verification of bills / work by PMC and CDAC

4.10 The successful bidder may opt for an Advance up to 30% of order value excluding the operations and maintenance against the equivalent bank guarantee. The advance shall be adjusted against initial payments as per payment schedule and once fully adjusted the bank guarantee shall be returned.

Note: All the payments are subject to submission of the valid and complete tax invoices.

5 Security Deposit (SD)

The successful bidder will be required to furnish the Security Deposit in INR equivalent to 5% of the Contract/Order value (excluding taxes) within 15 days of award of Contract / receipt of Order(s). The Security Deposit should be submitted in the form of Demand Draft drawn in favor of C-DAC payable at Pune or in the form of Bank Guarantee in the name of C-DAC, Pune. The Bank Guarantee submitted towards Security Deposit should be issued by a Scheduled Commercial Bank and must be valid for a period of 6 months. The Security Deposit will be returned within 30 days upon completion of installation, commissioning and ISAT, and on submission of Performance Security.

6 Performance Security

The successful bidder will be required to furnish the Performance Security towards the Data Centre Solutions supplied, in the form of a Bank Guarantee in INR equivalent to 3% of the invoice amount (except for O & M charges and excluding taxes), as per the format attached to this document. This bank guarantee should be submitted along with the invoice after successful installation and commissioning of the Data Centre solution. The Bank Guarantee should be from a Scheduled Commercial bank and shall remain valid for the period of 25 months from the date of installation and ISAT. The PBG must be negotiable at a branch of issuing bank in Pune.

C-DAC reserves the right to invoke the Performance Bank Guarantee(s) submitted by bidder, in case of the following:

a. The Item/Components fail to achieve the performance as stipulated in this document or
b. The bidder fails to provide the comprehensive warranty and other services in scheduled time frame, as stipulated in this document or
c. The bidder delays to provide the warranty services as stipulated in this document.

7 Completeness Responsibility

The bidders may please note that this is a contract on 'Turn-key' basis. Notwithstanding the scope of work, engineering, supply and services stated in bid document, any equipment or material, engineering or technical services which are not specifically mentioned under the scope of supply of the bidder and which are not expressly excluded there from but which – in view of the bidder - are necessary for the required performance of the datacenter solution in accordance with the RFP specifications are treated to be included in the bid and has to be implicitly performed by bidder. In no case, the bidder will be permitted to increase the prices quoted.

8 Comprehensive Warranty

The Supplier warrants that all the Goods are new, unused, and of the most recent or current models, and that they incorporate all recent improvements in design and materials, unless provided otherwise in the Contract. The supplier further warrants that all Goods supplied under this contract shall have no defect arising from design, materials or workmanship (except when the design and/or material is required by the Purchaser's specifications) or from any act or omission of the supplier. The warranty should be comprehensive on site, repair/replacement basis free of cost. Bidder has to enter into agreement / MoU with C-DAC Pune on award of contract which shall be in-line with this RFP document.

Note: - Supplier has to do the AMC / PM of all the supplied equipment as per the standard schedule with no additional charges to C-DAC. Any consumables required shall

be paid by CDAC. The supplier has to take prior approval from C-DAC before using any consumables.

All the equipment and components supplied must have **two years** onsite comprehensive warranty from date of successful installation, commissioning and signing of ISAT.

SLA and managed service scope as per **Annexure - H.**

9 Post warranty AMC

The bidder should quote for post warranty AMC services towards the integrated datacenter solution/sub-systems supplied and installed. The AMC charges should be for 3rd year, 4th year and 5th year from the date of successful installation and ISAT of datacenter solution. The AMC charges per year should be quoted as per price format given in Section V of this document and must not be more than 7% of the cost of capital items supplied.

The post AMC charges will be binding on the bidder. C-DAC reserves the right to enter or not into the AMC after the end of warranty period.

10 Penalties

CDAC reserves the right to levy penalties for each site, as given below.

Sr. No	Parameters	Penalty
A	Penalty for Delayed Deliveries and installation	0.5% of order value per week for delay in installation and commissioning beyond schedule. If the delay is more than 10 weeks, C-DAC reserves the right to cancel the Contract/ Order. In case of in ordinate delay on the part of bidder in completing the work and cancellation of Purchase order, C-DAC will arrange to complete unfinished work through suitable contactor and expenses incurred by C-DAC in doing of such work shall be recovered from the bidder. Any delay because of CDAC, conditions arising out of Force Majeure will not be considered while calculating the delay period for penalties. i.e. total 7% of maximum penalty shall be levied against Delayed Deliveries and installation
B	Penalty if uptime of Data Centre components. Measured on quarterly basis is	Penalty for downtime shall be levied as given below in B.1, B.2, B.3 which will be over and above the penalty mention above in para A.

Sr. No	Parameters	Penalty
	(as per calendar year)	
1	Less than 98.5% but more than 97.5% in a quarter	Penalty @0.2% of the order value per quarter.
2	Less than 97.5%	Penalty @0.5% of the order value per quarter.
3	Less than 95%	C-DAC reserves the right to terminate the contract and invoke the performance bank guarantee.
	Capping	The maximum penalty as stipulated in Para A and B above put together will be capped to 10% of the order value.

The detailed mechanism / method for arriving at the measurable parameters mentioned in table above is covered in the **Service Level Agreement (SLA) as per Annexure –H,** to be signed before award of contract/ release of Order.

11 Force Majeure

C-DAC may consider relaxing the penalty and delivery requirements, as specified in this document, if and to the extent that, the delay in performance or other failure to perform its obligations under the contract is the result of an Force Majeure. Force Majeure is defined as an event of effect that cannot reasonably be anticipated such as acts of God (like earthquakes, floods, storms etc.), acts of states / state agencies, the direct and indirect consequences of wars (declared or undeclared), Pandemic, hostilities, national emergencies, civil commotion and strikes at successful Bidder's premises or any other act beyond control of the bidder.

12 Arbitration

In case any dispute arises between the C-DAC and successful bidder with respect to this RFP, including its interpretation, implementation or alleged material breach of any of its provisions both the Parties hereto shall endeavor to settle such dispute amicably. If the Parties fail to bring about an amicable settlement within a period of 30 (thirty) days, dispute shall be referred to the sole arbitrator mutually appointed by both parties. If the sole arbitrator is not appointed mutually by both the parties then the District Court Pune shall have exclusive jurisdiction for appointment of sole arbitrator through court. Arbitration proceedings shall be conducted in accordance with the provisions of the Arbitration and Conciliation Act, 1996 and Rules made there under, or any legislative amendment or modification made thereto. The venue of the arbitration shall be Pune. The award given by the arbitrator shall be final and binding on the Parties. The language

of arbitration shall be English. The common cost of the arbitration proceedings shall initially be borne equally by the Parties and finally by the Party against whom the award is passed. Any other costs or expenses incurred by a Party in relation to the arbitration proceedings shall ultimately be borne by the Party as the arbitrator may decide. Courts in Pune only shall have the exclusive jurisdiction to try, entertain and decide the matters which are not covered under the Arbitration and conciliation Act.

13 Risk and Ownership

All risks, responsibilities and liabilities in respect of goods delivered at site shall remain with selected bidder till they are successfully installed and commissioned at site and taken over by end users. Part deliveries shall not be treated as deliveries. Only full deliveries of all items ordered will be considered as delivery. The ownership of the items delivered at site, shall be of C-DAC Bangalore on successful installation of items.

14 Indemnity

The successful bidder shall indemnify, protect and save C-DAC Pune/Bangalore from/against all claims, losses, costs, damages, expenses, action suits and other proceeding, resulting from/arising out of:

1. Infringement of any law pertaining to intellectual property, patent, trademarks, copyrights etc. by the bidder or
2. Such other statutory infringements in respect of all the equipment's supplied by successful bidder, or
3. Caused due to any act/omission/performance/under or non or part performance/failure of the bidder.

15 Assignment

Selected bidder/ Party shall not assign, delegate or otherwise deal with any of its rights or obligation to other parties under this Contract, without prior approval of C-DAC.

16 Severability

If any provision of this Contract is determined to be invalid or unenforceable, it will be deemed to be modified to the minimum extent necessary to be valid and enforceable. If it cannot be so modified, it will be deleted and the deletion will not affect the validity or enforceability of any other provision.

17 Termination

Validity of purchase order/rate contract will remain till fulfillment of all obligations (including but not limited to providing comprehensive warranty / support till

completion of three years from acceptance of the entire integrated solution as a whole) by the successful bidder.

In case of the delays in providing the stipulated services, and /or defect/delay/under or non- performance pertaining to the services / products supplied by the bidder, C-DAC Pune will give written notice to the bidder directing to set the things right within 30 days of notice. If bidder fails to comply with the requirements, C-DAC Pune shall have the right to terminate the contract and / or cancel the order/s. The successful bidder agrees and accepts that he shall be liable to pay damages claimed by C-DAC, in the event of termination of contract / cancellation of order, as detailed in this RFP. The successful bidder may terminate the contract by at least 30 days' written notice, only in the event of non-payment of undisputed invoices for 90 days from the due date. Except this situation, the successful bidder shall have no right of termination.

"C-DAC Pune will release the due amount payable to successful bidder towards the material and / or services provided till the date of termination, those are accepted by C-DAC Pune. However, the amount towards penalty, if any will be deducted from the payable amounts."

C-DAC reserves the right to terminate the contract / cancel order with or without cause/ reason, by giving 90 days' notice to the successful bidder.

18 Limitation of Liability

The liability of the Bidder / Contractor arising out of breach of any terms/conditions of the tender / contract/work order and addendums/amendments thereto, misconduct, willful default will be limited to the total contract value. However, liability of the bidder in case of death/injury/damage caused to the personnel/property due to/arising out of/incidental to any act/omission/default/deficiency of bidder/contractor will be at actual. In no event shall either Party, its officers, directors, or employees be liable for any form of incidental, consequential, indirect, special or punitive damages of any kind

19 Disclaimer

The purpose of this RFP is to provide the bidder(s) with information to assist the formulation of their proposals. This RFP does not claim to contain all the information each bidder may require. Each bidder should conduct his own investigations and analysis and should check the accuracy, reliability and completeness of the information in this RFP and where necessary obtain independent advice. C-DAC Pune makes no representation or warranty and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability or completeness of this RFP.

20 Jurisdiction

The disputes, legal matters, court matters, if any shall be subject to Pune jurisdiction only.

21 Corrupt or Fraudulent Practices

It is expected that the bidders who wish to bid for this project have highest standards of ethics.

C-DAC Pune will reject bid if it determines that the bidder recommended for award has engaged in corrupt or fraudulent practices while competing for this contract.

C-DAC Pune may declare a vendor ineligible, either indefinitely or for a stated duration, to be awarded a contract if it at any time determines that the vendor has engaged in corrupt and fraudulent practices during the award / execution of contract.

22 Interpretation of the clauses in the Tender Document / Contract Document

In case of any ambiguity/ dispute in the interpretation of any of the clauses in this Tender Document, the interpretation of the clauses by Director General, C-DAC shall be final and binding on all parties.

(End of Section- III)

Section IV – Schedule of Requirement

This Section covers the general and technical requirements of Data Centre components.

1 Data Centre on Turn-key Basis

The Data Centre is required to be built on 'Turn-key' basis. The successful bidder should build the entire data center infrastructure which includes civil works, civil building for DC area as well as for UPS and Panel area, interiors, environmental controls like humidity, temperature etc., security (including access/ monitoring equipment), electrical systems, power systems, power supply, Dry Cooler, PAC, Piping , Valves , Air Cooled Chillers, Pumps, Pipes ,Valve, Fire alarm and suppression , BMS etc. as specified. The responsibility towards required material/items/equipment's, work, man power etc. rests with the successful bidder. Civil work involves construction of approximate 15000 sq ft of building which includes DC area, utility block, office area etc. The building will be designed for G + 4 floor but scope of this tender will be limited to construct ground floor only. The foundation design will be for G +4 in the DC area + office area which is approximately 12430 sq. ft., Utilities like Adiabatic dry cooler will be installed above LT Panel + UPS room. There will not be any vertical expansion for UPS + Panel room area. Bidder to refer site layout drawings. Along with civil construction, other works such as Drainage line, sewage line, storm water line, office interior and furniture, discussions room furniture, construction related approvals and completion related approvals etc. are part of scope of this tender, The overall requirements and available information/ data/documents are included in this Section. The bidders are advised to go through same and visit the sites before working out the details in this perspective and submit the solution document complete in all respects. Estimated power requirement will be 4760 KVA from two substations i.e. Velankani Muss - regular feeder and Kionics Muss-alternate feeder. Power from two substations is required to have redundant EB source.

2 Background

Under National Super Computing mission (NSM) Phase-3, implementing agency C-DAC is going to build data center for 20 PF supercomputing system at C-DAC Bangalore, which includes server racks as well as storage rack. This data center should be environmental friendly, energy efficient in which almost 50% of heat extraction from server racks is by Direct Contact Liquid Cooling (DCLC) and rest by room cooling. Main components in DCLC systems inside each rack are Cooling Distribution Unit (CDU), manifold, cold plate, underfloor piping, fluid etc. In CDU there are primary and secondary loop. Secondary loop is connected with cold plate and coolant flow is controlled by actuator/ pump. In CDU indirect heat exchange from liquid to liquid takes place. Primary loop is connected to Dry cooler water circuit. Dry cooler is closed loop cooling system in which heat exchange takes place from air to water. Dry cooler will be adiabatic dry cooler. Adiabatic cooling systems function similarly to dry cooling systems, but with the incorporation of pre-cooling pads; running water over pre-cooling pads

and drawing air through the pads depresses the ambient dry bulb of the incoming air. The depressed dry bulb allows for greater system heat rejection. Supply, installation, testing and commissioning of secondary loop components like CDU, Underfloor SS piping, rack supply and return manifolds, cold plates including dripless connectors and tube etc. components are not part of scope, whereas Operation and Maintenance of these components are part of the scope including BMS monitoring. All Racks are with DC power Bus bar and are of 45 U size. **All Racks are not part of the scope of this tender.**

3 General Requirements:

The general requirements applicable to the data center are given below. Other than these requirements, depending on the site conditions, the bidder may propose appropriate changes in other requirements. However, the responsibility towards successful installation and commissioning and smooth running of data center rests with the successful bidder only.

3.1 Bidder needs to take all approvals and permissions required prior starting of the projects from Local Bodies, State Govt/ Central Govt., other agencies. (Consent to construct, establish and operate)

3.2 Design and Site Preparation of the proposed Data Centre in terms of the civil, electrical, Safety & Security System and mechanical work required to build the Data Centre including false ceiling, raised flooring, moisture sealing and all other necessary components.

3.3 Supply, installation and setting up of the Data Centre basic Infrastructure (Transformer, UPS and Air-Conditioning System, Fire Prevention, Detection and Suppression System, Diesel Generator Units, Lightings, Power Panels (HT/LT System), Power Cabling, BMS management system etc.

3.4 Supply, installation and setting up of the multi-layer Physical Security infrastructure like biometric based access-control system, CCTV/ surveillance systems.

3.5 Onsite support for Data Centre Infrastructure Operations on 24*7*365 basis by qualified engineers/ personnel for a period of two years to ensure at least 99.982% uptime on a monthly basis.

3.6 The solution shall comprise of supply, installation, testing, commissioning training and handing over entire constructed civil building as per drawing and civil specifications.

3.7 The solution shall comprise of supply, installation, testing, commissioning training and handing over of all materials, equipment, hardware, software, appliances and necessary labour to commission said system complete with all the required components strictly as per the latest IS, IEC, IEEE, ASHRAE, ASHRAE TC9.9 2017,NBC etc. codes.

3.8 Also, the scope includes the supply, installation & commissioning of any material or equipment including building, approvals, permissions, Civil, Electrical , Cooling , BMS that are not specifically mentioned in the specifications and design details but are required for successful commissioning of the project.

3.9 The vendor shall provide detailed design, documentation, make, and model, efficiency including user, system and operation manuals along with the necessary diagrams, design drawings and details bifurcation of Bill of Quantity (BOQ) along with details description. Design drawing should include but not limited to Architecture Drawings, sections, structural drawings, Single Line Diagram, Discrimination curves, Lighting drawing, P & ID (Process and Instrumentation Diagram), , equipment sizing and selection along product selection calculations etc. with clear sectional drawings for server and utility room, interior, raised flooring, false ceiling, fire rated glass partitions, complete BMS system required for data centre etc.

3.10 The vendor shall take the necessary clearance / approval of the drawings, design, quality of material, make and model of the quoted material etc. prior to the execution of the project

3.11 The Data Centre should be complete in all respects.

3.12 Electrical power and water during construction is in the scope of bidder. Client shall not provide any accommodation for the contractor and his staff including labour.

3.13 The scope of installation, configuration, integration and commissioning shall mean to install and configure all components and subsystems integrating the Building Management System with the required components, integrating the entire facility and make the system operational as per scope of work.

3.14 To assess the efficiency of the data centres the power usage effectiveness (PUE) needs to be monitored for PUE on Dry cooler , PUE for room cooling load and total PUE

3.15 The acceptance test shall cover the following scope:

3.15.1 Factory Test Reports

Bidder shall provide factory test report for all products after testing each parameter of products as per their standard test procedure.

- Electrical panels - LT and HT
- Transformers
- DG Sets
- PAC
- In-Row
- PAHU
- Pumps
- Dry Cooler
- UPS and battery

- Air Cooled Chiller
- Plate heat Exchanger
- Thermal Storage Tank
- Bus Bar

4 Design of Data Centre

The proposed design and indicative layout drawings enclosed in the RFP document are for reference and for the purpose of bidding. The vendor so finalized would be required to make the necessary shop drawings within the layouts so as to arrive at a final scheme in line with the requirements and in accordance with the requirements of Indian standards, IEC, IS, IEEE, NBC etc. Structural drawing, reinforcement quantity are provided for Server area only and which are indicative only , Bidder to calculate quantity for RCC footing, column, slab, plinth , plinth beam, slab beam etc. and accordingly in the bid needs to be submitted. Structural drawing for the Panel + UPS room area is not provided. Bidder to work out the same considering loading due to Adiabatic Dry Cooler and other equipment's. However no change whatsoever in the price schedules would be allowed after the award of the work and the price shall remain firm throughout the project and the entire works are to be executed within the quoted price schedules.

The shop drawings during execution should include the following, but is not limited to,

a) Floor plan with design layout and detailed drawings, showing necessary sections etc.

b) Layout of raised floor and false ceiling layout integrating all utilities services.

c) Cable Tray Layout

d) Electrical diagrams (including UPS, SLD, Lighting, Earthing, Equipment Layout, Power Distribution etc.)

e) Cooling system layout with (P & ID, Piping layout, Equipment Layout, Schematic etc.)

f) Fire detection and suppression plan/ layout

g) Access Control Plan

h) Surveillance camera placement plan

i) Environment monitoring system placement plan

j) Fire Evacuation plan

k) Architectural Drawing , Layout and sections

l) Structural Drawings in DC area considering G + 4 building

m) Structural Drawing UPS + Panel Area considering structural loading of Adiabatic Dry cooler above this room.

n) Facad Drawings

o) Etc.

5 Design Inputs

Tables given below are the details of exact load parameters. These values are given to the bidders to come out with appropriate configuration and sizing. The major sub systems of the DC infrastructure are:

a) UPS along with Li Ion Batteries

b) Adiabatic Dry Cooler, Piping, Pumps, Electrical Panel, Instrumentation etc.

c) Air Cooled Chillers, Pumps, Electrical Panels, Pipes, Valves, and Instrumentation etc.

d) Raised Flooring and False Ceiling

e) PAC units and related work

f) I-BMS System

g) Electrical Panels and cables

h) Thermal Storage Tank

i) Plate Heat Exchanger

j) Pumps

k) Illumination system

l) Transformer

m) HT Panels, RMU Panels

n) DG Sets

The specifications and requirement of the entire solution is stipulated in the RFP with respect to the design and solution, certain indicative inputs like layout, SLD, P&ID etc. are provided. Bidder may follow the indicative inputs provided in this RFP or come out with innovative design which is optimal and cost effective without violating any of the specifications given.

For building related civil work architectural drawing as well as structural drawings are provided with this Tender. Also the area of UPS room + Panel room based on the loading of Dry Cooler and other equipment's bidder to work out the structural design . Bidder to submit all these details in bid submission.

5.1 The envisaged IT load for data centre: 2343 KW max.

Sr. No	Description	Power in Kw/Rack	Qty.	Total IT Power (Kw)
1	Server Rack –CPU Only	35	42	1470
2	Server Rack CPU+ GPU	38	16	608

Sr. No	Description	Power in Kw/Rack	Qty.	Total IT Power (Kw)
3	Rack for Central Switch	25	4	100
4	Storage Rack	15	5	75
5	Network Rack for Switches	15	5	75
6	Spare Rack	15	1	15
	Total IT Power			**2343**

All CPUs of servers are cooled by using direct contact liquid cooling (DCLC) technology by use of cold plate. Adiabatic Dry cooler, Cooling Distribution Unit, Rack Manifold etc. will be used for extracting the heat load generated by CPU. Leaving water from the dry cooler will be given to Cooling Distribution unit (CDU). Secondary of CDU with PG 25 fluid, with additive will deliver the fluid to the rack manifold. Cold plates are connected to this rack manifold by using flexible tubes. Cold plate is used to maintain the CPU temperature. The heated fluid will return back to CDU and inside CDU, heat transfer will takes place indirectly with Adiabatic Dry cooler water. This is how the CPU temperature is maintained. Rest of the periphery cooling, other hardware and room cooling will be using In-row cooling. Input to the CDU i.e. Dry cooler leaving water temperature is to be maintained at 33 Deg C and return i.e. entering water temperature to the dry cooler will be with Delta T of 8 to 10 Deg C. Each CDU will be feeding to individual point of delivery (POD) network and CPU + GPU rack row. Outlet from CDU i.e. inlet to manifold (input to cold plate) will be 35 deg C and return will be of Delta T of 5 to 10 Deg C. Bidder is required to consider Plate heat exchanger (PHE) of appropriate rating in the circuit of Adiabatic Dry cooler. PHE should have in Primary connection In and out of chilled water and secondary in and out with Dry cooler leaving water. Thermal storage tank for storing chilled water of capacity is to be considered. Thermal storage tank should maintain the stored water temperature of 15 Deg C +/- 1 Deg C along with level sensors and temperature sensors. Bidder is required to consider ASHRAE n=20 data for site ambient conditions. Data center room temperature = server inlet air temperature and will be 22.5 Deg C + / - 2 Deg C. The layout drawing provided is with Point of Delivery Architecture (POD). POD architecture is a repeatable in design pattern, and its components maximize the modularity, scalability, and manageability. POD architecture is required to be with HOT aisle containment. There should be separate CDU for each POD for DCLC. In case of server rack with CPU + GPU node, part of the load is cooled by DCLC loop, part load will cooled by Rear Door Heat Exchanger (RDHX). Location of Adiabatic Dry cooler, Air Cooled Chillers, Pumps, Chemical Dozing Plant, Expansion Tank, Thermal Storage Tank, Air Separator etc. equipment's are as given in the drawings.

Bifurcation in the POD architecture is as below in the table:

Description	Unit	DCLC Cooling	Room Cooling	RDHX Cooling	No OF Racks	Total Power
POD-1	Kw	147	213		14	360
POD-2	Kw	252	208		14	460

Description	Unit	DCLC Cooling	Room Cooling	RDHX Cooling	No OF Racks	Total Power
POD-3	Kw	231	209		14	440
POD-4	Kw	252	208		14	460
CPU+ GPU	Kw	176		447	17	623
Total		1058	838	447	73	**2343**
Total On DCLC Cooling		**1058**				
Total On Chilled Water Cooling		**1285**				

'Server Rack- CPU only' will have 64 nos. of nodes and each node is 1 U and half width. 'Server rack- CPU+GPU' are with 32 Nos of nodes and each node is 2U and half width.

Details bifurcation of cooling load per rack for DCLC and room cooling is in below table.

Description	Server Rack –CPU Only	Server Rack CPU+ GPU
DCLC Cooling Power Per Rack Kw	21	11
Room Cooling Power Per Rack-Kw	14	
RDHX Cooling Power Per Rack-Kw	0	27

Each server rack –CPU only as well as CPU + GPU Racks will require three phase power inputs from two overhead bus bars. Out of three, two will be 4P 415 V, 63 Amps, 5 Wire system and one will be 2P, 230 V 3 wire system. Details of Power requirement for each POD is as summarized below in the table.

Sr.NO.	Description	No OF Racks	Total Power
1	POD-1	14	360
2	POD-2	14	460
3	POD-3	14	440
4	POD-4	14	460
5	CPU+ GPU	17	623
	Total	**73**	2343

All server racks are of 45 U with dimensions of (WXD) 800 mm X 1400 mm**. All server racks will be free issue item means all server racks are not part of scope of this tender**. Based on above, all IT related inputs and subsequent below maintained technical specifications of the product along with drawings, Bidder is required to study and work out the bid. All the packages are as per standard Data Center Practices, as per IEEE, IEC, NBC, ASHARE etc. standards. This is turnkey tender which includes but not limited to Building Civil Work, all statutory approvals required, bringing power from the two substations including any modification in substation, HT cable supply and laying, RMU Panels, HT breaker panel, Load

sanction, load release, Work completion report, approval from CEIG , approval of PESO, CCOE for underground fuel storage tank, All LT Panels , UPS ,Li Ion Batteries, LT Cabling, Bus Bars, RTPFC Panels, Chiller Work, Adiabatic Dry Cooler Work, Piping Work ,I- BMS system , Building completion certificate etc.

Bidder is required to consider minimum rating of all selected components considering site ambient conditions, deration factors, utilization of 80% under peak load.

6 Requirements towards Civil/Interior work for Building related activity

6.1 General

In case where the specifications in the drawings or those given in schedule of quantities are found wanting the latest IS specifications shall hold good. Whenever reference has been made to Indian Standard or any other specifications, the same shall mean to refer to latest specifications irrespective of any particular edition in the specifications below or schedule of quantities.

6.2 Workmanship

The workmanship shall be the best of its kind and shall conform to Specifications as below or Indian Standard Specifications in every respect or the latest trade practice and shall subject to the approval of the engineer. All materials and / or workmanship which in the opinion of the engineer is defective or unsuitable shall be removed immediately from the site and shall be substituted with proper materials and/ or workmanship forthwith.

6.3 Materials :

All materials shall be best of their kind and shall conform to the latest Indian Standards. All materials shall be or approved quality as per samples and from approved by the engineer. A set of specimen samples of all approved materials shall be kept at site as well as in the office of the engineer, the cost of which to be borne by the contractor.

6.3.1 Cement: Shall comply with the latest specifications IS: 8112/12269 of 43/53 grade of approved manufacture.

6.3.2 Reinforcement: Shall be of HYSD strength deformed bars Torsteel/ Torkari conforming to IS: 1786 – 1990.

6.3.3 Coarse Aggregate: Shall be of the best quality, hard machine crushed stone approved by the engineer, free from earth or any organic matter etc. Suitably graded and shall conform to IS: 383-1990.

6.3.4 Sand: Shall be natural pit/river sand clean, sharp, strong, and angular and composed of hard siliceous materials. It shall be free from any harmful materials such as iron pyrites, coal mica, shale, clay alkali, soft fragments, sea shale, organic impurities, etc. It shall be obtained from approved quarries and shall conform to IS:383-1990.

6.3.5 Bricks: It shall be table moulded bricks approved by the engineer, well burnt, sound, hard square and with sharp edges and shall conform to Indian Standards 1077 – 1992 having strength of 35 kg/sq.cm as specified in the item.

6.3.6 Timber: Shall be of best quality as specified in the schedule of quantities perfectly dry, well-seasoned and free from sap wood, sound straight, free from loose knots, cracks shakes and any appearance of root and any other defect and conforming to IS: 12896 – 1990 and shall be approved by the engineer, No wood work shall be placed in position covered in the wall unless it is approved by the engineer.

6.3.7 Flush Shutters: Shall be of kiln seasoned of solid core construction with frame lock rail and well balanced backings and faced with high quality commercial or teak veneering as specified. The shutters shall be chemically treated proofing against termites as per IS: 2202 –1991Ceramic Tiles: Will be of approved colour, design and size approved by the engineer conforming to IS: 777 – 1988.

6.3.8 Granite: Polished granite slab and tiles shall be of the kind specified in the schedule of quantities conforming to samples approved by the engineer for colour & texture. The slab shall be machine cut to required dimensions and shall conform to IS Standards.

6.3.9 Plastic (Acrylic) Emulsion Paint and Enamel Paint: Plastic emulsion painting will be of approved brand of paint and colour conforming to IS: 5411 – 1991 & will be applied over a coat of primer (including preparation of wall surface). Painting for the doors will be carried out with synthetic enamel paint of approved brand and colour over one coat of primer, all of relevant IS specifications 4511-1993.

6.3.10 Solid Concrete Block: Shall be of 100mm/150mm/200mm thick and strength of 40kg/sqcm. Conforming to IS: 2885 – 1992.

6.3.11 Hardware Fittings for Doors: All the doors shall be provided with brass oxidized hinges and other fittings such as heavy duty ball bearing 4 no's of butt hinges, tower bolts, locks etc shall be of brass chromium plated fittings or as specified in schedule of quantities. All the fittings shall be as per make list & approved by the engineer.

6.3.12 Water used for mixing concrete and mortar and for curing shall be clean and free from injurious amounts of oil, acid, alkali, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. The pH value of water shall generally be not less than “6”. Water has to meet the requirements mentioned in clause 4.3 of IS: 456 – 2000. Water shall be tested to establish its suitability. Water for construction purpose shall be stored in well protected and proper tanks

6.3.13 Admixtures: Admixtures to concrete shall not be used without the written consent of the engineer. When permitted, the contractor shall furnish full details from the manufacturer and shall carry such test as the engineer may require before any admixture is used in the work to check particularly for Chlorides.

6.3.14 Admixture may be used to modify one or more of the following properties of FRESH CONCRETE:

- To increase workability without increasing water content or to decrease the water content at the same workability.
- To retard or accelerate both initial and final setting times.
- To reduce or prevent settlement.
- To increase slight expansion in concrete and mortar.
- To modify the rate or capacity for bleeding or both.
- To reduce segregation of concrete, mortars and grouts.
- To improve penetration and or pump ability of concrete, mortars and grouts.
- To reduce rate of slump loss.

Admixtures may also be used to modify one or more of the following properties of

HARDENED CONCRETE:

- To retard or reduce heat generation during early hardening. To accelerate the rate of strength development.
- To increase the strength of concrete or mortar (Compressive, tensile or flexural).
- To increase the durability or resistance to severe conditions of exposure including the application of devising salts.
- To decrease the capillary flow of water.
- To decrease the permeability to liquids.
- To control the expansion caused by the reaction of alkali with certain aggregate constituents.
- To produce cellular concrete.
- To increase the bond of concrete to steel reinforcement.
- To increase the bond between old and new concrete.
- To improve impact resistance and abrasion resistance.
- To inhibit the corrosion of embedded metal.
- To produce coloured concrete or mortar.

Integral water proofer: Admixture used as integral water proofer shall be free of chlorides sulphates and shall conform to IS: 2645, the application and doses shall be as per manufacturer's specification.

6.4 Earthwork:

6.4.1 Site Clearance: The site shall be free from rubbish of all kinds, rocks, trees, dirt and superfluous earth, all shrubs, brush wood, stumps of trees and saplings, grass and other rant vegetation etc. The serviceable material to be stacked at site in a manner as directed by the engineer. All cavities or holes formed shall be filled with good earth well rammed and levelled neatly. Site clearance shall be done around the proposed construction. The contractor shall provide all labour and material for site clearance at his own cost.

6.4.2 Profiles: Shall be with pegs, bamboos, strings or burgies to show the correct formation before the start of work and maintained till the completion of the work.

6.4.3 Bench mark and levels: The contractor shall layout one or more permanent bench marks in some central place before start or the work, from which all important levels exact bed levels for the excavation will be set. The contractor shall provide all labour and material for setting, levels and profiles at his own cost.

6.4.4 All useful materials such as gravel, stone relics of antiquity, coins, and fossils etc, met with during excavation shall remain the property of the employer and shall be handed over to the site engineer /PMC engineer.

6.4.5 All cutting shall be done from top to bottom. No undermining shall be permitted. Cutting shall be done to precise levels and any cutting taken deeper shall be made good with PCC 1:4:8 to the required levels without any extra cost. The final surface shall be neatly dressed.

6.5 Excavation in trenches: The foundation trenches shall be excavated to the exact width of the lowest step of foundation or footing as shown on drawings. The sides of the trenches shall be kept vertical and bottom horizontal both transversely and longitudinally as shown on the drawings Steps shall squarely bench out as shown on the drawings or as directed by the site engineer /PMC engineer. The excavated earth shall be deposited atleast three meter or 1/3 of depth away from the edge of excavation whichever is more. Working space on the outer periphery, if required, shall be provided by the contractor at his cost. The bed of the trenches shall be made level and compact by watering and ramming, any soft and defective spots detected shall be filled with concrete of the mix as specified for foundations or as directed by the engineer. Cost of such concrete shall be paid to the contractor. In case excavation is taken deeper than required, the extra depth shall be good with concrete as specified foundation or as directed by the engineer at no cost to the Owner. The contractor shall at his own expense without extra charges shall make provision for all sorting, strutting, close or open timbering, pumping, dredging or bailing out water and the trenches shall be kept free from water until the work in foundation is completed and trenches refilled. The trenches shall be kept free from water until the work in foundation is completed and trenches refilled. The trenches shall be inspected and passed before concrete is placed.

6.6 Earth filling: Filling can be in the sides of foundation trenches, under floors or for site formation. The earth to be used for filling shall be free from salt petre, organic or other foreign matter. The space around the foundation in trenches and under floor shall be cleared or all debris, brick pieces or any other rubbish, surplus mortar falls etc. Filling shall be done in layers not exceeding 150 mm thickness. Each layer shall be well watered and rammed to the satisfaction of the engineer. Final surface shall be neatly dressed.

Sand filling: The sand shall be clean and free from any foreign matter.

6.7 Hard core: Shall either be of stone ballast; gravel or stone rubble of required size and shall be free from dust and impurities. Hard core of stone ballast not exceeding 40 mm gauge and shall be laid in required thickness dry rolled and consolidated with a power roller to satisfaction of the engineer. Hard-core or rubble stone shall be laid with stones of required height vertically, closely and hand packed with smaller pieces and/or ballast 40mm gauge as directed by the engineer and consolidated dry with a 10 tonne power roller unless otherwise specified in the schedule or quantities to the satisfaction of the engineer/owner.

6.8 Bidder to take care for very minimal disposal of excavated soil , Bidder to ensure maximum use of excavated soil. Record for the same to be maintained separately.

6.9 Concrete:

6.9.1 Cement Concrete: For foundation concrete shall be mixed in proportion and with ingredients as specified in the Drawing. The concrete shall be mixed in a mechanical mixer. No more concrete shall be mixed than can be consumed within half an hour. It shall be deposited gently in the trenches in horizontal layers not more than 30 cm thick and rammed and consolidated with steel rammers of 5 to 6 kg weight. After laying and consolidation is completed water for a week from the next day shall be done.

6.9.2 Reinforced cement concrete work- It is the intent of these specifications to ensure that all concrete placed at various location in the job, should be durable, strong enough to carry the design loads, it should wear well and be practically impervious to water, it should be free from such defects as shrinkage, cracking, honey combing and spalling of the surface. Unless otherwise called for in this specification, all plain and reinforced concrete shall conform in all respect to IS: 456 – 2000

Mix design: Mix design shall be as per guidelines in IS: 10262 – 1982 reaffirmed in 1989 subject to minimum cement content as per IS 456-2000. The mix design shall be subject to approval of the site Engineer/ PMC engineer.

6.9.3 Mixing: All concrete whether plain or reinforced, ordinary or controlled shall be mixed in a full bag mechanical mixer, having a minimum drum speed of 60 revolutions per minute. The cement and aggregates shall be first mixed dry until all particles of aggregate are coated with cement. Water shall be added and mixing continued for at least two minutes to result in a concrete of a uniform colour and consistency. The proportion of aggregate sand etc for various types of concrete shall be weighed in weigh batcher. The quantity of water used shall be minimum with practical workability and shall be varied as required to suit the moisture content of the aggregate and to produce having specified slump. Moisture correction for fine and coarse aggregates shall be made regularly.

6.9.4 Water Cement Ratio: Water cement ratio shall be carefully controlled throughout the work. This calls for a regular check on the equipment used for measuring water. Only graduated litre cans shall be used for the purpose. The water cement ratio as determined of approved mix design shall be strictly adhered to.

6.9.5 Transportation. Concrete should be placed in its final position within 30 minutes of mixing. The contractor shall arrange the mixer position and adopt a method of transportation so as to ensure that this period is not exceeded under any circumstances. Transportation shall be smooth and free from jerking.

6.9.6 Concrete placing: Concrete should not be dropped from a height greater than 2 meters. A properly constructed chute shall be used in such cases where it is necessary to exceed this height. Concrete must be thoroughly worked into the forms so that they are entirely filled, reinforcing bars adequately and tightly surrounded and entrapped air released from the mass of concrete. Placing shall be carried out by hand poking as well as vibrators. Concrete should not be moved through any considerable distance in the moulds, being consolidated as nearly as possible in the place where it is dumped. In casting beams or other deep sections concrete shall be laid in layers about 30cm,each layer being properly compacted.

6.9.7 Consolidation: All plain and reinforced concrete shall be consolidated by means of mechanical vibration. Adequate number of vibrators shall be used to ensure full compaction of concrete in about 10 minutes of placing. If needle vibrators are used, these shall be inserted at places not exceeding 0.5M apart until it is immersed to the full depth of concrete. Wherever possible shutter vibrators shall be used and the contractor shall design the shuttering so that this can withstand vibration. Care shall be taken to ensure that concrete is not over vibrated so as to cause segregation. In addition to mechanical vibration sufficient hand tools must be used to ensure full consolidation around reinforcement and at edge; and corners. All exposed faces of concrete shall be covered with Hessian, sand or similar materials which shall be kept continuously wet for a period of at least 7 days after casting.

6.9.8 Construction joints: Construction joints shall be made only where shown on the drawings or approved by the site engineer/ PMC engineer. Such joints shall be kept to the minimum and shall not be located in valleys. The joints shall be at places where the shear force is the minimum and shall be at right angles to the direction of main reinforcement. In case of columns and walls the joint shall be horizontal and

8 to 15 cms below the bottom of the beam or slab running into the column or wall head or below the anchor reinforcement of beam and slab coming into the column and wall and the portion of the column or wall between the stopping of level and the top of the slab shall be concreted with the beam or slab.

6.9.9 Vertical joints: At the end of any day's work or run of concrete the concrete shall be finished off against temporary shutter stopper which should be vertical and securely fixed. This stopper should be removed as early as the weather permits.

6.9.10 Horizontal joints: Horizontal joints should be washed down two hours after casting in the manner described above for vertical joints. If the concrete has been allowed to harden excessively, the surface shall be chipped over its whole surface to a depth of at least 10mm and thereafter thoroughly washed. Before fresh concrete is added on the other side of a construction joint, the surface of the old concrete will be thoroughly wetted and covered with a thin layer of cement mortar 1: 2 or epoxy bond coat as directed by the engineer.

6.9.11 Expansion joint: Expansion joint shall be provided where required as shown in drawing or as directed by the engineer. The filler to be used shall be of approved material

6.10 Testing:

6.10.1 The following tests shall be carried out on the materials and concrete used in RCC work

Material	**Test**	**Field/Lab test**	**Test Procedure**	**Minimum Quantity of material/ work for carrying out the test**	**Frequency of testing**
Stone aggregate	a) Percentages e of soft or deleterious s material	General Visual inspection, laboratory test where required by the Engineer-in-charge or as Specified	IS: 2386 PART II 1963	As required by Engineer-in-charge	For all Quantities

Material	Test	Field/Lab test	Test Procedure	Minimum Quantity of material/ work for carrying out the test	Frequency of testing
	b) Particle size distribution Ten percent fine value	Field of lab as required by Engineer-in-charge		45 cum	For every 45 cum or part thereof as decided by Engineer-in-charge
		Laboratory		45 cum	Initial Test and Subsequent test as @ when required by Engineer-in-charge
Water for Construction purpose	Chemical & Physical Properties	Lab	IS: 8025-1964	Water from each source	Before commencement of work and thereafter every three months till completion of work
Reinforced Cement Concrete	a) Slump test b)Cube test	Field Lab	Standard Standard	20 cum in slab, beams & connected Columns 5 cum in Column	At least once in a day a) Every 20 cum of days concreting Every 5 cum

6.10.2 Slump tests: The slump tests shall be carried out from time to time as directed by the engineer on concrete actually being placed in the works at the commencement of each period of concrete placing in accordance with the procedure laid down in the latest Indian Standards Specifications.

6.10.3 Cube tests: Whenever required by the engineer but subject to the minimum requirement given in the table above, cubes shall be made in a manner as laid down in the latest Indian Standards Code of Practice (IS:456) and sent to an approved laboratory for testing and the results submitted to the engineer immediately on receipt. The cost of all such tests made shall be borne by the contractor. At least 6 cubes will be taken on each day of concreting when a minimum of 5cum of concrete is laid or as instructed by the engineer. The contractor shall keep a record at site of all such tests identifying them with the portion of the work to which they relate. This record will be checked by the engineer from time to time.

6.10.4 Acceptance criteria: Out of six sample cubes, three cubes shall be tested at 7 days and remaining three cubes at 28 days, if found necessary. The average of the strength of three specimen tested at 7 days shall be accepted as the compressive strength of the concrete provided the variation in strength of individual specimen is not more than 15% of the average otherwise 28 days test shall have to be carried out. The concrete may be considered satisfactorily if the 7 day's compressive strength is not less than 2/3 of the specified 28 day compressive strength. However, the engineer may require the 28 day test also to be conducted even if the 7 day strength is considered satisfactorily. Whenever both 7 day and 28 day tests are done on the same sample, 28 day strength done shall be considered for acceptance..

6.10.5 The acceptance criteria for 28 day strength shall be as follows.

- The average of the strength of three specimen be accepted as the compressive strength of the concrete provided the strength of any individual cube shall neither be less than 70% nor higher than 30% of the specified strength.
- The actual average strength of accepted sample exceeds specified strength by more than 30% the engineer-in-charge, if he so desires, may further investigate the matter however, if the strength of any individual cube exceeds more than 30% of specified strength, it will be restricted to 130% only for computation of strength.
- If the actual average strength of accepted sample is equal to or higher than specified strength up to 30% than strength of the concrete shall be considered in order and the concrete shall be accepted at full rates.
- If the actual average strength of accepted sample is less than specified strength but not less than 70% of the specified strength, the concrete may be accepted at reduced rate at the discretion of Engineer-in-charge.

6.10.6 If the actual average strength of accepted sample is less than 70% of specified strength. The Engineer-in-charge /PMC engineer shall reject the defective portion of work represented by sample. Remedial measures necessary to retain the structure shall be taken at the risk and cost of contractor. If however, when engineer-in-charge so desires, he may order additional tests to be carried out to ascertain if the structure can be retrained. All the charges in connection with these additional tests shall be borne by the contractor.

6.11 Inserts and pipes: Inserts of any kind like fan hooks, sleeves, pipes, bolts and nuts, anchor, bolts etc., are to be accurately placed in the concrete (and/or brick work) and concreted over, as and when required and directed. The word “insert” will mean article like anchors beams, sleeves, pipes, bolts, nuts etc.

Pipes: All electric conduits and junction boxes and all sanitary pipes, water supply pipes and down pies that lie within concrete slabs, beams or columns shall be laid in place and the engineer’s approval shall be obtained before the casting of concrete. No cutting of structural concrete will be permitted. All care shall be taken to ensure that conduit pipes are not damaged. This is applicable in the area like office etc.

6.12 Formwork: Formwork shall be erected true to line the and to the shapes required in the work with tolerances as per IS 456 -2000 and shall carry without deformation the full weight or wet concrete and other live loads. It should also withstand the effect of vibration without deflection, building, distortion or loosening of its component parts. The contractor shall be responsible for the sufficiency or all formwork, centring and moulds; formwork shall be wetted thoroughly before concreting. All form work, centring and shuttering used for concreting shall be rigid and straight, so as to produce all concrete members true to line and level with a tolerance of 1/8" (3mm). Wire or similar items shall not be left in concrete having face exposed to weather. Bolts shall be permitted if they are greased/provided in sleeve pipe to allow for easy withdrawal and the holes subsequently made good. The formwork shall be designed so that the soffits of slabs and the sides of beams may be removed first leaving the formworks to the soffit of beams and their supports in position. Wedges shall be provided to allow accurate adjustment of formwork and its easy removal. All joints shall be tongued and grooved and sufficiently tightened to prevent leakage of grout. Camber fillets shall be provided at all corners whenever called for on the drawings. The boards shall be planned and straightened in order that the surface against the corner shall not be broken at joints between boards. All formwork shall be coated with approval oil before it is fixed in position. Cleanout holes shall be provided at the bottom of all columns and care shall be taken to remove any rubbish, wood shaving or any other foreign material before concreting. Temporary supports shall be provided as required and/or ordered by engineer. The contractor shall provide steel/plywood formwork in place of timber boarding wherever called for by the engineer.

6.13 Reinforcement: Steel reinforcement shall be mild steel conforming to IS: 432 – 1989 or round twisted steel conforming to IS: 1786 – 1990 or T.1. Strong II Conforming to IS: 1139 as called for on the drawings. Fabric reinforcement in topping slab or precast concrete units shall be of hand drawn mild steel wire mesh, I.R.C. weldmesh or other equivalent as approved. Bars shall be free from mill scale, excessive rust, oil or paint. The contractor shall submit bar bending schedules for the approval of the engineer prior to commencement of fabrication. These will indicate the accurate dimensions and bending of bar as required on the structural drawings. Fabrication shall be accurately done to the dimensions, spacing and minimum cover as shown on structural drawings and tolerance as per IS 456 -2000. All steel be rigidly held in place with 20 gauge annealed steel wire cement mortar (1:2) cubes (cover blocs), S. Chairs and spacer bars shall be used in order to ensure accurate positioning of reinforcement. All joints in torsteel reinforcement shall be overlapped strictly accordance with drawing. The lap shall be staggered in such a way that at one particular section not more than 25% of the bars are lapped.

6.13.1 Tolerance on placing of Reinforcement

Unless otherwise specified by the Engineer-in-Charge, reinforcement shall be placed within the following tolerances:

a) For effective depth, 200 mm or less + 10mm

b) For effective depth, more than 200 mm + 15 mm

The cover shall in no case be reduced by more than one third of specified cover or 5 mm whichever is less.

6.13.2 Measurements: The length of bar shall be measured to correct to 'cm' of reinforcement placed in position as per drawings. Only such laps, dowels, chairs, spacer pins, as approved by the engineer or as shown on drawings shall be measured and paid. No allowance shall be made for rolling margins. For calculating steel quantity weight shall be considered as per IS standard weight. Standard Weight of Steel Reinforcement bars (Mild steel and high strength Deformed Bars) Used in construction shall be on the basis of the length incorporated in Concrete and weight shall be Computed in accordance with the Table given below.

Diameter of Bar In MM	**Weight per meter length In KG**
6	0.222
8	0.395
10	0.617
12	0.888
16	1.579
20	2.467
22	2.985
25	3.855
28	4.836
32	6.316

6.13.3 Cover of reinforcement: Care shall be taken to maintain the correct cover to reinforcement. Unless otherwise specified in the drawings the following minimum covers (exclusive of rendering or other decorative finish) shall be provided in all reinforced concrete work. At each of a reinforcement bar in a column not less than 25mm nor less than twice the diameter of bar. For links to a longitudinal reinforcing bar in a column not less than 40 mm. For longitudinal reinforcing bar in a beam neither less than 25 mm nor less than the diameter of bar. For tensile, compressive, shear reinforcement in a slab neither less than 20 mm nor less than the diameter of bar. Vertical or horizontal reinforcement in concrete walls, neither less than 25 mm nor less than diameter of bar. Main or subsidiary reinforcement on concrete footing and caps not less than 50 mm. For shutter finished concrete exposed to weather and soil and subject to corrosive conditions increase all cover by 10 mm.

6.13.4 Size stone Masonry: Stones shall be hard, sound and free from decay and weathering. The stones shall be hammer dressed on all beds and joints so as to have a rectangular shape and square on all sides and beds. The bed joints shall be rough

chisel dressed at least 5 cms back from face and side joints at least 4 cm. The remaining portion shall not project beyond the surface of bed and side joints. The brushing in the face shall not be more than 4 cms on exposed faces and one cm on faces to be plastered. The hammer dressed stones shall also have rough tooling for a minimum width of 2.5cm along the 4 edges of the face. Where specified the face of the stones shall be chiselled dressed , the mortar shall be used as specified in the schedule of quantities. The stones shall be wetted before use. The walls shall be built true to plumb or to specified batter. The height of each course shall be not less than 20 cms. Face stones shall be laid alternate hedges and stretches. These shall break joints at least half the height of the course. No pinning shall be allowed on face. No face stone shall be less in breadth than height and atleast 1/3rd of the stones all tail into the width for length not less than twice their height. The interior filling shall be with flat-bedded stones laid in mortar. Chips and sprawls being used to avoid thick mortar joints and shall not exceed 10% of the quantity of stone masonry. The structure shall be carried regularly. Where breaks are unavoidable the joints shall be raked back at angle of 45º. No toothing is to be allowed. Bond stones right through the thickness of walls shall be provided at no more than 2.0 metre apart clear in every course. Quoins shall be of the same height as of the course and shall be formed of tones 40 cms long laid stretchers and header alternatively. All bed joints shall be horizontal and all side joints vertical. Face joints shall be not more than 1 cm thick. Face to be plastered shall be raked to a depth of 20 mm and un plastered faces shall be struck flush and finished at the time of laying. The scaffolding shall be provided as required.Measurements: Stone masonry shall be measured in cubic meters nearest to two decimal places. The length, height and thickness shall be measured at joints excluding the bushing. Only specified dimensions shall be allowed. The rates shall include curing etc.

6.13.5 Brick Masonry: BRICKS The bricks shall be table moulded first quality of regular and uniform size, shape and colour, uniformly well burnt throughout but not over burnt. They shall have plane rectangular faces with parallel sides and sharp straight and right angled edges. They shall be free from cracks or other flows. They shall have a frog of 10mm depth on one of their flat faces. They shall give a clear metallic ringing sound when struck.(c) They shall show a fine grained, uniform homogeneous and dense texture on fracture and be free from lumps of lime, lamination, cracks, air holes, soluble salts causing efflorescence or other defects which may in any way impair their strength, durability, appearance or usefulness for the purpose intended. They shall not have any part under- burnt. They shall not break when thrown on the ground on their flat face in a saturated condition from a height of 60 cm. The size of brick shall be 23 x 11.5 x 7.5 cm. Only bricks of one standard size shall be used on one work only. Bricks which are commonly of size 25 x 12.5 x 7.5 cm shall be used. The following tolerances are permitted in the standard conventional size adopted on a particular work:

Length	---	plus or minus	3 mm about 1/8”)
Breadth	---	plus or minus	1.5 mm (about 1/15”)

Depth -- plus or minus 1.5 mm (about 1/16")

After immersion in water, absorption by weight shall not exceed 20 per cent of the dry weight of the brick when tested according to I.S.S. No. 1077-1957. Unless otherwise specified the load to crush the brick when tested according to I.S.S. No. 1077-1957 shall not be less than 35 kg/sq. cm

Scale for Dimensional Characteristics

No. of BRICKS in the lot	**No: of bricks to be selected**	**Permissible Defective**	**No. of Bricks to divided into**	
2001-10000	20	1	40	Groups of 20
10001-35000	32	2	60	for dimensional
35001-50000	50	3	80	characteristics

6.13.6 Concrete Block Masonry: Solid concrete blocks – Shall conform to the requirements of IS: 2185-2005. The blocks shall be sound, free from cracks, broken edges, honeycombing and other defects that would interfere with the proper placing of block or impair the strength or performance of construction.

Dimensions and Tolerances

The nominal size of the blocks shall be as specified. The maximum variation in the length of the units shall be not more than + 5 mm and maximum variation in height and width of unit, not more than + 3 mm.

Compressive Strength - The average crushing strength of eight blocks, when determined in accordance with IS: 2185-2005 shall be not less than as specified in the item

Drying Shrinkage: The drying shrinkage of the blocks (average of three blocks), when unrestrained, shall be determined in accordance with IS: 2185-2005 and shall not be exceed 0.1 per cent.

Moisture Movement – The moisture movement (average of three blocks), when determined in the manner described in IS: 2185-2005, shall not exceed 0.09 per cent.

Water Absorption – The water absorption (average of three blocks) , when determined in the manner described in IS: 2185-2005 shall be not more than 10 per cent by mass.

6.14 Flooring:

6.14.1 Cement Concrete Flooring: Shall be laid in thickness and with cement concrete as specified in the schedule of quantities laid in panels either by fixing AC or glass strips or any other class of strips as specified in the schedule of quantities or with wooden removable forms. Before laying floor concrete the sub-grade shall be properly cleaned, trimmed to give required thickness of floor and neat cement slurry to give proper bond of floor with the sub-grade. The cement concrete shall be laid and finished with towels and finished with a coat of neat cement on top to give a smooth and homogeneous surface. No extra mortar shall be laid over the concrete to make the floor in level or for drying the floor surface. The joints shall be straight both ways i.e along the length and width. No surplus mortar on the adjoining panel shall be allowed to spill from the other panel.

6.14.2 Cement Skirting and Dados: Shall consists of 20 mm or as specified in the schedule of floating coat or neat cement including rounding of junctions with floors as directed.

6.14.3 Granite Slab Flooring : Except Granite slab of approved design, quality , method of lining, polishing etc. will be same as marble stone flooring.

6.14.4 Granite/ Sira Stone Cladding on walls: In case of reinforced cement concrete backing the lining shall be secure to the backing after it has set. The cramps shall be fixed in concrete while laying at the required positions. The grouting for veneering work shall be full of mortar, hollows noticed shall be made good by taking out the marble slab and refixing.

6.14.5 Ceramic tile flooring : Ceramic tiles, shall be of approved Indian make unless otherwise specified in the description of item. The tiles shall be flat, true to shape, free from cracks, crazing spots, chipped edges and corners. The tiles shall be thickness as specified by manufacturer and of size as specified in the items of work or as directed by the engineer and the tiles shall conform to relevant Indian Standards. Preparation of surface and laying : The sub-grade concrete or RCC slab shall be cleaned, wetted mopped. The bedding for the tile shall be 12 mm average thickness not less than 10 mm at any place, consisting of cement mortar 1: 4 (cement: 4 coarse sand) or as specified. Mortar shall be spread, and corrected to proper levels and allowed to harden. Over the bedding mortar neat grey cement slurry of honey thick consistency shall be spread @ 3.3 kg of cement for square meter. Tiles shall then be laid and gently tapped with a wooden mallet till it is properly bedded in line and level with adjacent tiles. The joints shall be as thin as possible and in straight line as to suit the required pattern. Where full size tile cannot be laid, it shall be cut (sawn) to required size edges rubbed smooth to ensure a true and straight joint. The floor be checked with a straight edge to obtain a true surface. The floor tile near the wall shall enter 10 mm under the striking or dado finish. Pointing & finishing : The joints shall be cleaned of the grey cement grout with wire brushes a depth of 5 mm and all dusts and loose mortar removed. The joint then be flush pointed with white cement mixed with pigment to match the colour of tiles and floor kept wet for 7 days. The floor shall not hollow when tapped with a wooden mallet.

6.14.6 Ceramic tiles in skirting and dados: Ceramic tiles shall be the same as that of flooring: Preparation of surface: The joints of masonry walls shall be raked out to a depth of at least 15 mm. In case of RCC walls the surface shall be hacked and roughened with wire brushes. The surface shall be cleaned thoroughly washed with water and kept wet. Laying: The surface shall be plastered with cement mortar 1:3 (1 cement:3 coarse sand) or as specified to an average thickness of 12 mm and allowed to harden. The plastered surface shall be roughened with wire brushes or by scratching diagonal lines 1.5mm deep at 7.5 cm centres both ways. The back of tiles shall be buttered with grey cement slurry and edges with white cement slurry and set in bedding mortar. The tiles shall be lightly tampered and corrected to proper plane and lines. Tiles shall be set in required pattern with as fine as possible butt joints. Top of dados, skirting's etc. shall be truly horizontal and joints truly vertical. Where full tiles cannot be used, cut (sawn) tiles of required size shall be provided as in flooring. At corners, edges of tiles shall be cut at 45o before fixing. The joints shall be cleaned and flush with white cement mixed with pigment to match the colour of tiles. The surface shall be kept wet for seven days. The finished work shall not sound hollow when tapped with a wooden mallet.

6.15 Finishing:

6.15.1 Cement Plastering: The joints shall be racked out and the surface cleaned, washed and kept wet before plastering is commenced.

6.15.2 Cement Paints: IS 54 The paint shall be of approved manufacturer, approved by the engineer. Before painting is commenced on surface, all dirt and foreign material shall be completely removed. The surface shall be sprayed several times with a few minute's intervals between each spraying to allow moisture soak into the surface. Cement paint solution shall be get uniform finish. After the first coat of paint has hardened, it shall be wetted again before the application of the 2nd coat. At least 24 hours should elapse between the two coats. Similarly, number of coats (minimum three) shall be given to get a uniform colour. It shall be kept damp at least for seven days.

Plastic /Acrylic Emulsion Paint: The surface shall be prepared as specified for enamel paints. First a priming coat of primer as specified by the manufacturer shall be applied. The 2nd and 3rd coat of plastic/acrylic emulsion paint approved shade and manufacture shall be applied to achieve an even surface. If the finish is not to the satisfaction of the engineer more coats shall be applied to achieve smooth and even surface. Proper patty shall be used.

6.15.3 Synthetic Enamel Paint: Surface to be painted shall be dry, free dust and dirt and rubber smooth by means of sand paper or Pumice stone to the satisfaction of the engineer. The paint shall be ready mixed synthetic enamel of approved make and manufacture. The primary coat shall be ready mixed of approved make and the primer coat is applied and perfectly dried all holes, cracks etc shall be filled with putty and the surfaces sand papered. Then a second coat of approved shade and manufacture shall be evenly applied and allowed to dry. The third coat shall be

carefully applied as and when required, to achieve smooth and even surface. Putty shall be lead based and of good quality.

6.16 Waterproofing "Cetroof" Treatment: (Cement Based Waterproofing Treatment Through Specialist Agencies)

6.16.1 Terrace Waterproofing Terrace waterproofing shall be "CETROOF SURFACE TREATMENT" (Permanent waterproofing treatment) by one of the Specified Agencies mentioned in the list attached and shall be as per their Specifications, and shall carry 10 years Guarantee against leakage. This Treatment shall start directly over R.C. C slab and shall include for providing and laying of brick bat coba with necessary gradient for the easy flow of water. The coba shall be done in special waterproof mortar and shall be finally covered with "CETROOF" waterproof joint less plaster, finished smooth with trowel in grey Cement colour, marked into 30 x 30 cms false squares. The treatment shall be carried along the inside of parapet or other adjoining walls, upto a height of about 300 mm in the shape of round vata (rounding off). The surface provided shall be hard and tough, suitable for all normal domestic purposes. Rate quoted shall include for making round vata and alsof for tucking the treatment on the vertical face of the parapet for tucking. Rate quoted by the Contractor shall include for the above waterproofing treatment of Specialized-Agencies, with all overheads and profits.

6.16.2 Toilet Waterproofing - Toilet waterproofing by approved specialist firm under guarantee of 10 years. the main contractor shall, while the concrete is still green, carry out smooth cement punning in this layer to both bottom and sides of sunk portions at the time of concreting of the slab. The brick bats from well-burnt bricks of about 40mm size completely saturated with water shall be used for filling in sunk portions of toilets including space around W.C pan. The surface of sunk-portion where waterproofing is to be done shall thoroughly cleaned with wire brushes. All loose scales shall be removed and dusted off. The cleaned surface shall be treated with neat cement slurry admixed with acrylic waterproofing command to penetrate into crevices and fill up all porosities in the surface. The cracks observed if any, in the slab shall be appropriately mortar. After treatment above, brick bats fully saturated with water shall be laid in position within layers of cement mortar 1:4 duly admixed with acrylic waterproofing compound. The top most layer of brick bat shall not be covered with cement mortar.) Treatments at II (g) shall follow except that top layer will be 12mm thick and finished suitably. This item shall be carried out after nahany traps, W.C. pan, all pipes are laid in position and are duly jointed the treatment shall be worked wall around the nahany traps, pipes and their joints, holes made in the alls shall also be treated suitably. 12mm thick waterproof plaster in cement mortar 1:4 with acrylic waterproofing compound shall be carried out up to proposed height of dado in the toilets. Before carrying out waterproofing treatment on the wall, the wall surface shall be thoroughly cleaned the joints of brick work shall be raked out if required, treatment of cement slurry admixed with acrylic waterproofing compound be carried out to the wall. Junction of wall and top of slab/beam shall be treated with cement slurry with acrylic, waterproofing compound by injection method.

6.16.3 LEAKAGE TESTS (Applicable to all types of waterproofing treatments to terrace and toilet blocks). After completion of waterproofing work of terraces as well as toilet blocks the leakage test shall be carried out by impounding the water 75mm to 150mm deep, over the surfaces treated .Joint inspection shall age carried out by the Contractor with site engineer /PMC engineer representative to find out leakage / dampness of the surface if any. In case any leakage/dampness is noticed, the same shall be rectified by the Contractor without any extra cost .

6.17 ANTI TERMITE TREATMENT -

6.17.1 CHEMICALS: The chemicals used for the soil treatment shall be any one or a combination of the following the concentration shown against each in aqueous emulsion:

Chemicals	**Chemicals**
Aldrine	0.5% (by weight)
Chlordane	1.0% (by weight)
Dieldrin	0.5% (by weight)
Deptachlor	0.5% (by weight)

TREATMENT OF COLUMN PITS WALLS TRENCHES AND BASEMENT EXCAVATIONS: The bottom surface and slides (up to a height of 30 cm., from the bottom) of the excavations mentioned above at 5 litres per. metre of surface area. made for column pits, trenches and basements shall be treated with to chemical emulsion
TREATMENT TO BACKFILL EARTH:
After the column foundations, wall foundations and retaining walls of the basement come up, the backfill in immediate contact with the foundation structure shall be treated with the chemical emulsion at the rate of 15 litres/m2 of the vertical face of the sub-structure of each side. The earth is usually returned in layers and treatment shall be carried out in similar stages. The chemical emulsion shall be directed towards the concrete or masonry surface of the columns and walls so that the earth in contract with these surfaces is well treated with chemicals.
TREATMENT TO R.C.C. FRAMED STRUCTURES:

The treatment described in 2 and 3 above applied essentially to masonry foundations where there are voids in the joints through which termites can seek entry into the superstructure. Hence the foundations require to be completely enveloped by a chemical barrier. In the case of R.C.C. framed structures with columns and plinth beams and R.C.C. basements the concrete mix is rich and dense (being 1:2:4 or M 150 or richer), it is unnecessary to start the treatment from the bottom of excavation for start at a depth of 50 cm. Below ground level from this depth, the backfill around the columns beams and R.C.C. basement walls shall be treated at the rate of 15 litres/m2 of the vertical surface. The other details of the treatment shall be as laid down in 3 above.
TREATMENT OF TOP SURFACES OF PLINTH FILLING: After the earth filing is completed within the plinth area and before the dry rubble packing or sub-grade is laid, the entire surface of the filled earth shall be treated with chemical emulsion at 5 litres per sq. meter. Light rodding of the surface may be carried out to facilitate proper absorption of the emulsion.
TREATMENT AT JUNCTION OF WALLS AND FLOOR:
Special care shall be taken to establish continuity of the vertical chemical barrier on inner wall to surfaces from the ground level (where it had stopped with the treatment described in 3 above) upto the level of the filled earth surface. To achieve this, a small channel 3 x 3 cm., shall be made at all junctions of wall and columns with the floor (before laying the sub grade) and rod holes made in the channel upto the ground level 15cm. Apart and the rod moved backward and forward to break up the earth and chemical emulsion poured along the channel at the 5 litres per linear meter so as soak the soil right to the bottom. The soil should be tamped back into place after this operation.
TREATMENT TO SOIL ALONG EXTERNAL PERIMETER OF BUILDING:
Finally the earth round the external perimeter of the building up to a depth of 30cm shall be treated at the rate of 4.5 litres per running meter of plinth wall. To facilitate this treatment, solid
SPRAYING EQUIPMENT: A pressure pump shall be used to carry out spraying operations to facilitate proper penetration of chemical into the earth. The above specifications are in the line with the I.S. code of Proactive for Ant-termite Measures in Buildings, I.S.: 6313 (Part-ii) 1971.

6.18 GRANITE / SIRA STONE CLADDING:

Providing & fixing Sira stone cladding of approved size of thickness 75 mm to 100 mm / 3” to 4” with cement including jointing, making necessary grooves and cement filling for the grooves, acid wash. This also includes providing & removing scaffolding, curing etc., must be complete in all respect as per drawing details.

6.19 VITRIFIED TILE FLOORING:

Tile manufactured as “Printed Vitrified tile with soluble salt or penetrating pigments and design pattern with roll filled / double charged Technology. Tiles to be homogeneous and properties to be uniform all through tiles and confirm to IS specification No.13755”.

6.20 DESIGNER CONCRETE PAVING TILES/ BLOCKS: The paving tiles to be of Eurocon or Duractre make unless otherwise mentioned and laying to be as per the following instruction.

6.20.1 SUBSTRATA PREPARATION – FLOOR - The ground is to be watered and rammed thoroughly to create a firm base. Over this 3” of river sand is to be laid and rammed thoroughly. On top of the sand cushion, for pedestrian traffic, 4”of 1:5:10 brick jelly concreting has to be done and for heavy traffic, 4” of 1:4:8 PCC concreting to be done.

6.20.2 FLOOR TILES LYING: Prepare base mortar with cement and sand in the ratio 1:4.. The total mortar thickness should not be more than 1” in case where tiling is to be done on RCC slabs, finished floor levels would have to be marked using tube levels. In this process, if it is observed in some area mortar thickness is likely to be in excess of 1” in those areas PCC work will have to be done to raise levels, so that thickness is not more than 1”. Set the levels for the finished floor (i.e, dead level or slope as specified by the site engineer/PMC engineer. Prepare cement slurry (i.e, mixture of cement and water to form a thick paste) and spread it on the levelled base mortar. Wet the reverse of the tile with water. Complete immersion of tile in water is not required. If tiles are square or rectangle in shape, set the right angles for the rooms and place the first tile along the right angle lines and place it in a base mortar. Tap gently and uniformly only with a rubber or wooden mallet covered with cloth to obtain perfect levels. Clean the surface of the tile with a wet sponge immediately after laying. Ensure that the base mortar cement, which squeezes through joints does not settle on the tile. Also ensure that the water used is clean and not sally, hard or brockish. It is suggested to leave a fine gap of 1mm all around for external tiles like Regolia, Aquarius etc., for fast and proper laying. For the tiles like Macedonia, Basel and Magnifique, offset laying shall be followed: a) While placing Macedonia, a groove of 6-8 mm must be left all around the tile. In the case of Basel, the second tile should be placed exactly at the bottom of the first diamond and ensure the grooves match perfectly. Likewise, when following offset laying for Magnifique, the second tile should be placed exactly at the midpoint of the other tile. For external tiling completely open to sky, the tiles should be laid in such a way that for every 10’ x 10’ area laid, there should be an expansion gap of 2 mm on all sides. This should be followed throughout the area of laying to provide for the expansion for all tiles. Absence of expansion gaps may result in lifting / chipping / cracking of tiles. 11. In site where multiple levels are encountered, the tiles on the ridge will have to be adequately protected with mortar cushion. When large span tiles are laid on curved substrate, it is suggested that the tiles be cut to take the

contour of the slope ensuring proper bedding. Fill in the joints with pointing material, which is a mixture cement and desired colour of pigment. To arrive at the desired colour / shade, mix the same with water to form a smooth paste which should be applied to the joints preferably with the use of rubber squeeze or rubber sheet. For higher quality of finishes you could use if required a polymer based cementations tiling joint filler. Do not apply the pointing material all over the tile surface. Allow pointing material to set, for 15 minutes and then clean the surface of the tile with wet sponge, removing the excess pigment on the tile surface. Wash the surface with soap water or mild detergent to obtain a clean surface. Do not use the area laid for 3days for pedestrian traffic areas, 7 days for light traffic areas and 10 days for heavy traffic. M.S. rods should be driven into the soil as close as possible to the plinth wall at intervals of 15 cm. and up to a depth of 30 cm. And the rods moved backwards and forwards in a direction parallel to the wall to break up the earth so that the chemical emulsion mixed intimately with the soil.

6.21 REATMENT OF SOIL SURROUNDINGS PIPES, WASTES AND CONDITS:

When pipes, wastes and conduits enter the soil inside the area of the foundations, the soil surroundings the point of every must be loosened around each such pipe, waste or conduit for a distance of 15 cm. and up to a depth of 7.5 cm. Before treatment is commenced. When they enter the soil external to the foundation, they shall be similarly treated unless they stand clear of the walls of the building by about 7.5 cm for a distance of over 30 cm.

6.22 CIVIL BOQ -In Below table civil BOQ has provided. A) Bidder needs to calculate the quantity, submit Design Based Report (DBR) alongwith Bar Bending Schedule (BBS) etc. which will be evaluated by TEC as part of Technical Evaluation. B) The bidder also has to submit the Design Based Report (DBR) for plumbing as per relevant I.S. codes.

Sl. No	Description	Unit	Quantity
A	**Civil Works**		
1	**Earth work by Mechanical Means**		
	Earthwork Excavation For All Type Of Foundation of building , depth upto 2m in all types of soil of required any depth as per drawing including dressing the bottom and sides of pits stacking the excavated soil clear from edges of excavation with all lead & lift after breaking of clods etc., including bailing out of water etc., complete including the cost of all materials, cost of labour, cost of equipment and machinery, all lead and lift, loading and unloading, transportation, and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the directions of the Engineer In charge of the work. [Excavated Earth To be Used for Filling. Contractor to plan excavation in such way that excavated earth retained and reused for filling][**Quantity will be measured as per actual .Only**	Cu.m	

Sl. No	Description	Unit	Quantity
	150mm additional space for working will be provided for excavation. if additional working space required to be considered in quoted rates] Depth Upto - 2mtr.		
2	**Earth work by Mechanical Means**		
	Earthwork Excavation For All Type Of Foundation of building, depth upto 2mtr to 4mtr. in all types of soil of required any depth as per drawing including dressing the bottom and sides of pits stacking the excavated soil clear from edges of excavation with all lead & lift after breaking of clods etc., including bailing out of water etc., complete including the cost of all materials, cost of labour, cost of equipment and machinery, all lead and lift, loading and unloading, transportation, and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the directions of the Engineer in charge of the work. **[Quantity will be measured as per actual .Only 150mm additional space for working will be provided for excavation. if additional working space required to be considered in quoted rates] Depth Upto - 2 to 4mtrs.**	Cu.m	
3	**Earth work by Mechanical Means - in Soft Rock without blasting. Approx.**		
	Earth work excavation for foundation of structures as per drawing and technical specification, Including setting out and surveying, Stocking the excavated earth for backfilling to the extent required and utilizing / transporting the remaining earth locally upto 3.00km lead. (Depth upto 3.00 Mts) - in Ordinary Rock (without blasting) - Mechanical Means Including providing shoring and strutting, removal of stumps and other deleterious matter, dressing of sides and bottom etc., Including the cost of labour & HOM of machineries, as per drawing and technical specification. The work shall be carried out as per the directions of the Engineer in charge.	Cu.m	
4	**Earth work by Mechanical Means - in Hard Rock without blasting. Approx**		

Sl. No	Description	Unit	Quantity
	Earth work excavation for foundation of structures as per drawing and technical specification, Including setting out and surveying, Stocking the excavated earth for backfilling to the extent required and utilizing / transporting the remaining earth locally upto 3.00km lead. (Depth upto 3.00 Mts) - Hard Rock (without blasting but by chiseling) - Mechanical Means Including providing shoring and strutting, removal of stumps and other deleterious matter, dressing of sides and bottom etc., Including the cost of labour & HOM of machineries, as per drawing and technical specification. The work shall be carried out as per the directions of the Engineer in charge.	Cu.m	
5	**Earth Filling With Available Earth**		
	Refilling Available Approved Earth (Excluding rock) in the sides of foundation upto plinth in layers not exceeding 20cms.in depth ,compacting each deposited layer by rammering after water with all lead and lift etc., complete Including the cost of all materials, cost of labour, lead and lift, transportation, and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the directions of the Engineer in charge. [Excavated Earth To be Used for Filling. Contractor to plan excavation in such way that excavated earth retained and reused for filling]	Cu.m	
6	**Earth Filling With Borrowed Earth**		
	Earthwork Filling to the Foundation with Approved New Earth brought from outside including watering and compaction in layers of 15cms,thick, etc., complete including the cost of all materials, cost of labour, cost of equipment, all lead and lift charges and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge of the work	Cu.m	
7	**Anti-Termite Treatment**		

Sl. No	Description	Unit	Quantity
	Providing and injecting chemical emulsion for Pre-constructional Anti-Termite Treatment, creating continuous chemical -barrier under and around the column pits, walls, trenches, basement excavation, top surface of the plinth filling, junction of wall and floor, along the external perimeter of building, expansion joints, over the top surface of consolidated earth on which apron is to be laid, surrounding of pipes and conduits, with chloropyriphos emulsifiable concentrates of 20% concentration, including cost of chemical, diluting in water to one percent concentration, labour, HOM of equipment's, all lead and lift ,loading and unloading ,transportation and all other incidental charges etc complete as per approved shop Drawing. The work shall be carried out as per directions of Engineer in charge of works. (Plinth area of the building at ground floor only shall be measured)	Sqm	
A	**Sub total of Earth works**		
B.	**Plain Cement Concrete Works**		
1	**PCC M7.5 1 : 4 : 8 below Foundation**		
	Providing and laying in position plain cement concrete of nominal mix M7.5 [1:4:8] with OPC cement @180kgs, with 40mm and down size graded granite metal coarse aggregate @0.85 Cum and fine aggregate @0.57 cum machine mixed, concrete laid in layers not exceeding 15 cms. thick, well compacted, in foundation and plinth, including cost of all materials, labour, HOM of machinery, loading, unloading, transportation, curing, lead and lift charges and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work.	Cu.m	
2	**PCC M5 Grade Concrete Below Flooring**		

Sl. No	Description	Unit	Quantity
	Providing and laying in position plain cement concrete of nominal mix M5 Grade [1:5:10] with OPC cement @160kgs ,with 40mm and down size graded granite metal coarse aggregates @ 0.86 cum and fine aggregates @ 0.58 cum machine mixed, concrete laid in layers not exceeding 15 cms. thick, well compacted, in foundation and plinth, including cost of all materials, labor, HOM of machinery, curing, cost of equipment, transportation, lead and lift charges, and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work.	Cu.m	
3	**PCC 1:2:4 For Sill and Coping**		
	Providing and laying in position plain cement concrete of nominal mix 1:2:4 with 20mm and down size graded granite metal, machine mixed, concrete laid in layers not exceeding 15 cms thick, vibrated for all works coping, bed blocks, anchor blocks, plain window Sills, fillets etc,, Including cost of all materials, labour, HOM of machinery, curing, cost of equipment, lead and lift charges transportation and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work.	Cu.m	
4	**Soling**		
	Providing and laying rubble soling and hand packed and set on ends with interstices Filled tight with Small chips and blinded at top with hard murrum & M Sand including watering and consolidation by hand roller etc complete including the cost of all materials, cost of labour, cost of equipment, lead and lift charges and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge of the work.	Cu.m	
B	**Sub total of PCC works**		
C	**Shuttering & Centring Works**		
1	**Shuttering works - Below ground level & Upto Plinth**		

Sl. No	Description	Unit	Quantity
	Providing and removing centering, shuttering, strutting, propping etc., and removal of form work for **foundations, all types footings, pedestals, bases of columns, Plinth beams** for mass concrete including cost of all materials, labour, lead and lift charges and staging for form work all other incidental charges etc., complete as per design drawing. Strong Plywood shuttering to be provided. The work shall be carried out as per the direction of the Engineer in charge. (Height Upto 5.5mtr.)	Sqm	
2	**Shuttering works - Above Plinth Level**		
	Providing and removing centering, shuttering, strutting, propping etc., and removal of form work for flat surface such as S**uspended floors, folded plates, roofs, beams. girder beams, lintels, Chejja's, staircase landings, balconies** verticals and likes, thickness upto 250 mm including staging for form work ,cost of all materials, labour ,lead and lift charges and all other incidental charges etc., complete as per approved shop drawing. Strong plywood shuttering to be provided. The work shall be carried out as per the direction of the Engineer in charge. **(Height Upto 5.5mtr.)**	Sqm	
3	**Shuttering work for retaining walls.**		
	Providing and removing **shuttering, centering, strutting, propping** etc., and removal of form work for **vertical surface** such as walls at any thickness, drop walls, **retaining walls**, lifts, Sump, outer periphery wall, underground sump, overhead tank including attached pilasters, buttresses, cills and string courses cost of all materials, including staging labour etc, complete as per specifications. Strong plywood shuttering to be provided. The work shall be carried out as per the direction of the Engineer in charge. (Height Upto 5.5mtr.)	Sqm	
C	**Sub Total of Shuttering & Centering Works**		
D	**Reinforced cement concrete works**		
4	**Ready Mixed Concrete (RMC)**		
	Note: **1) The RMC shall be obtained from the batching plant installed at site by the agency.** **2) Test results of concrete for 28 days shall conform to IS standards .The rate is inclusive of obtaining of concrete cubes and furnishing test results.**		

Sl. No	Description	Unit	Quantity
	Note: 1.Gradation of metal for concrete. 40 mm and down size brocken metal. 1. 40 mm to 25 mm 50% + or - 6% tolerance 2. 20 mm 25% + or - 2.5% tolerance. 3. 12mm to 10 mm 25% + or - 2.5% tolerance. 20 mm and downsize broken metal. 1. 20mm 66% + or - 7% tolerance. 2. 12mm to 10mm 34% + or - 3% tolerance. 2. As per IS 456 of 2000 for major works only design mix should be adopted.		
	Providing and laying in position machine batched , machine mixed and machine vibrated Ready Mixed Concrete confirming to IS :4926 - 2002 of specified grade **M25 - Grade** (unless otherwise specified), for reinforced concrete structural elements, as per relevant IS specifications, using 20mm and down size graded granite jelly for RCC works, including admixtures in recommended proportions (as per IS : 9103) to accelerate, retard setting of concrete, improve workability without impairing strength and durability, laid in layers not exceeding 15 cms thick and well compacted, machine batched, machine mixed, vibrated, curing, pumping of concrete etc including cost of all materials. labour, HOM of machinery, curing, and all other incidental charges etc., complete as per design drawing . The work shall be carried out as per the direction of the Engineer in charge of the work for the following works.		
(a)	Footing, Pedestals, Retaining wall concrete - [M25 RMC]	Cum	
(b)	Plinth/Grade Slab With Finish /Columns/ Roof Beams & slab / slabs [M25 RMC]	Cum	
5	**Site Mixed Concrete [SMC]**		
	Providing and laying in position reinforced cement concrete of design mix M25 with OPC cement @ 340 Kgs ,with 20 mm and down size graded granite metal coarse aggregate @0.70 cum and fine aggregates @0.47 cum ,with superplasticizer @ 3lts conforming to IS 9103 - 1999. Reaffirmed -2008 ,machine mixed, concrete laid in layers not exceeding 15cms thick, vibrated for all works in foundation for Footings, pedestals, retaining walls return walls, wall(any thickness) including attached pilasters, columns, pillars, posts, struts, buttresses, bed blocks, anchor blocks & plinths etc., including cost of all materials. labour, HOM of machinery, curing, and all		

Sl. No	Description	Unit	Quantity
	other incidental charges etc., complete as per approved shop drawing . The work shall be carried out as per the direction of the Engineer In charge.		
(a)	All Types of Footing, Pedestal, Retaining [M25 Mix]	Cum	
(b)	Plinth , Roof Slabs & Beams, lintels [M25 Mix]	Cum	
(c)	Column Concrete [M25 Mix]	Cum	
(d)	Staircase Concrete [M25 Mix]	Cum	
(e)	Chajja		
	Providing and laying in position reinforced cement concrete of design mix M20 with OPC cement @24 kgs ,with 12mm and down size graded metal coarse aggregate @0.345 cum and fine aggregate @0.391 cum ,with superplasticizer @0.225 lts ,machine mixed well compacted for plain chajja of 7.5 cms , average thickness, upto ground floor level etc. including cost of all materials, labour, HOM of machinery, curing, and all other incidental charges etc., complete as per approved shop drawing . The work shall be carried out as per the direction of the Engineer in charge of the work.	Sqm	
D	**Sub Total of reinforced Cement Concrete works**		
E	**Masonry works**		
1	Solid Block Masonary-200mm Thick		
	Providing and constructing Precast Concrete Solid Blocks With compressive strength not less than 35 Kg/Sqmm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with solid concrete blocks of size 40x20x20cms conforming to I.S: 2185/2005 in foundation and superstructure including cost of materials, labour charges, scaffolding, curing, lead and lift, and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge of the work. **(Scaffolding to be included in all height as per drawings.)**	Sqm	
2	**Solid Block Masonary-150 Thick**		
	Providing and constructing Precast Concrete Solid Blocks With compressive strength not less than 35 Kg/Sqmm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with solid concrete blocks of size 40x15x20cms conforming to I.S: 2185/2005 in foundation and superstructure including cost of materials, labour charges, scaffolding, curing, lead and lift, and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the	Sqm	

Sl. No	Description	Unit	Quantity
	direction of the Engineer in charge of the work. **(Scaffolding to be included in all height.as per drawings.)**		
3	**Solid block Masonry -100 Thick**		
	Providing and constructing non-load bearing wall with cement concrete solid blocks with compressive strength not less than 35 Kg/Sqmm with cement mortar 1:4 (Jamb, closer blocks) with steel reinforcements two no's of 8mm dia for every fourth course and distribution at 30 cms c/c with blocks of size 40x10x20cms.(lxbxh) conforming to I.S : 2185/2005 in foundation and superstructure including cost of materials, labour charges, scaffolding, curing, lead and lift charges ,and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge of the work. **(Scaffolding to be included in all height. as per drawings.)**	Sqm	
4	**Size Stone Masonry**		
	Providing and constructing granite / trap / basalt size stone masonry in foundation / outer plinth wall with cement mortar 1:6, stone hammered dressed in courses not less than 20 cms high, bond stones at two m. apart in each course including cost of materials, labour, HOM of machinery, curing, lead and lift charges, and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge of the work.	Cum	
E	**Subtotal Of Masonry Works**		
F	**Steel & Fabrication**		
1	**Reinforcing steel**		
	Rates quoted to include for all levels, depths, heights and locations unless specified otherwise.		
	All existing exposed reinforcement steel shall be cleaned of all rust or any other matter, if any and treated with approved anticorrosive coating before concreting.		
	Wastage of steel shall not be measured.		

Sl. No	Description	Unit	Quantity
	Providing, fabricating and placing in position all TMT reinforcements of tested quality of all diameters conforming to IS:1786 with approved grade of steel as per design & Drawing for R.C.C work Including straightening, cutting, bending, hooking, placing in position, lapping and / or welding wherever required, tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design. cost of materials, labour, HOM of machinery complete, lead and lift charges and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work. **Fe 500** **REFER STRUCTURAL DRAWINGS**	MT	
2	**Structural Steel**		
	Providing, Fabricating and erecting Structural steel works in welded/bolted made up of single or built up sections, trusses and framed work at all heights using ISMC, ISMB, ISA, Tata Structural RHS, SHS, bolts, circular pipes or any other sizes and shapes etc. as per the required pattern as per architectural and structural drawing including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer after fabrication, inspection all complete. Structures to be painted with one more coat of red oxide primer as per IS -2074 after erection followed by two coats of enamel paint of approved brand, grade and quality. Cost to include necessary bolts/thread bolts/foundation bolts/plates etc., complete as per design drawing and direction of Engineer in charge. The quoted rate shall include necessary scaffolding, lifting, erection, transporting at all levels.	MT	
F	**Subtotal Steel & Fabrication Works**		
G	**Doors and Windows**		
1	**Door Frames**		

Sl. No	Description	Unit	Quantity
	Providing and fixing African Teak wood frames for all types and sizes doors, wrought, framed or assembled including making plaster, grooves, side clamps/Hold Fast (including cost of cement concrete) but including two or more coats of approved melamine polishing, cost of materials, labour, HOM of machineries, lead and lift charges and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work.[all fittings are as per recommended make list]	Cum	
2	**Door Shutter - with both side laminate**		
	Supplying & fixing 30mm thick waterproof Flush BWR Grade door covered in 1mm thick lamination on both sides with the edges covered all-round in 32mm x 8mm teak wood lipping [Size to be matched to finished shutter] matching to selected laminate all-round fixed to doorframe with heavy duty ball bearing , 4 no's of butt hinges of size 125mmx35mmx3mm with required hardware fittings like door stopper ,handle, lock, ball catch , Door Closer, tower bolt etc.as per design etc. Cost to include 2 coats of melamine polish, cost of all materials, labour, lead and lift charges and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge.[All fittings are as per recommended make list]	Sq.m	
3	**Fire rated Door frames and Shutter**		

Sl. No	Description	Unit	Quantity
	Providing and fixing of ISI marked fire doors with frame as per IS 3614:2021, 120 minutes fire rating with 30 minutes insulation double leaf door set tested to IS/ISO 3008. Door set shall include grooved step frame profile of 125x75mm, made of 1.2mm GI (120GSM) and 60mm thick shutter made of 1.2mm GI (120GSM) with infill of 120kg density mineral wool. Grooved frame shall include EPDM smoke seal. Include hardware's, minimum 6nos SS ball bearing hinges of SS304 100x89x3mm, 1no of Single point Panic device and external trim with key cylinder on active leaf and 1no two point Panic device on the inactive leaf, tested as per EN1125 and CE marked. 2no of Door closer with spring size of EN 3-5, as per EN1154 and CE marked. 1no door coordinator for sequencing. 2nos vision panel 200 x 300 with 6mm clear fire rated glass and finished in desired colour of powder coating not less than 50microns including suitable anchors & fire rated puff grouting all-inclusive for fixing of door set - for staircase **/** exit pathway / Refuge area applications.	Sq.m	
4	**Aluminum Three Track Windows**		
	Providing & Fixing in position aluminum windows with sliding shutter & mesh using **three track** window frame of size 92 x 31.75 mm bottom section of 1.3mm thick, weight 1.07 Kg/m; sides and top sections of 1.3 mm thick .weight 0.933 kg/m shutter frame section comprising top and bottom section of Size 40 x 18 mm ,wall thickness 1.25mm .weight 0.417 kg/m .shutter side outer 40mm x 18mm ,wall thickness 1.25mm .weight 0.417 kg/m ,shutter interlock section 40 x 26.7 mm ,wall thickness 1.1mm .weight 0.469 kg/m ,the shutter mounted on nylon rollers with approved quality of fixtures such as aluminum handles tower bolts etc. providing and fixing 5.5mm thick plain glass for shutter fitted with EPDM Gasket Rubber beading all aluminum sections including cutting to required length ,joints mitred subdividing the frame tanned and rivetted, in the assembled frame, stiffened with end clips for corners,angles.one shutter should be provided with approved mosquito mesh shutter etc.,		

Sl. No	Description	Unit	Quantity
	and fixed to the walls lintels, floor beams as the case may be with necessary steel screws, raul plugs or teak wood gates including cutting masonry or concrete and making good original surface using cement mortar. Including, cost of labour, cost of materials, lead and lift charges and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge of the work.		
	Do using Aluminum section powdered coated to a minimum of 60-70 microns with exterior durable pure polyester grade powder of approved quality and color.	Sq.m	
5	**Aluminum Two Track Windows**		
	Providing & Fixing in position aluminum windows and ventilator's as per approved drawings with sliding shutter using **Two track** window frame of size 61.85 x 31.75 mm bottom section of 1.2 thick, weight 0.695 Kg/m sides and top sections of 1.3mm thick .weight 0.659 kg. shutter frame section comprising top and bottom section of Size 40 x 18 mm ,wall thickness 1.25mm .weight 0.417 kg/m .shutter side outer 40mm x 18mm ,wall thickness 1.25mm .weight 0.417 kg/m ,shutter interlock section 40 x 26.7 mm ,wall thickness 1.1mm .weight 0.469 kg/m ,the shutter mounted on nylon rollers with approved quality of fixtures such as aluminum handles tower bolts etc. providing and fixing 5.5mm thick plain glass for shutter fitted with EPDM Gasket rubber beading all aluminum sections including cutting to required length ,joints mitred subdividing the frame ten onned and rivetted, in the assembled frame, stiffened with end clips for corners, angles ,etc.,		
	and fixed to the walls lintels, floor beams as the case may be with necessary steel screws, raul plugs or teak wood gatties including cutting masonry or concrete and making good original surface using cement mortar. Including, cost of labour, cost of materials, lead and lift charges and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge of the work.		
	Do using Aluminum section powdered coated to a minimum of 60-70 microns with exterior durable pure polyester grade powder of approved quality and color	Sq.m	
6	**Aluminum Louvers For Ventilators**		

Sl. No	Description	Unit	Quantity
	Providing & Fixing Aluminum Fixed Louvers with 50 mm x 50 mm outer frame with 1.5 mm thick fixed louver profile including All necessary fittings. cost to include 5.5mm thick tinted glass ,gasket, sealant, EPDM Gasket Rubber Beading including ,cost of labor, cost of materials, lead and lift charges and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work. Louver shall be fixed in an angle so that no horizontal vision seen.		
	Do using Aluminum section powdered coated to a minimum of 60-70 microns with exterior durable pure polyester grade powder of approved quality and color.	Sq.m	
7	**Toughened Glass Door**		
	Supply and fixing 12 mm thick Toughened Glass door with pivoted on floor spring (BTS -75V) with complete accessories, like floor strike plate top patch PT Series with the following features, a) One set of 300mm long pull handles of DORMA or equivalent make b) One number Corner lock US10 of DORMA or equivalent make with EPC ,Keys And Locks. c) Floor spring BTS-75V of DORMA or equivalent make d) Lock keeper plate stainless steel strip of DORMA or equivalent at the bottom of doors. Including cost of all materials, labour, lead and lift charges and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge of the work.	Sq.m	
8	**Curtain wall glazing**		
	Supply & fixing 0f Curtain glazing using approved colour powder coated Aluminum sections of approved make of 56.3mm x 77mm including tip x 2.25mm @ weight of 1.751kg/mt [Jindal section No.22703] with flat [53mm x 10mm x 2mm@ 0.434kg/mt [section jindal section No. 22711] and cap system with 6mm thick heat strengthened glass of approved colour. The cap profile shall be approved as per architectural requirement. The horizontal member shall be of approved profile like V shape or any other shape and profile for the vertical members shall be flat shape system. if any other profile required to suit elevation requirement and site requirement , contractor to provide the same.		

Sl. No	Description	Unit	Quantity
	The cost of the curtain glazing shall be include providing & fixing glass with required accessories such as EPDM gaskets, fire stops between floors silicon sealants around the frame, anchor plate, anchor bolts, drilling & fixing the curtain glazing frame to either masonry or reinforced cement concrete at the case may be according to the site condition completing the works in all respects including all necessary accessories like spacers, weather seals, smoke seal, stainless riction stays ,handles etc. Openable will shall be made with suitable section including hinges, locks, etc. complete [10% of total area to be consider for openable type window.] consider make one bay sample and get it approved from clients/Engineer in charge before further execution. Necessary shop drawings to be prepared & get approval from Engineer in charge.		
	Including the cost all materials, cost of labor, cost of equipment's and machinery all lead & lift , loading and unloading transportation and all other incidental charges etc. complete as per design drawing. The work shall be carried out as per directions of Engineer in charge of work**.**	Sq.m	
9	**KUBIK Full Height Single Glazed Partition- (Ultraline 45)**		
	Supply and Installation of single glazed partition of kubik make 45mm system, using KOPS- 001 (45mm x 25mm) as top channel, wall starter, KOPS 002 (45mm x 25mm) as bottom channel. Partition Dimension - 45mm x 25mm. With black finish & 12mm thick clear toughened glass with fire rated. Necessary sections to be provided at door level & regular glass interval in vertical direction so that glass partition should be steady. etc complete including cost of labour, cost of materials, lead and lift charges and all other incidental charges etc., Sample to be approved by Architect/Client complete as per design drawing and direction of engineer in charge. Necessary shop drawings to be prepared & get approval from engineer in charge.	Sq.m	
10	**KUBIK Single Leaf Glass Shutter with Door Frame (Ultraline 45)**		

Sl. No	Description	Unit	Quantity
	Supply and Installation of kubik modular door frame make of 45mm x 25mm, using KOPS- DF 201 (45mm x 25mm) as door frame. With black finish & 12mm thick clear toughened glass with fire rated. with necessary hardware fitting of make **kubik & Geze** - regular finish of kubik glass hinges- KOPS 104 AL or plush hinges, kubik studio lock, Geze open door closer with hold open unit /Acrylic/Saddle plate, kubik door stopper etc. complete including cost of labour, cost of materials, lead and lift charges and all other incidental charges etc., Sample to be approved by Architect/Client complete as per design drawing and direction of engineer in charge. Necessary shop drawings to be prepared & get approval from architect	Sq.m	
11	**Automated Door:** Providing and fixing Automates sliding door operator of approved make with the following specifications Operating System L-4150mm glass clamping rai: 2nos,rador sensors - 02nos, safety light sensor01pair, programmer selector switch(with knob): 01 set, special manets for glass mounting (for 4150mm operator system) and 12mm thick toughened glass and features including microprocessor control, self-learning, reversing when obstruction is encountered etc, complete including all necessary fixture and accessories, cost of all materials, labour, lead and lift charges and all other incidental charges ect, complete as per design drawing. The work shall be carried out as per the direction of Engineer - in - charge of work. Necessary shop drawings to be prepared & get approval from architect.	Sqm	
G	**Sub Total of Doors & Windows**		
H	**Flooring & Cladding Works**		
1	**Staircase - Granite**		

Sl. No	Description	Unit	Quantity
	Providing and laying 19mm thick mirror polished machine cut granite slabs of required size and approved shade, colour, texture laid over 20mm thick base (average) cement mortar 1: 4[1 cement : 4 coarse sand] with cement slurry at 4.4Kg/Sqm and joint treated with white cement matching pigment ,including curing etc. complete for Staircase. Rate quoted is inclusive of chipping staircase steps. **Bull nosing to be done for staircase treads and side polish for Risers and treads, s**kirting including cost of labours, cost materials, lead and lift charges and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work .Sample to be approved by Engineer In charge /Client before laying.		
	Staircase area (Tread, landing)	Sqm	
	Staircase risers	Sqm	
	Skirting for staircase	R.m	
	Making 4mm "V" grooves in treads	R.m	
2	**Granite Flooring**		
	Providing and laying 19mm thick mirror polished machine cut granite slabs of required size and approved shade, colour, texture laid over 20mm thick base (average) cement mortar 1: 4[1 cement : 4 coarse sand] with cement slurry at 4.4Kg/Sqm and joint treated with white cement matching pigment ,including curing etc. Including cost of labours, cost materials, lead and lift charges and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Architect in charge of the work. Sample to be approved by Engineer in charge before laying.	Sqm	
3	**Vitrified Tile Flooring**		

Sl. No	Description	Unit	Quantity
	Providing and laying Vitrified floor tiles 595x595mm /600mm x 600mm or any approved size (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 13755 of approved make in approved colours laid on 25mm thick(average) Cement Mortar 1 : 3 (1 cement : 3 Coarse sand) with necessary cement slurry (4.4 Kg/Sqm) including pointing the joints with jointing powder (cornmix) and matching pigment etc., complete including all lead, lift , at all levels and curing and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the Engineer in charge of the work. Sample to be approved by Engineer in charge before laying	Sqm	
4	**Vitrified Tile Skirting**		
	Providing and laying Vitrified tile skirting of 100mm ht with above specification in CM 1:3 and 12mm / 1/2" thick mortar including cost of labors, cost materials, lead and lift charges, curing and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work. Sample to be approved by engineer in charge before laying.	R.m	
5	**Ceramic Tiles Flooring For Toilets**		
	Providing and laying Ceramic tiles 300x300mm or any approved size (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 13755 of approved make in approved colours laid on 20mm / 3/4" thick(average) Cement Mortar 1 : 3 (1 cement : 3 Coarse sand) with necessary cement slurry (4.4 Kg/Sqm) including pointing the joints with jointing with epoxy pigmented etc., complete including all lead, lift , at all levels and curing and all other incidental charges etc., complete as per approved shop drawing. The work shall be carried out as per the direction of the engineer in charge of the work**.**	Sqm	
6	**Ceramic Tile Cladding For Toilet Upto 2100 Height**		

Sl. No	Description	Unit	Quantity
	Providing and laying Ceramic tiles of approved color, make and size 300mm x 450mm or any approved size for dado work laid in C.M. (1 cement : 3 fine sand) 12mm thick with cement paste including waterproofing compound and joints finished neatly with epoxy pigmented paste to match the colour of the tiles, for All the corner are finished with UPVC edge beading .including cost of labors, cost materials, lead and lift charges ,curing ,acid washing and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work. Sample to be approved by Engineer In charge before laying.	Sqm	
7	**Ceramic Tile Cladding Pantry**		
	Providing and laying Ceramic tiles of approved color, make and size 300 x 300mm or any approved size for dado work laid in C.M. (1 cement : 3 fine sand) 12mm thick with cement paste including waterproofing compound and joints finished neatly with epoxy pigmented to match the colour of the tiles, Corner PVC Beading including cost of labours, cost materials, lead and lift charges ,curing ,acid washing and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work. Sample to be approved by Engineer In charge before laying.	Sqm	
8	**Granite Cladding for Lift**		
	Providing and laying 19 mm thick granite tile of approved colour, make and size or any approved size for dado work laid in C.M. (1 cement: 3 fine sand) 50mm thick with cement paste including joints finished neatly with white cement paste pigmented to match the color of the tiles, including cost of labors, cost materials, lead and lift charges, curing ,acid washing and all other incidental charges etc., complete as per design drawing. The work shall be carried out as per the direction of the Engineer in charge of the work. Sample to be approved by Engineer before laying.	Sqm	
9	**Granite Platform for Hand Wash Basin And Pantry**		

Sl. No	Description	Unit	Quantity
	Providing and fixing machine Polished and machine cut granite slab for wash basin and kitchen counter with 19 mm thick granite top set in CM 1:3 on the existing platform with edge cutting ,rounding of edges [Full Round Bull Nosing] and edges polishing of granite slab for exposed surface cutting holes for wash basins, including curing and providing and removing scaffolding ,wherever necessary, including the cost of all material, cost of labor, cost of equipment and machinery, all lead and lift, loading and unloading, transportation and all other incidental charges etc complete as per design drawing. The work shall be carried out as per directions of Engineer in charge of the work. Sample to be approved by Engineer/Client before laying.	Sqm	
10	**Sira Stone Cladding**		
	Providing and fixing natural surface 75 to 100mm thick sira stone for cladding, upto the roof height and coping over burnt brick masonry or RCC walls over one coat of 1:6, 20 mm thick rough coat plaster, size 600 X100 X 100 Height in each layer, necessary insert plates in concreting/dash screw support MS angle ,gun metal cramps and stone 20mm deep machine cut edge all round and remaining width to be hammered to give either paper joint , pointed with cement and matching pigment complete. The work shall be carried out as above and as per revised Drawing, including curing and providing and removing the scaffolding wherever necessary etc. complete including the cost of all material, cost of labor, cost of equipment and machinery , all lead and lift ,loading and unloading ,transportation and all other incidental charges etc. complete as per design drawing. The work shall be carried out as per directions of engineer in charge of works. Sample to be approved by Engineer In charge before laying	Sqm	
H	**Sub Total of Flooring & Cladding**		
I	**Plastering & Painting Works**		
	PLASTERING		

Sl. No	Description	Unit	Quantity
	General Notes for Plastering :The rates quoted for all plastering works shall include for providing grooves as directed & at junctions of surface of concrete/masonry [i e at Columns & walls, Beams & walls ,Ceiling etc.,] and at such junctions Chicken mesh **(Arphita Mesh)**(To be included in Quoted Cost) shall be fixed with M.S. 'U' Clips for a Width of 150mm / 6" Wide on each surface, before plastering is done. The plastering for Fins and band to be included in plastering item rate only. The rates also include for necessary scaffolding curing etc., complete including necessary plaster grooves wherever required, smooth lime rendering /neeru finish etc., complete at all heights as per approved shop drawing and direction of Engineer In charge **(Scaffolding to be included in all height as per drawings.)**		
1	**Internal Wall Plastering**		
	Providing 15mm thick cement plaster in single coat with cement mortar 1:4, to masonry including rounding off corners wherever required smooth lime rendering, ; Providing and removing scaffolding including the cost of all material, cost of labor, cost of equipment and machinery ,all lead and lift ,loading and unloading ,transportation and all other incidental charges etc. complete as per approved shop drawing. The work shall be carried out as per directions of Engineer in charge of works.	Sqm	
2	**Ceiling Plastering**		
	Providing 12mm thick cement plaster in single coat with cement mortar 1:3 ,to ceiling including rounding off corners wherever required smooth lime rendering, ; Providing and removing scaffolding including the cost of all material, cost of labour, cost of equipment and machinery, all lead and lift ,loading and unloading ,transportation and all other incidental charges etc complete as per approved shop drawing. The work shall be carried out as per directions of Engineer in charge of works.	Sqm	
3	**External Wall Plastering**		

Sl. No	Description	Unit	Quantity
	Providing 18mm thick cement plaster in single coat with cement mortar 1:4,to masonry walls including rounding off corners wherever required sponge finish ; Providing and removing scaffolding including the cost of all material, cost of labor, cost of equipment and machinery ,all lead and lift ,loading and unloading ,transportation and all other incidental charges etc complete as per design drawing. The work shall be carried out as per directions of Engineer in charge of works.	Sqm	
4	**Rough Plastering**		
	Providing rough cement plastering 15mm thick in single coat with cement mortar 1:4 ,to masonry for base of dadooing works with approved quality ,providing and removing scaffolding including the cost of all material, cost of labour, cost of equipment and machinery ,all lead and lift ,loading and unloading ,transportation and all other incidental charges etc complete as per design drawing. The work shall be carried out as per directions of Architect in charge of works.	Sqm	
5	**Plastic Emulsion Painting**		
	Providing and applying painting for walls and ceiling with two or more coats with **Plastic emulsion paint** of approved brand on wall surface /ceiling surface over the primer coat of approved make and colour after scrapping the original surface and rubbing with sand paper of zero size and with base coat of plasto fix primer ,two coats of wall putty of Birla White or Asian paints make with smooth finish and two or more coats of plastic emulsion painting of approved colour successively after drying each coats and finishing etc complete. including cost of all material, cost of labour, cost of equipment and machinery ,scaffolding, all lead and lift ,loading and unloading ,transportation and all other incidental charges etc complete as per approved shop drawing .The work shall be carried out as per directions of Engineering charge of works.	Sqm	
6	**Apex paint For External Walls**		

Sl. No	Description	Unit	Quantity
	Providing and finishing External walls in two coats with waterproof cement paint [Apex Ultima Paint]of approved brand and shade over one OR More coats of primer to give an even shade after thoroughly brooming the surface to remove all dirt and loose powdered material, free from mortar drops and other foreign matter including the cost of all material, cost of labour, cost of equipment and machinery , scaffolding, all lead and lift ,loading and unloading ,transportation and all other incidental charges etc complete as per design Drawing. The work shall be carried out as per directions of Engineer in charge of works.	Sqm	
I	**Sub Total of Plastering & Painting**		
J	**Water Proofing Works**		
	Note: 10 Years Warranty & Guaranty to be provided For all water proofing works. if any additional specification required to be considered in the quoted rate. If Contractor have any different specification / vendor to be provided along with tender. for work to be complete, contractor provide methodology for carrying out waterproofing from an Authorized agency**.**		
1	**Water Proofing for Toilet**		
	Step 1: The surface shall be prepared thoroughly by chipping all loose material/mortar, cleaned with wire brush and coir brush in order to remove all loose & deleterious matter, dust etc.		
	Step 2: Through and through cracks shall be treated with a non-shrink grout “GP2” & 12mm Dia GI nipples shall be fixed at weak locations and pressure grouted using neat cement slurry admixed with expansive grouting additive flow cable /cebex100 at a dosage of 225 gms per bag of cement.		
	Step 3: Hunching will be done with Polymer modified mortar with integral waterproofing compound NITOBOND LATEX.		
	Step 4: Acrylic based waterproofing system “ BRUSH BOND RFX ” shall be mixed as per manufacturer specification and shall be applied in two coats @ dosage of 0.65 kg/ m2 (for two coats) over the retaining wall internally and shall be cured for minimum 3days	Sqm	
2	**Providing and laying integral cement based treatment for Water Proofing on the Sump**		

Sl. No	Description	Unit	Quantity
	·After PCC has been laid; we grout Protekta SB at regular intervals of every 1 M center to center. This grout material has property of expanding when it comes in contact with water. It forms a water impervious layer and prevents travel of water to the top of PCC.		
	·Spray of Protekta Base on PCC surface towards porosity reduction.		
	·Application of a slurry prepared with Protekta F500 & cement. This layer is a hard layer & will be abrasion resistant.		
	After the treatment on PCC, you can do the raft slab casting.		
	Treatment on –ve Side		
	(* Hi pressure grouting with Fosroc Conbextra GP2, 2 coats of Fosroc Brushbond for internal side for overhead tank, waterbody),(2 coats of Fosroc Brushbond external side & a cement sand mortar(1:3) mixed with Fosroc Nitobond SBR for only outside of Sump Tank)	Sqm	
3	**Terrace Water Proofing**		
(a)	Step 1: The surface shall be prepared thoroughly by chipping all loose material/mortar, cleaned with wire brush and coir brush in order to remove all loose & deleterious matter, dust.		
	Step 2: 25mm deep "U" grooves shall be cut along concrete / brickwork junctions and construction joints, change of direction and same shall be filled with 1:3 cement modified mortar admixed with polymer modifier "NITOBOND LATEX" @ a dosage of 300 ml per bag of cement with proper coving at corners.		
	Step 3: Through and through cracks shall be treated with a non-shrink grout "GP2" & 12mm Dia GI nipples shall be fixed at weak locations and pressure grouted using neat cement slurry admixed with expansive grouting additive flow cable /cebex100 at a dosage of 225 gms per bag of cement.		
	Step 4: The area to be treated shall be pond with water and leakage/ dampness if any shall be marked.		
	Step 5: Hunching will be done with Polymer modified mortar with integral water proofing compound NITOBOND LATEX.		
	Step 6: Acrylic waterproofing system "BRUSH BOND RFX" shall be mixed as per manufacturer specification and shall be applied in 2 coats @ dosage of 0.65 kg/m2 (for two coats) over the terrace slab externally and shall be cured for minimum 3days	Sqm	

Sl. No	Description	Unit	Quantity
(b)	**·Slope Making** –		
	With M20 concrete mixed with **Emulsion KR2** in proportion of 125 ml/bag of cement. Average thickness estimated – 65 mm to 75 mm.	Sqm	
	·Curing for 15 days		
4	**Providing and Making waterproofing for chajjas as per below specification**		
	• Clean the surface thoroughly with wire brush & water wash. • Porosity Reduction: Brush application of impregnation product called Protekta Base which fills the fine pores with crystalline silicate growth. • Making coping by polymer modified mortar at slab and parapet wall junction. • Surface Preparation. Brush application of Protekta F500 slurry to a thickness of approximate 1 mm. • Making coving with polymer modified mortar prepared with Protekta F500. • Slope Making -With M20 concrete mixed with Protekta KR2 in @ 125 ml/bag of cement • Curing for 15 days • Water proofing by spray of Protekta M.E		
	etc. complete including cost of all material, cost of labour, cost of equipment and machinery, all lead and lift ,loading and unloading ,transportation and all other incidental charges etc. complete as per approved shop Drawing. The work shall be carried out as per directions of Engineer in charge of works	Sqm	
J	**Sub Total of Water Proofing Works**		
K	**Fabrication Works**		
1	**M.S. Grill - Windows and Ventilators**		
	Providing fabricating and fixing **M.S Safety Steel grills** as per detail drawings to window openings made of M.S Sections (bright bars) and flats for horizontal, vertical ,all around ,cross members as per drawings including one coat of primer and two or more coats of enamel painting. The work shall include the cost of all lift, loading and unloading, transportation, and all other incidental charges etc., complete as per approved shop Drawing. The work shall be carried out as per the directions of the Engineer in charge of the work	Kg	
2	**M.S Railing for Staircase**		

Sl. No	Description	Unit	Quantity
	M.S. Railings to the staircase & Balcony consisting of approved dia pipe handrail and vertical required dia pipe as per design & drawing and fixed to the wall/slab and finishing the same complete as per the design with one coat of primer and two coats of enamel paint including the cost of all material, cost of labour, cost of equipment and machinery ,all lead and lift ,loading and unloading ,transportation and all other incidental charges etc complete as per design Drawing. The work shall be carried out as per directions of Engineer in charge of works.	Kg	
K	**Sub Total Fabrication Works**		
L	**Miscellaneous Works**		
1	**Fire rated Everest Board (Dry To Dry Area)**		
	Providing and fixing 200mm , Everest dry wall systems which include Twin set of Everest galvalume wall frame system by leaving 49mm Air gap between the frames, Frames (coating of AZ-150 and yield strength of <345 Mpa), comprising 51mm mm ceiling track with equal flanges of 32mm and floor track with two equal flanges of 32mm, both of Base Metal Thickness of 0.55mm fixed to the floor and the RCC soffit or beam bottom with 45 x 8 mm dia. anchor fasteners at 610mm centres; vertical GI studs of size 51mm, having one flange of 42 mm and another flange of 44mm, to equal lips of 6mm and Base Metal Thickness of 0.55mm are then insert fixed into the track profiles at 610 mm centres maximum. Horizontal noggins with the floor track profile to be provided behind every horizontal joint of the boards and twin frames also been connected using noggin channels. 12.5mm Gypsum plaster board (conforming to IS 2095; 2011) and 12mm Everest Board (includes manufacturing through Autoclave Process (High Pressure Steam Cured) conforming to IS 14862 Type 'B' Category III. shall be fixed to the either side of the frame as inner and outer layer respectively, with 25mm & 35mm Everest Boards self-drilling self-tapping countersunk screws respectively at 300 mm centre maximum, by staggering the joints of the boards. Finally the joints of the boards shall be jointed and finished with Everest resin-based cementicious jointing compound and joint fiber mesh tape, as per the recommended practice of Everest Industries Ltd. Twin set of 50mm thick and 48 kg/m3	Sqm	

Sl. No	Description	Unit	Quantity
	density Rockwool shall be used as an infill in between the cavity of the drywall held to its position with holding clips/ GI wire/ wire mesh. The rate shall include for providing additional frame work for creating openings for doors and glazing, wherever required. The work shall include the cost of all lift, loading and unloading, transportation, and all other incidental charges etc., complete as per design Drawing. The work shall be carried out as per the directions of the Engineer in charge of the work.**(2 Hour Fire Rated Wall)**		
2	Providing and Installing the **Sintex of 2000 litres on** terrace of approved make, colour with required base platform for tank. As per design drawing the work shall include the cost of all lift, loading and unloading, transportation, and all other incidental charges etc., complete as per design Drawing. The work shall be carried out as per the directions of the Engineer in charge of the work. (For base platform cost to be paid in respective item) Necessary shop drawings to be prepared & get approval from architect.	No's	
3	**Landscape Works -** Including grass, shurbs, trees with trenching and digging hole in soil for tree. and paver blocks as per design and includes all lead, lift and transportation charges. any missing item, if it is required consider in quoted rate. The work shall be carried out as per the design & drawing in directions of the Engineer in charge of the work. Necessary shop drawings to be prepared & get approval from Engineer in charge. Softscape Area- 600 Sqm & Hardscape Area-235 Sqm	Sqm	
4	**Plumbing**		

Sl. No	Description	Unit	Quantity
	Providing & Fixing testing and commissioning of **Sanitary Fixtures with CP fitting**. **CPVC Pipes & fitting** for internal and external water supply system. **PVC Soil vent waste** pipes & fitting for internal and external, rain water pipes. . **CPVC** The work shall include cutting jointing with solvent cement pressure testing the joints / pipeline for 10 kg/sq.cm hydraulic pressure, for 2 hours etc. making holes, **PVC soil**, waste and vent pipe confirming to IS 13592 of SWR quality 6 kg / sq.cm pressure rated self-fit type with socket, **fittings like tees, elbows, bends, unions, coupling, reducer tees, collars etc** including chasing in solid block masonry walls with groove cutting machine to required width and depth, making bores in walls, making good the walls and bores in CC or CM 1:3 as applicable clearing the debris, MS hooks for fixing pipes and making good the walls and floors. Including **Approved Make** of Sanitary Fixtures, Pipes, Fitting & dia. Including all necessary materials for work. The work shall be carried out as per directions of Engineer in charge of works. Includes Ladies, Gents & handicap toilet, pantry RWH system, rain water pipes from terrace, external drainage with necessary chambers, pumps. any missing item if it is required for functioning to be consider in quoted rate. all necessary allied work to be consider & should be in good condition.as per enclosed MAKE list. shop drawings to be given for approval .	Lumsum	
5	**External Development Works**- Providing & construction of underground water storage tank capacity as per drawings, roads, gutter, hume pipe with necessary materials. The work shall include the cost of all lift, loading and unloading, transportation, and all other incidental charges etc., complete as per design Drawing. The work shall be carried out as per the directions of the Engineer in charge of the work. Necessary shop drawings to be prepared & get approval from Engineer in charge.	Sqm	
6	**Interiors Work-**		

Sl. No	Description	Unit	Quantity
	Fabrication & Installation of 3 No's Meeting Room Table Finished with Veener & MS base. 25 no's of Chairs, 12 No's of Work Station, Storage units, Glass frosting, Roller blinds for windows in office area, 6 No's of White boards. with all necessary materials, if any missing item is needed should be include in quoted rate. as per design and drawing includes all lead, lift and transportation charges. The work shall be carried out as per the design & drawing in directions of the Engineer in charge of the work. Necessary shop drawings to be prepared & get approval from Engineer In charge.	Lumsum	

7 Requirements towards Civil/Interior work inside Data Center and Utility Work

7.1 **METAL GRID CEILING**: The drop ceiling shall be provided with Armstrong Lay in (Hot dipped galvanized steel) metal ceiling system 600 x 600 x 5 mm with standard 2.5 mm dia (16% open space) and fleece with NRC (Non Directional Visual) of 70 & CAC 36 (CAC is a measure for rating the performance of a ceiling system as a barrier to airborne sound transmission through a common plenum between adjacent closed spaces) to be laid on Armstrong grid system. The modular ceiling sheets with necessary fittings should be done up aesthetically to integrate with the lighting.

7.2 **Raised flooring**: Suitable raised false flooring as per prevailing standards should be provided as per site requirements. The entire Access floor system shall be made from high density cementitious board and provide Class O as per BS 476 PART 6 for Fire propagation index and Class 1 as per BS 476 Part 7. Fire Ratings tested as per CIRC 91/61 or BS 476 Part 6 & 7 fire resistance up to 60 min as per NFPA. System should have antistatic property and air leakage resistance. The system shall be able to withstand a minimum UDL of 2500 kg per sq meter and a point load of minimum 500 kg. and rolling load of minimum of 300 Kg. The panel shall be coated with epoxy coating on the exposed surface. Have an infill of light weight cementitious material. Insulated against heat and noise transfer. Panels shall be finished with High Performance Anti-Static Laminate.. Panels will remain flat through and stable unaffected by humidity or fluctuation in temperature throughout its normal working life. Panels will provide for impact resistance top surfaces minimal deflection, corrosion resistance properties and shall not be combustible or aid surface spread of flame. Panels will be insulated against heat and noise transfer. Panels will be 600 x 600mm and fully interchangeable with each other within the range of a specified layout. Panels shall rest on the grid formed by the stringers which are bolted on to the pedestals. Panels shall be finished with anti-static 0.9 mm Laminate and thick plastic edge material that is self-extinguishing and will be PVC free. Panel should withstand a Concentrated Load of minimum 500 Kg applied on area 25mm x 25mm in the centre of the panel which is placed on four steel blocks without deflecting more than 2.5mm and without setting permanently more than 0.20mm. Pedestal installed to support the panel will be suitable to achieve a **finished floor height of 750mm in Data**

Centre Area and **750 mm in UPS and Battery Room**. Pedestal design will confirm speedy assembly and removal for relocation and maintenance. Pedestal base to be permanently secured to position on the sub-floor. Pedestal assembly will provide for easy adjustment of levelling and accurately align panels to ensure lateral restrain. Pedestals will support an axial load of minimum 1500 Kgs, without permanent deflection and an ultimate load of 2500 Kgs. Pedestal head will be designed to avoid any rattle or squeaks. Pedestal should have GI Base plate of suitable dimensions, GI Pipe, check nut for level adjustment, threaded stud with GI pedestal head, all screws etc. Under-structure (US) system consists of stringers to form a grid of 600 x 600mm. These stringers are locked into the pedestal head and run both ways. The US system will provide adequate solid, rigid and quiet support for access floor panels. The US system will provide a minimum clear, uninterrupted height of 600 mm between the bottom of the floor and bottom of the access floor for electrical conducting and wiring The stringer shall be hot dipped galvanized steel cold roll construction specially designed to stabilize lateral stability and to support the panels on all sides for alignment. The channels shall have counter sunk holes at both ends to accommodate bolting of the same to the pedestal head assembly. Earthing point connections are to be part of standard design. The longitudinal ribs and flaps in the lower part should be designed to increase flexion resistance. The grid formed by the pedestal and stringer assembly will receive the floor panel. Bidder to consider to providing 6 nos. 2-point panel remover, lead, lift, steps for 600mm/700mm raised floor etc. Area under consideration for Raised flooring will be Data Centre area and UPS and Battery Room. Bidder needs to consider minimum 20 % perforated tile of total raised floor tile in Server area and in UPS area. Out of 20% perforated tile minimum 5% tiles needs to be active tile.

7.3 **Fire Rated Steel Door-two hours-** Two hours fire rated double skin steel door constructed from 1.25mm thick galvanized steel sheet formed to provide a 46mm thick fully flush door shell with lock seam joints at stile edges and the internal construction of the door should be specially designed Honey Comb structure with reinforcements at top, bottom and stile surround. The door frames and door shutters should be primed with Zinc-Phosphate Staving Primer and finished with Polyurethane Aliphatic grade or epoxy paint as per approved manufacturer specifications. Door if used for Emergency purpose is required to be with Panic bar. The Fire Doors are to be fully insulated and shall be tested as per IS: 3809-1979, ISO: 834-1975, IS: 3614 (PART-II)- 1992 and BS 476 (PART- 20 & 22)- 1987 under live fire conditions, The wired glass is to comply with both BS 476: PART 22 and BS 6206 relating to fire resistant and impact performance.

7.4 **Fire rated Partition/ Walls:** Partition walls within the data centres should have 2-hour fire rated. Suitable smoke seals should be used. Fire line boards should conform to IS:2095 – 1996-Part-I. Providing and fixing minimum 132MM thick FIRE RATED gypsum board partitions with 2 Nos. x 15mm thick fire line board on both sides of 72mm GI floor channel and 70mm Square MS Pipe stud as per specifications, including cost of chasing for electrical conduits,. This item includes all tools, tackles, material, labor, fixture adhesives sealants etc. for the complete work.

7.5 **Opening for the Cables** or other utility services which are coming inside the building needs to be sealed by Fire resistance board system, water soluble fire retardant

solutions, fire expanding foam etc. having minimum of 2 hours' fire rating when tested in accordance with BS 476 part 20 and UL 1479 for horizontal and vertical openings in RCC slabs, Beams, walls, Brick masonry or Gypsum partitions for passing service shafts. The service lines could be of various types like electrical cables, cable trays or metal pipes etc. The foam shall have Acoustic property as per DIN 4109 and Smoke and Air Seal. The Foam should have the feature of Re penetrability for future maintenance or repair activities. Fire soluble cable coating Should be suitable for protecting against spread of flame on timber panels and tested as per IEC 332 part 3 standard for reduced spread of flame & tested as per FM Class 3971. It should have no derating effect on cables, free from fiber, asbestos, odorless and solvent free, flexible when dry after application.

7.6 **Room Signage and fire evacuation map.** Providing & fixing Aluminium Modular Signage using Aluminium Alloy 6063 extrusion with Anodising (The thickness of the anodization is typically 30 microns. The integrity of the anodize coating is tested to meet the international specifications ISO 2143-1981.) With lifetime Warranty in normal working condition.

7.7 **INSULATION ON ROOF AND FLOOR SLAB**: Supply and installation of external thermal insulation class-"O" closed cell elastomeric nitrile rubber insulation with adhesives recommended as per the approved shop drawings/ specifications. Minimum 13 mm thick for floor and ceiling insulation is required.

7.8 **Providing and fixing of tested 120 minutes fire rated** - integrity and radiation control and partial insulation (EW120) - fully glazed non-load bearing fixed glass partition system with symmetrical (Bi-Directional) fire protection. The glass should be Contraflam Lite or equivalent 14 mm clear 120 min fire rated and partially insulated (EW120), Non Wired Toughened Interlayered glass having a sound reduction of minimum 30 dB and compliant to class 1(B)1 category of Impact Resistance as per EN 12600.The glass shall be able to withstand fire attack from both sides. The glass should be manufactured in UL & TUV audited Facility and including UL Certification. The profiles are manufactured from 1.6 mm galvanized steel sheet pressed and formed to a required profile of the dimension. These specifications are applicable for fire rated glass door, fire rated glass partition and fire rated glass sliding door.

7.9 Bidder to consider civil related work for underground fuel storage tank of capacity **2 X 25 KL capacity** as per drawing approval received from **PESO and CCOE,** Equipment's foundations for DG Sets, Transformers, Chillers etc. Construction of Tranches, underground Hume pipe etc. is also in the scope of Bidder. Pipe Rack required to bring the cables from DG yard/Transformer Yard is part of scope of Bidder, also pipe rack for taking the chiller piping and dry cooler piping from chiller yard and Dry Cooler Yard inside the Data Center is part of scope of the Bidder. Bidder to submit this layout drawing as part of Bid Submission. Two hours Fire wall in between two transformers is also part of scope of Bidder. Height of this fire wall needs to above the top most point of transformer. Bidder needs to take utmost care for pipe rack design to maintain the building facade / building look. Panel boxing needs to be considered by appropriate material to hide the piping inside pipe rack.

7.10 **HOUSE KEEPING**: The vendor is responsible for keeping the site clean and deep cleaning by removing all the debris etc. every day, using adequate covering/tarpaulin sheets etc. to cover the any areas required (client property etc.). All cleaning equipment's like heavy duty vacuum cleaners etc to be according to the approval.

7.11 Power Cable entry in each rack will be from Top, Bidder need to consider **boxing arrangement** or cable manager or cable trunking system so that entire data centre installation should look aesthetically good.

8 Requirements towards Electrical Work

8.1 **Emergency Power off (EPO):** EPO is to be factored in the design for server room.

8.2 **Substation modification work** if any required will be as per local electricity board (BESCOM or KPTCL), along with as per approved GTP and makes of HT cable of 11 KV with approved GTP and make for straight through joint /heat shrinkable. Bidder needs to do the feasibility study with electricity board, route survey, any issue related with ROW, approval for road digging work, Hume pipe for road crossing. Metering Kiosk along with CT, PT, and meter will be as per local regulations. Above all aspect but not limited Bidder to consider in the scope of work.

8.3 **11 KV RMU UNIT, 630 Amps, Metering Kiosk** - At RMU panels, two inputs from two different substation are going to terminate. This arrangement will be prior to metering Kiosk. Specification of this RMU will be as per local electricity board. These specifications apply to factory-built, RMU type, metal-enclosed switchgears. The equipment to be supplied shall come in the form of a compact switchboard and shall meet the requirements as Easy to install, Safe and easy to operate, Compact, Low maintenance etc. SF6 gas is the preferred dielectric medium for MV RMUs. Oil filled switchgear will not be considered. SF6 gas used for the filling of the RMU shall be in accordance with IEC 376.It is preferable to fit an absorption material in the tank to absorb the moisture from the SF6 gas and to regenerate the SF6 gas following arc interruption. There shall be continuity between the metallic parts of the switchboard and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people. The substation frames shall be connected to the main earth busbar without dismantling any busbars. The cables shall be earthed by an earthing switch with short-circuit making capacity, in compliance with IEC 129 standard. The earthing switch can only be operated when the switch is open. The earthing switch shall be fitted with its own operating mechanism and manual closing shall be driven by a fast-acting mechanism, independent of operator action. The moving contacts of the earthing switch shall be visible in the closed position through transparent covers. Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earthing switch when the switch is closed. They shall be maintenance-free, with breaking in low pressure SF6 gas. The position of the power contacts and earthing contacts shall be clearly visible on the front of the switchboard. The position indicator shall provide positive contact indication in accordance with IEC 265-1 standard. In addition, manufacturer shall prove reliability of indication in accordance with IEC 129 § 6.105 standard. The switches shall be of the "increased

operating frequency" in accordance with IEC 265-1 § 3.104 standard. They shall have 3 positions, open-disconnected, closed and earthed, and will be constructed in such a way that natural interlocking prevents unauthorized operations. The switches shall be fully mounted and inspected in the factory. Manual opening and closing will be driven by a fast-acting mechanism, independent of operator action. Each switch can be fitted with an electrical operating mechanism in a specially reserved location, without any modification of the operating mechanism and without de-energizing the switchboard. The switch and earthing switch operating mechanism shall have a mechanical endurance of at least 1000 operations. It is preferable to have all bushings accessible from the front of the RMU. Bushing along the sides or the rear of the RMU are not acceptable. The circuit breakers and earthing switches can be locked in the open or closed position by 1 to 3 padlocks 6 to 8mm in diameter. Any accidental overpressure inside the sealed chamber will be limited by the opening of a pressure limiting device in the lower part of the enclosure. Gas will be released to the rear of the switchboard away from the operator. Manufacturer shall provide type test report to prove compliance with IEC 298 appendix AA 'Internal fault'. An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch or earthing switch. All manual operations will be carried out on the front of the switchboard.

General technical data	
Type	Outdoor/Indoor Type RMUs
Rated voltage:	12 kV
Operation voltage:	11 kV
Rated lightning withstand voltage:	75 kV
Rated power-frequency withstand voltage:	28 kV, 1 Min
Rated frequency:	50 Hz
Rated peak current:	50 kA peak
Rated short-time current:	20 kA
Rated short-time:	3 s
Basic Equipment:	
Operation	Manual
Load break switch 630 A High Performance VCB 630 A Disconnector switch 630 A	
Protection Self-Powered O/C & E/F Protection with relay and with suitable protection CTs	
Rated Continuous current and breaking capacity:	
Bus bars	630 A
Vacuum Circuit Breaker	630 A (Fixed Type)
Cable size for:	
Isolators	Up to 400 sq. mm 3 core
Vacuum Circuit Breaker	Up to 400 sq. mm 3 core
Class of Protection:	
SF6 Gas Tank – SS	IP 67
Front Cover	IP 2X

Cable Cover	IP 3X
Outdoor Enclosure	IP 54

Bidder needs to consider civil work required for installation of metering kiosk and RMU unit as per guideline by local electricity authority like BESCOM, KPTCL etc.

8.4 11 KV HT Breaker Panel-630 Amps 35 KA VCB Panels

11 kV Vacuum Circuit Breaker Panel - The switchboard shall be sheet steel fabricated, free standing, dust and vermin proof, totally enclosed, fully compartmentalized, floor mounted type. The circuit breaker panels shall be draw out, multi-panel unit type unless otherwise specified. The unit shall be robust design to withstand the stresses encountered in the event of an electrical fault. Automatic safety shutters shall be provided to shroud bus side and cable side main disconnecting contacts of the circuit breaker when the circuit breaker is taken to test position. Bus bar shutter shall be Permalink / Hylams of minimum 4.75 mm and shall have red paint. The instrument / control chamber shall incorporate the indicating instruments, lamps and components of the control circuit. The instrument chamber shall be provided with a separate door, which can be opened when the circuit breaker is `ON'. The instrument chamber shall also be totally segregated from the rest of the panel. Wherever equipment's are mounted on the door, the wiring shall be with flexible wires. The wires shall be neatly bunched and clamped and shall be sufficiently long so that the door can be opened without causing unnecessary stress on the terminations at the instruments. All instrument and relays belonging to one panel shall be mounted on the same panel. One vertical panel shall include one feeder. Extension chambers at rear portion shall be considered for termination of large size / number cables, if required. Necessary dummy cubicles complete with horizontal bus bars, space heaters, power, control and annunciation, bus bars / cables shall be included to avoid interference of beams with cable openings wherever required. All bus bars and their main current carrying connections shall have the same sectional area throughout their length. Bus bars shall be sized to continuously carry the rated current without exceeding the final temperature of 85 Deg. o C. and the same shall be capable of withstanding the full fault level without any deformation. The rating of bus bars shall be same as that of incoming breaker rating. Bus bars shall be of aluminum (unless otherwise mentioned in specific requirements) with proper plating at joints. The bus bars shall be provided with cast epoxy sleeving or nylon film of suitable insulation class throughout their lengths and vertical droppers and colour coded. Joints in bus bars shall be provided with shrouds. For long bus bars, suitable expansion joints may be provided. The bus bars shall be supported by insulators of non-carbonizing material resistant to acid and alkali and having non-hygroscopic characteristics and braced to withstand the fault level specified. The clearance between live parts and the earth shall be as per the Indian Standard. In case of copper to aluminum connections, proper treatment shall be given to minimize the bimetallic effect. Bus bars and connections shall be secured in such a manner that the insulators are not subjected to bending forces under short circuit conditions. Dynamic stresses shall be calculated on the basis of peak short circuit current. The vertical droppers shall be sized to carry continuously at least the rated current of the connected circuit breaker. It shall be possible to extend the bus bars at either end of the

switchboard for addition of future units. Both ends of bus bars must be suitably drilled for this purpose. Where bus bars are taken through the partitions of adjacent cubicles, shrouding shall be provided to prevent spread of fire from one unit to the next. Thermal design of the bus bars shall be based on installation of the switchgear in poorly ventilated conditions. The cooling air volume shall take into account only the bus enclosure. For safety reasons, each panel (Vertical Section) shall be divided into compartments to keep main equipment segregated. Switchgear shall be provided with all necessary safety interlocks and features along with Mechanical safety interlock. All PT's shall be epoxy cast resin type All PT's shall be draw out type and connections between the bus bars and PT shall be completely shrouded. Automatic shutter shall be provided to shroud the bus bars when PT is taken out. For Incomer feeders PT may be mounted on circuit breaker truck and shall be of fixed type since the same are connected on the incoming cable side. It shall be possible to remove voltage transformer from the circuit breaker whenever required HRC fuse protection shall be provided on primary as well as secondary side. The primary connection shall be disconnected before PT or its primary fuses become accessible. All current transformers shall be epoxy cast resin type. All current transformers shall be capable of withstanding dynamic and thermal stresses originated by short circuit fault current for one second. Terminals shall be provided with plastic covers to prevent inadvertent contact. HT switchgear will be connected to transformers or other equipment by PVC / PILC /. HT XLPE cables. All power and control cables shall enter the switchgear from bottom. Sufficient space and support arrangement shall be provided in the cubicles to accommodate cables. The number of cables per circuit sizes and types shall be intimated to the supplier. If the required number of cable terminals cannot be accommodated in the circuit breaker chamber, additional dummy panel with bus extension suitable for the number of cables to be terminated shall be provided. External DC control supply shall be provided for tripping and closing circuits to one panel. Also external AC control supply shall be provided for auxiliary power and heater circuits to one panel. Supplier shall provide suitable control switch and fuse at the point of receiving control supply. Supplier shall be required to loop both these supply to all the panels in case of multi breaker panels forming one unit. The cubicles shall be provided with space heaters to prevent moisture condensation and maintain cubicle temperature 5o C above the ambient. The space heaters shall be located at the bottom of the switchboards and shall be controlled through a thermostat with an adjustable setting, a manually operated switch. The thermostat shall preferably be located in the metering / relay chamber. Circuit breakers shall have completely sealed interrupting units for interruption of arc inside the vacuum. It shall be possible to isolate easily the vacuum interrupter unit from the breaker operating mechanism for mechanical testing of the interrupter to check loss of vacuum. The circuit breakers shall be complete with surge arrestors to provide protection to the equipment controlled by the breaker, against switching surges. Over voltage produced by the circuit breaker during switching off induction motor or switching on / off of transformer shall be limited to 2.5 times the peak value of rated phase to neutral voltage. Surge absorbers of either Z or Cr type with nonflammable, nontoxic liquid filled capacitors shall be used and located in switchgear cubicle if the over voltage limit exceeds. Surge diverters shall be provided for vacuum circuit breakers. Circuit breaker shall be power operated by a motor charged spring operated mechanism. It shall be strong, rigid, positive and fast in

operation to ensure that the pole discrepancy does not exceed 10ms. Mechanism shall be such that failure of any auxiliary spring shall not prevent tripping and will not cause tripping or closing operation of the power operated closing devices. When the circuit breaker is already closed, failure of any auxiliary spring shall not cause damage to the circuit breaker or endanger the operator. The closing release shall operate correctly at all values of voltage between 85% and 110% of the rated voltage. A shunt trip shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and all values of supply voltage between 70% and 110% of rated voltage. Spring operated mechanism, shall be complete with motor of adequate rating, opening spring, closing spring with limit switch for automatic charging and all necessary accessories to make the mechanism a complete operating unit. After failure of power supply to the motor, at least one open-close-open operation of the circuit breaker shall be possible. Operating mechanism shall normally be operated locally, when the breaker is in "Service" position. Electrical tripping shall be performed by shunt trip coils. Provision also shall be made for local electrical control when the breaker is in "Test" position by a control switch on the switchgear cubicle door. Also, "Local / Remote" selector switch lockable in "Local" position shall be provided on the cubicle door. 'Red' and 'Green' indicating lamps shall be provided on cubicle door to indicate breaker close and open positions. Breaker "Service" and "Test" positions shall be indicated by separate indicating lamps on the cubicle door, in case mechanical indication of "Service" and "Test" positions are not available on the cubicle door. For metering, main CTs and auxiliary CTs, if used, the accuracy class shall be normally 1.0. All metering CTs shall have an adequate burden. Instrument security factor shall be less than 5 unless otherwise specified. Protection CTs shall have class of accuracy of 5P10 and minimum burden 15VA. Core balance CTs shall be such that the earth fault relay should be able to operate over its entire range. CTs to be used for REF and Differential Protection will be PS Class.

Sr.No	Description
1	11 KV 630A VACCUM CIRCUIT BREAKER electrically operated draw out type with fixed & moving contact, 4NO+4NC auxiliary contacts, safety shutter etc. Short circuit rating 25 KA for 3 Sec Shunt coil /Closing coil voltage 24 V DC motor voltage 230V AC
2	POTENTIAL TRANSFORMER 11KV/ 110V Fixed type Core 1 - CL 1.0 Burden - 50 VA
3	CURRENT TRANSFORMER 11 KV Ratio- 50-100/5+5 Amps Burden- 10 VA No. of cores- Two Accuracy Class- core 1- 1.0 core 2- 5P 10
4	PROTECTION RELAYS MASTER TRIP ELEMENT AUX. RELAY
5	METERING Ammeter with SS Digital type Voltmeter Load Manager with RS485 port; Accuracy: Cl 1.0 8 Window Annunciator with Hooter
6	CONTROL SECTION BREAKER CONTROL SWITCH BREAKER ON/OFF, TRIP, IND. LAMPS POWER PACK RYB PHASE INDICATING LAMPS SPACE HEATER WITH THERMOSTAT AL BUSBARS 630 A SET BUSHINGS 1 SET 1 SET SAFETY SHUTTER 1 SET 11KV BUS BAR SUPPORT INSULATOR BUS BAR PVC SLEEVES & POWDER COATING OF CABINET

8.5 2500 KVA, 11KV/433 V ONAN Distribution Transformer with RTCC and OLTC-

Distribution transformer shall be oil filled type ONAN cooled. The transformer shall be in compliance with relevant standards IS 1180 and latest revision. Transformers shall operate without injurious heating at the rated capacity within +10 percent of the rated voltage of that particular tap. Transformers shall be capable of delivering the rated current at a voltage equal to 105 percent of the rated voltage without exceeding the limiting temperature rise. Overloads shall be allowed within the conditions defined in the loading guide of the applicable standard. Under these conditions, no limitations by terminal bushings, or other auxiliary equipment shall apply. The Transformer and all its accessories like current transformers etc. Shall be designed to withstand without injury, the thermal and mechanical effects of any external shot circuit to earth and of short circuits at the terminals of any winding for a period of two seconds. Transformer shall be capable of withstanding thermal and mechanical stresses caused by symmetrical or asymmetrical faults on any winding. Transformers, complete with bushings / cable boxes, shall be designed and constructed to withstand without damage, the effects of external short circuits as per the specified standards. The tanks shall be fabricated from mild steel plates and shall be designed to withstand the pressure, which will be encountered under normal operation and abnormal conditions such as short circuit. The core shall be assembled from special scale free high grade cold-rolled grain oriented silicon steel with minimum loss with heat and oil resistant insulation. The cores and windings shall be suitably braced to prevent displacement or distortion of the coil during short circuit. Core clamping bolts shall be insulated with synthetic resin bonded paper or equivalent. All coils shall be wound from high conductivity copper annealed to remove spring tension. The design and arrangement of winding and their insulation shall be to ensure uniform distribution of voltage surges among all coils and windings. The windings shall be subject to thorough shrinking and seasoning process to avoid absorption of moisture. The windings shall be properly insulated from the core and between themselves. The coils shall be axially and radially supported in such a way that deformation does not take place under short circuit. Windings shall be brought out and terminated on outdoor bushings, cable boxes or bus duct chamber, which will be located as specified on data sheets. The orientation and location of winding terminals shall be indicated in specific requirement. When outdoor bushings are specified they shall be supplied complete with adjustable spark gap and terminal connectors suitable for specified size of ACSR conductors. The cable box shall be complete with gaskets between the joints. The cable boxes shall be provided with disconnecting chamber wherever specified in the data sheet. Cable box for termination of high voltage PVC / XLPE cables shall be suitably dimensioned for air insulated termination. The air insulated terminal box shall be sized to permit use of all type of end termination kit including "PUSH-ON" type end termination kit. Such cable box shall also have arrangements for grounding the armor of PVC / XLPE cables inside the cable box. Terminal chamber for bus duct termination shall have Gasketed cover plate bolted to it. A separate inspection cover shall be provided to facilitate connection and inspection. For transformers having provision for terminations TPN bus duct on 433V side neutral of star connected secondary winding shall be brought out to a secondary terminal chamber. A CT shall be mounted at the neutral terminal with CT secondary wired up to the marshalling

box. An extra neutral bushing shall be provided for neutral grounding of transformers having secondary voltage of 433 V. In such cases, neutral CT shall be mounted before bifurcation of neutral. Weather proof type marshalling box shall be provided on the front side of the transformer tank and not on radiator. It shall be provided with terminals for oil temperature indicator, winding temperature indicator, magnetic oil gauge and Buchholz Relay and other control terminals as applicable. The transformer shall be supplied complete with first filling of oil. The oil shall conform to relevant Indian Standards. In case the Conservator / Radiator / Cooling tubes of the transformer are sent separately, sufficient quantity of oil shall be sent loose including 10% additional oil in non-returnable sealed drum. The transformer oil shall conform to IS-335. The transformer shall be complete with Buchholz Relay of double float type with isolating valves on either side and distance pipe. The relay shall be complete with independent voltage free alarm and trip contacts. Separate Buchholz relay shall be provided for main tank and OLTC chamber. For OLTC chamber the relay should be single float type with one normally open and one normally close contact. Oil temperature indicator shall be complete with maximum reading pointers, alarm and trip contacts. The indicators shall be of 150 mm dia. circular type and shall be mounted inside Marshalling Box. They shall be complete with setting keys. The transformer shall be provided with 150 mm dia. magnetic oil gauge indicator with low level alarm contacts and minimum / maximum level marking on front side of the transformers. The minimum oil gauge indicator shall be provided on the conservator side. Tapping shall be provided on high voltage side and shall be capable of carrying the external short circuit current. Percentage and Number of Taps shall be as specified in specific requirements. The transformer shall be suitable for continuous operation with frequency variation of +/- 5% without exceeding the specified temperature rise. The transformer shall be designed with particular attention to the suppression of maximum harmonic voltages, especially the third and fifth, so as to minimize interference with communication circuits. The noise level, when energized at normal voltage and frequency, shall not exceed, when measured under standard conditions, the value specified by NEMA. The maximum flux density in any part of the core and yoke at normal voltage and frequency shall be such that the flux density under over voltage conditions shall not exceed the maximum permissible values for the type of core and yoke material used. The type of material and values of flux density in the core/yoke for the 100%, 110%, 125% and 140% and the hysteresis characteristics curves shall be submitted. Transformer shall be capable of operate below the knee of the saturation curve at 110% voltage to preclude Ferro – resonance and non-linear oscillations. The onload tap changer (OLTC) gear shall have diverter resistance or reactance and the current diverting contacts shall be housed in a separate oil chamber segregated from the main tank of the transformer. The contacts shall be accessible for inspection and shall be replaceable type. Separate Buchholz Relay shall be provided for OLTC tank. OLTC shall be provided with following modes of control-. Manual and Electrical mode from local on the transformer itself, Electric mode from remote manually, Electric mode from remote automatically through voltage sensitive relay. Local OLTC panel shall be suitable for outdoor location. Local panel to be mounted on the transformer tank for operation of OLTC. REMOTE TAP CHANGER CUBICLE (RTCC)- separate indoor mounted remote tap changer cubicle needs to be provided. **Following details needs to be submitted.**

Positive Sequence impedance at maximum voltage tap.	
Positive Sequence impedance at minimum voltage tap.	
Zero sequence impedance at principal tap.	
Efficiency at 75 Deg. C winding temperature	
At full load	
At 75% full load	
At 50% full load.	
Maximum efficiency and load at which it occurs	
Regulation at full load at 75 Deg.C winding temperature at	
Unity power factor	
0.85 power factor lag.	
Resistance per phase at	
Primary winding: ohms	
Secondary winding: ohms	
Conductor area (sq. mm) and current density (amp / cm2)	
Primary winding	
Secondary winding	
Type of winding	
Primary	
Secondary	
Insulating materials for inter turn insulation	
Primary winding	
Secondary winding	
Insulating materials for inter winding insulation	
Insulating materials between	
Winding and core	
Laminations of core	
Make, type, dial size, number of contacts and contact ratings current and voltage rating for following items	
Magnetic oil level gauge	
Dial type thermometer	

Winding temperature indicator	
Gas and oil actuated relay	
Thermal withstand capability under full short circuit conditions, in terms of number of times of occurrence of short circuit and corresponding anticipated percentage reduction in transformer life. Relevant calculation shall be submitted.	
Full Load Losses	
Non Load Losses	
Maximum Continuous Rating (KVA) with ONAN cooling	2500KVA
Temperature raise above ambient of 50Deg.C	
a. Winding	55
b. Oil	50
Maximum flux density in any part of core of rated voltage and frequency	1.7 Tesla
Over fluxing withstand requirements	
a. 110%	Continuous
b. 125%	10 Sec.
Rated Voltage in kV	
a. HV winding	11
b. LV winding	0.433
Voltage Variation	+/- 10%
Vector Group	Dyn11
Rated Frequency	50Hz
Frequency Variation	+/- 3%
Neutral Earthing	Effectively Earthed.
Tap Changer	
a. Type	On load
b. Tapping Range	+/- 15% in Step of 1.25.
c. Make	
Percentage Impedance	6.25 %
Insulating Oil	Confirming to IS :335
Insulation Level In kV	
(Highest/ Power frequency/Impulse)	
a. H V	24/50/125
b. L V	1/3
Maximum current Density of winding	……
Termination arrangement	
a. H V	Cable Box
b. L V	Cable Box
Supply of Neutral bushing CT rating	Yes

8.6 LT Panels (Low Tension/voltage Panels):

Design, Supply, installation, testing and commissioning of all LT panels. Panels will be as per IEC 61439. Panels feeders should have rated capacity of Load manager with RS 485 communication port. This should compactable for BMS system to know the energy consumption. Bidder to submit License certificate of LT panels as per IEC 61439. Selection of switchgear should be as per IEC 60947 and bidder to submit the Discrimination chart for all the feeders. All the panels should be with Transient Voltage Surge Suppressor (TVSS). For selecting the source fault level bidder to consider value of transient reactance (Xd') as per IS -1180 for transformer rating and sub transient reactance (Xd") for alternator output at common bus at synchronization panel as per ISO 8528 Part 1 to 10. Typical Electrical SLD drawing along with Panel, UPS and Battery room layout drawing is provided for minimum requirement. The switchboard shall be totally enclosed, metal clad, sheet steel fabricated, compartmentalized, dead front type, dust and vermin-proof, freestanding, floor mounting type. It shall be of unit construction suitable for splitting into sections for shipping to site and to be correctly re-erected on prepared foundations without skilled supervision. The individual shipping section length shall not preferably exceed 2 metres. Provisions shall be made for addition of future units on either ends of a switchgear line-up after its installation on site. End busbar fishplates shall be provided. The switchgear shall be easily extensible on either side by the addition of vertical sections. It shall be possible to extend the switchgear, irrespective of the type of end panel and the design shall be such as to permit addition of extension panels of a type other than the type of end panel. Any adapter panels required shall be included in the basic price and indicated clearly in the technical particulars furnished. The switchboard shall be fabricated preferably from cold rolled sheet steel of minimum thickness 14/16 gauge. The height of the switchboard shall be constant throughout its length, Adequate lifting facilities such as hooks for ease of handling on site shall be provided. These hooks when removed shall not leave any openings in the switchgear. Front access shall be available to all components in each cubicle, which require adjustment, maintenance or replacement. Checking and removal of components shall be possible without disturbing adjacent equipment. All auxiliary equipment shall be easily accessible. Setting of relays shall be possible without de-energizing other equipment. Each unit of switchgear shall have necessary interior barriers to form separate compartments for buses, switching devices entering cable connection etc. All barriers shall be manufactured from non-inflammable material, preferably of sheet steel. The arrangement of the feeders shall ensure that operating handle of the switch / breaker shall be above 300 mm but below 1800 mm from ground level. Horizontal busbar chambers shall be at the top of the board. Busbars shall be completely shrouded to prevent metal pieces falling on the busbar during maintenance. The busbars shall be of aluminum with continuous rating as given in the SLD. All busbars and their main current carrying connections shall have preferably the same sectional area throughout their length. The busbars shall be colour coded. The busbar sizes shall be determined taking into consideration the continuous rating without exceeding

the final temperature of 45o C over maximum ambient temperature and the fault level specified. The busbars shall be supported by insulators on non-carbonizing material resistant to acid and alkali and having non-hygroscopic characteristics and braced to withstand the fault level specified. Two earth terminals shall be provided on each switch cubicle, at the back, near the floor. An earth bar of at least 50 x 6 mm copper shall be fixed to these terminals. The earth bar shall be electrically continuous and shall run the full extent of each board. Each unit shall be constructed to ensure satisfactory electrical continuity between all metal parts not intended to be alive and earth terminals of the unit. Suitable holes with bolts and lugs shall be provided at each end of earth bar of switchgear for connection to a main earthing grid of 50 x 6 mm GI bus. The earth bar shall be accessible in each cable entering compartment either directly or through a branch extension to ground the cable armour and shields. Any unused circuit breaker compartment shall be fully equipped and provided with compartment door, vertical bus bars and control terminals / wiring, etc., such that the same could be used for housing outgoing breakers in future without any modifications to the panel. All quotations must indicate the number of circuit breakers, which could be provided in unused space for each switchboard line up. Unit price for providing such outgoing circuit breakers shall be quoted which could be considered during placement of order. The arrangement of feeders in the switchboard shall take into consideration the number and size of cables required for the feeders. For all electrical circuit breakers anti-pumping device shall be incorporated. The breaker shall be provided with minimum 6NO + 6NC auxiliary contacts. 20% auxiliary contacts (Min. 3 NO + 3 NC) shall be provided. All spare contacts shall be wired upto terminal blocks. Auxiliary contactor or relay shall be used to multiply contacts.

8.7 Supply, installation and commissioning of Diesel Generator Set with acoustics enclosure and the other necessary systems include power cum synchronization panel, exhaust system, earthing system, battery and battery charger along with Civil foundations for successful erection, completion of the Data centre. DG sets should be of prime rating and should be capable of operating continuously on an unbalanced system within limit described in section 6 of IEC 60034.1. Genset should be with Auto start, synchronization, auto stop controller. DG set should be with Auto Mains Failure (AMF) panel. Synchronization is to be with Automatic controller ver required. DG set should be load dependent start and stop arrangement. Height of the exhaust stack has to be as per Central Pollution Control Board (CPCB) norms. Genset should be supplied with day tank of standard fuel storage capacity.. Fuel tank capacity will be as per Petroleum and Explosives Safety Organization (PESO) fuel storage guideline. Alternator insulation should be of Class H and temperature raise limit to Class H. Entire Genset to be provided with necessary engine protection system, alternator protection system and reverse active power protection system etc. Selection of LT switchgear will be as per IEC 60947 and Genset will be as per ISO 8528 part1 to 10. Alternator should be with Resistance Temperature Detectors (RTD) and Bearing temperature detector (BTD). Electrical performance of the alternator will be as per IS 4722. DG system should come automatically ON LINE in less than 40 sec. First fill of oil is part of scope of the bidders scope. Fuel storage pumping system shall be designed

to have a trouble-free automated system without manual intervention for auto-filling of Day Tanks. Erection of pipe Exhaust structure as per pollution control norms and should have aviation lights in the exhaust pipes if the height is 30 meters. All necessary statutory approvals including, but not limited to, CEIG approval, CCOE approval, Fire authority approval, etc. as applicable to DG System and Bulk oil storage tank shall be taken by the bidder. Capacity required for each DG set will be 2250 KVA in prime rated condition and 2500 KVA in Stand By mode .(2250 /2500 KVA -Prime /Standby)

8.8 DG Bulk Storage Tank

2* 25KL of underground storage tank with all low side work and redundant pumps. Fuel Storage tanks-Fuel Level monitoring, transfer line flow metering, each pump run status, Fuel high & low level monitoring, supply flow rate monitoring & other critical monitoring components. Fuel storage tank should be designed to have trouble free automated system without manual intervention for auto-filling of day tank and also have BMS connectivity of monitoring only. Piping to be done to cater to the new DG sets . All required statutory approvals of fire and explosive departments will be in the scope of the bidder. Each tank shall be stored in a concrete chamber with clearance as per approval and standard from all sides which shall be back-filled with sand. All diesel fuel tanks shall be of the horizontal cylindrical type and of Double skinned construction complete with a common fill point cabinet with fill pipework for all tanks, access for inspection, draining, sampling point and ventilation. The tanks shall be located underground confined within a concrete pit. Hydrocarbon leak detection shall be provided for of each tank and in the vicinity of associated fuel pumps, raising an alarm from the Fuel Distribution Control System on detection of fuel. Suitable safety notices and personnel access for inspection of the diesel fuel tanks shall be installed. A fuel level sight gauge for each bulk tank shall be provided to give a clear indication of the level and quantity of fuel contained within individual tanks. Fuel level switches shall be provided to ensure the stored capacity in the fuel tanks.. All alarms will be connected to the controller and to central BMS system. All pipework connections shall be located through the top of each tank. There shall be no connections on the bottom of the tanks to minimize the risk of fuel spillage. The HSD yard where tanks, pumping equipment, loading and unloading facilities are located shall be provided with Dry sand Fire Buckets, Portable fire extinguishers, No Smoking and No Unauthorized Entry signboards as per safety regulations. Fire buckets and Fire extinguishers shall conform to the relevant IS Codes. 1800mm high industrial type fencing shall be provided covering the HSD yard. Every HSD tank shall be fitted with an independent vent pipe leading into the open air. The vent pipe shall be securely supported and shall not be less than 4 meters in height. Vent pipe of any tank shall not be interconnected with the vent pipe of another tank. The open end of every vent pipe shall be provided with two layers of non-corrodible wire gauze not less than 11 mesh per cm and shall be further protected from rain by hood or by suitably bending it downward.
The design shall be in accordance with the applicable portions of the latest revisions of the following Standards and Codes.

8.8.1 Petroleum Explosive Safety Organization (PESO)

8.8.2 Chief Controller of Explosives (CCOE)

8.8.3 Occupational Safety Health Administration (OSHA standard)

8.8.4 National Building Code 2016, Chapter IV (Life & Safety)

8.8.5 National Fire Protection Academy (NFPA)

8.8.6 IS (Indian standards) and ASTM/ASME (American Society of Testing Material/ American Society of Mechanical Engineers) standards for piping and fittings

8.9 Modular UPS:-

8.9.1 The UPS and associated equipment shall operate in conjunction with a primary power supply and an output distribution system to provide quality uninterrupted power for mission critical, electronic equipment load.

8.9.2 Each UPS Frame shall be sized for kW =kVA load i.e. Unity Output power Factor with no derating at 40 Deg C. Design of UPS should be Insulated-gate bipolar transistor (IGBT) rectifier and 3 level IGBT inverter switching with double conversion as per IEC 62040-3 operating modes. Inverter Switching Frequency shall be ≥18 kHz to keep the noise minimum. Inverter shall be PWM controlled using DSP logic. Analog control shall not be acceptable. Each UPS shall be of modular architecture with Power Unit & removable sub power modules rating from 25 kW to 50 kW achieve highest system protection. Failure of any sub power module in individual UPS Frame shall not lead to entire Frame Capacity down but only the failed sub power module capacity shall go down. i.e. In case of Failure of any one Sub Power module, rest of the available power module in the frame shall continue to operate in normal double conversion mode of operation with reduced capacity. This shall also be applicable to all UPS's operating in parallel configuration.. The UPS shall be housed in a freestanding cabinet with casters and shall contain Input, Output, Static Bypass and maintenance Bypass isolator. Each UPS should have phase sequence detection. Steady state voltage regulations will be within 1% of nominal output voltage, linear load harmonics distortion should be less than 3% and non-liner load harmonics distortion should be less than 5%. UPS should be capable of 100% unbalanced load. Efficiency of UPS should be minimum 95% from 25% to 75% in double conversion mode. Noise generated by UPS under normal steady state condition should not be more than 70 DB as per ISO 7779. UPS should be ROHS complied product. Cable termination will be from bottom. All serviceable components to be from front. UPS display should show the battery status monitoring, UPS mode, Alarm (Audio and visible), Events etc. The UPS communication capability should be able to integrate into any industry standard Building Management System (BMS). Adequate protections for UPS, for rectifier, bypass, battery, battery against overload, short circuit, battery over charging, battery over discharging, transients, surges (as per IEEE 587) etc. needs to be considered as per IEC 62040-1. Built in SNMP card, MODBUS TCP IP, Dry contacts card to be standard feature in UPS. Should comply with UL 1973/ CE/IEC 62619 /UN 38.3 for LITHIUM ION BATTERIES. The UPS shall be have self-regulating and self-protection against Over voltage, Powerline surges, Under voltage and

overcurrent induced by the mains, Sudden changes in the output load and short circuits at the output, Transient ,surges, voltage spikes shall be suppressed .Critical Cards within UPS which are directly exposed to air should be conformally coated to protect the UPS from Moisture and Conductive dust. AC/DC capacitor having service life of Min 10 years. No replacement for 10 years. IP rating of Min IP 20.

8.9.3 Parallel operation: it must be possible the connection of minimum 7 units of same size to set up a distributed parallel system, in order to increase system capacity or achieve system redundancy. Parallel control logic must ensure a high load sharing accuracy (less than 5% of nominal power) and no single points of failure. That is a distributed control design must be implemented (no master/slave architecture), so that any failure in one equipment won't impact operation of the whole parallel system. Parallel control connections must provide high noise rejection.

8.9.4 UPS to Battery Inter connecting cables,Links- Racks and standard accessories Connections to the Incoming terminals will be provided and take the load from Outgoing terminals of the UPS. All other equipment necessary to operate the UPS is in the scope of the Vendor.

8.9.5 The UPS shall be housed in freestanding cabinets. The mechanical structure of the UPS shall be sufficiently strong and rigid to withstand handling and installation operations. The sheet metal elements in the structure shall be protected against corrosion by a suitable treatment, such as zinc electroplating, bi-chromating, epoxy paint, or an equivalent.

8.9.6 The UPS shall be designed for forced air cooling. Air inlets shall be provided from the front bottom of the UPS enclosure. Air exhaust shall be from the top portion of the unit.

8.9.7 STANDARDS - Product should confirm to minimum applicable standards as IEC 62040-3 UPS PERFORMANCE, IEC 60950-, CE, VDE,

8.9.8 UPS Input:

AC input nominal voltage	340/380/400/415/440/460 VAC, three phase 50 Hzs, 5 wire (L1+L2+L3+N+G)
AC input voltage window	340V to 460V(@ 400V)
Input frequency range	49-51Hz
Input Power Factor	> 0.99 at 100% load
Input Current Distortion	< 4% at 100% load

8.9.9 UPS Output:

AC Output Nominal Output	(Customer configurable)-380VAC, 400VAC or 415VAC, Three phase five wire, 50 Hz

AC output voltage distortion	Max. 2% @ 100% linear load ,Max. 5% @ 100% non-linear Load
AC output voltage regulation (Static)	+/-1%
Voltage Transient Response	+/- 8% maximum for 100% load step
Voltage Transient Recovery	within < 50ms recovery time
Output Voltage Harmonic Distortion	<3% THD maximum for a 100% linear load <5% THD maximum for a 100% non-linear load
Overload Rating-Online	125% - 1 minute; 150% - 60 Sec
System AC-AC Efficiency	Greater than 95% from 25% load to 75% load in Double Conversion Mode
Output Power Factor Rating	unity power factor KVA=kW @ 40 Deg C without any de rating from 0.8 lagging to 0.9 leading
Output frequency	50 +/- 1Hz tracking
Output connectors	Three phase: Hardwire 5-wire (3 Phase + N + G)

8.9.10 ENVIRONMENTAL

Operating Ambient Temperature	+ 20 to +30°C
Relative Humidity	0 to 95% non-condensing
Operating altitude	
Audible noise	<70 dbA
Conformal coating PCBs	Required
Phase sequence detection	Required.`

8.10 Choices of lithium chemistries and cell designs : Based on long calendar life, high safety and high power density Bidder to choose either any one maintained below chemistry of Lithium.

NMC (LiNiMnCoO2 - Lithium Nickel Manganese Cobalt Oxide)

LFP (LiFePO4 -Lithium Iron Phosphate))

8.10.1 Selection of a particular chemistry should be made with safety in mind as well as the other system requirements, namely float service life, footprint or volume of the solution, power capability, temperature of operation and discharge time etc.. Bidder need to consider above aspects while selection chemistry of Lithium.

8.10.2 A Battery system shall be furnished for the UPS with backup time of 10 Mins at Unity PF, capacity to maintain UPS output at the specified load for the duration. Battery protection shall be provided by thermal-magnetic molded-case circuit breakers in each battery rack. UPS battery should be Lithium Ion based(LFP or LMO or NMC) battery as per recommended makes with back up time of 10 Mins at Unity PF with Built in DC Breaker , Battery Cabinet and Battery Monitoring system. These Batteries are to be in the RACK. The battery system shall be designed with highest level of protection built into the battery system against potential safety risk – over voltage and short circuit. Vendor to submit the compatibility certificate with Offered Model of Battery and UPS. Vendor to submit Battery Sizing calculation for back up.

8.10.3 The Complete battery system should be comprised of multiple such module in series / parallel combination to arrive at the required backup and DC voltage requirement of UPS.

8.10.4 Batteries should be compliant to

Safety Cell	UL1642
Module	UL 1973
Transportation	UN38.3
Seismic	GR63
EMC	IEC61000-6-2, and 61000-6-4
Rack Level	UL 1998,991
Battery Module & Switchgear	UL 1973 with each component level
battery Aging factor	IEEE 495
Battery manufacturer should have Quality Certificate	(i) ISO 14001:2004 (Environment) & OHSAS 18001:2007 (Health & Safety) and (ii) ISO 9001-2008

8.10.5 The Battery System should be equipped with Battery Management system to indicate the availability and health of entire battery system and cell balancing activity. Battery cabinet should be free standing housing Battery modules with Battery breaker, Battery management system, and Communication protocol for BMS etc.

8.10.6 The lithium ion battery solution shall communicate with the UPS via dry contact.

8.10.7 Battery monitoring shall be provided at the module, rack, and system level. A switched-mode power supply shall be included and shall provide power for the battery monitoring system from UPS Input and Output

8.10.8 The battery system shall consist of a 3 level of protection namely, cell, module and rack level.

1st Level Protection – Battery Management System (BMS) & Switch Gear: Each battery rack shall be installed with main switch gear to isolate the affected battery rack in the event of a fault. BMS shall also be included in each rack to provide continuous monitoring of the voltage and temperature of each cell within the rack. BMS gathers and analyses the rack current. In the event of over voltage or short circuit, the BMS will trip the MCCB at rack level.

2nd Level Protection – Fuse: Fuses are built into the main switch gear at rack level. In the event of a fault current (caused by short circuit) which the MCCB cannot be activated in the shortest time, fuses will be activated to clear the fault current without damaging the cells.

3rd Level Protection – Cell: Several protection features shall be incorporated into the cell namely, safety function layer (SFL), Multi-layers Separator, Safety Vent, Safety Fuse and Overcharged Safety Device. These safety features are to protect the cell from overcharging and thermal runaway.

8.11 AC wiring circuit:

Main circuit Point wiring should be surface or concealed in MS conduit system. Conduit wiring shall be as per IS-732. Conduits and conduit accessories shall be galvanized and shall conform to IS-2667, 1988. Conduit ends shall be free from sharp edges or burrs. The ends of all conduits shall be reamed and neatly bushed with Bakelite bushings. In order to minimize condensation or sweating inside the conduit system, all outlets shall be properly drained and ventilated in such manner so as to prevent entry of insects. Conduit pipes shall be fixed by 22 gauge ribbed G.I. saddles on 25 x 3 mm G.I. (Galvanized Iron) saddle bars in an approved manner at intervals of not more than 50 cms. Saddle shall be fixed on either side of couplers, bends or similar fittings, at a distance of 30 mm from the center of such fittings. In Data Center, Panel Room, UPS and Battery Room all conduits will be MS and in Office area PVC conduits will be used.

8.12 Lighting fixtures:

Lighting wiring between JB (Junction Box) and lighting fixtures shall be done by PVC insulated 3-core (phase neutral and earth) unarmored cable. All joints of conductors in Switch boards / JB's / Fittings shall be made only by means of approved Mechanical connectors (nylon / PVC connectors). Bare or twist joints are not permitted anywhere in the wiring system. Fixtures shall be firmly supported from the structures, support clamps etc. They may be bolted or welded to the steel work or metal inserts. In case of concrete structures, where metal inserts are not available, fixtures will be fixed to or supported from concrete surfaces with the help of anchor fastener, in such cases special care shall be taken to see that anchoring is firm. All LED fixtures shall be with high power factor, low harmonic (THD< 10%) (THD= Total Harmonics Distortion) and

minimum 100 lumens/watt. All existing light fixture needs to be replaced. Lux level requirement will be as per NBC.

8.13 Earthing and Earthing Pits:

All Electrical Equipment must be efficiently double earthed in accordance with the requirement of IS-3043/IEEE 80 and relevant regulations of Electrical. UPS power system earthing will be as per recommendations of IEEE-1100. Guidance will also be taken from IEEE 142:2007 where the combined path from the buildings earth bar to the final earth pits will be designed to fall within a range of 1Ω for general earthing and 1Ω for Generator earthing. All requirement for local regulatory bodies shall be considered & complied. The earth pits shall be as per IS with proper arrangement for testing. Maintenance free earth pits to be used. All Earthing conductors shall be hot dip galvanized / electrolytic grade base copper conductor. The main earthing rings shall be done as per practice laid in Indian Standard. All electrical equipment shall be connected to the earth bus at two points except the lighting fittings and junction boxes. All hardware for bolted joints shall be galvanized and the size of the bolt shall not be more than quarter of the size of earth conductor. Tinned copper lugs shall be provided where round earthing conductors are used. The 415V neutral shall be solidly earthed by means of two separate and distinct connections to earth. The earth pits shall be interconnected between themselves and the main earthing grid to form an earthing ring. All joints in the main earthing conductors shall be welded. Terminal joints on the equipment shall be bolted. Removable test links shall be provided near the earth pits to facilitate testing of earth pits. Where the earthing terminal diameter provided on equipment is larger than quarter of the size of the earth conductor, connection shall be made using a wider flag welded to the conductor. The equipment to be earthed shall be connected to a common earth grid of power system. The number of earth pits will depend upon soil resistivity and the voltage of the system. The earth pit together with the electrode shall be constructed as per IS-3043-1987. The potential difference between neutral and earth should be less than 3 V. A bolted assembly link shall be provided in the connection between earth electrode and the main earth conductor. Existing Earth pits cannot be used all should be new one. Equipotential earthing inside the data center needs to be considered with grid below raised flooring of 2 X 2 meter of 25 X 3 mm Cu strip and all end corners after covering complete room needs to be grounded. Pedestal /stringers, Rack body to be grounded to this grid so that flooring and equipment's are at equal potential. The method of testing shall be as per Clause No. 10.1 and 10.2 of IS-3043. The contractor shall prepare the test report on standard Format. The effective earth resistance of the system shall be <1ohm.The 415V neutral shall be solidly earthed by means of two separate and distinct connections to earth. Each connection shall be connected to an independent earth pit near the transformer. The earth pits shall be interconnected between themselves and the main earthing grid to form an earthing ring. The neutral earthing leads shall be kept away from the transformer tank. If the earth resistance is too high and the multiple electrode earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be

reduced by adding sodium chloride, calcium chloride sodium carbonate, copper sulphate, salt and soft coke or charcoal in suitable proportions. Following also shall be earthed:-Metallic noncurrent carrying parts of all electrical equipment's such as transformer, switchgear, panels, power sockets, lighting fixtures., shall be earthed at one point for and up to 230V and at two points for working voltage of 415 Volts, Steel structures / columns, Cable trays, spheres, vessels and other process equipment, Fence and gate of electrical equipment (of transformer yard),Cable shields and Armour, Street light poles near to main earth grid shall be earthed by tapping from main earth grid. For remote located street light pole, individual earth electrodes shall be constructed, Earth strips from Lightning arrester shall be laid and connected to Earth stations directly. Strips shall be of specified size. These shall be connected with plant main grid, whenever specified only below ground, Equi-potential jumpers for any or all of the above equipment joints / sections intended for earthing. Also, all the earth pits dedicated for IT equipment's shall be interconnected in a common grid separate from the other general earthing grid. The earthing pits needs to be coved by earth chamber in brick work / readymade high grade material earthing chamber.

8.14 Lightning Protection

The plant and structures shall be protected against lightning in accordance with requirements of IS-2309.Air terminal rods shall be provided at the top most points of all buildings and structures. Roof conductors shall be run at not more than 18 meters from each other on top of the buildings and interconnected at intervals of not more than 18 meters. Hot dip galvanized 25 x 3 mm G.I. strips shall be used for horizontal air termination. Early streamer type lightning protection of reputed make & type subject to approval shall be used. Down conductors shall be installed at every 30 meters of the periphery of the buildings and structures and connected to separate earthing pits. Each down comer shall be provided with one earthing pit. Each down conductor shall be provided with a test link for testing the installation. Portion at the conductor below ground shall be painted with bituminous paint. The down conductor shall be cleated to the wall or columns at intervals of 300 mm using G.I. clamps. All joints in the conductors shall be welded. Welding joints shall be painted with two coats of Bitumen. Each air terminal rod shall have 150 mm dia GI or 75 mm dia copper sphere with 5 nos. 150 mm long conical GI / Copper spikes. The spikes shall be screwed and welded / brazed to the sphere. The whole assembly shall be fixed to a GI rod of not less than 50 mm nominal bore by means of flanged connections. The down conductor shall be connected to the flange and welded / brazed. The top of the air terminal rod shall be two meters above top most point of structure.

8.15 Stainless steel (SS) cable tray

It is to be considered above each row of the Rack if required Cable tray Grid above the rack to be provided. (Minimum four crossing of SS cable tray - two at end and two at center are required in each POD Bidder to consider 3 X 150 mm and height of 65 mm SS cable tray. (2 nos. in parallel two each other)). Each POD as well as CPU + GPU rack

row needs to be inter connected to each other by same number of cable trays. Rack interconnecting cables mostly will be fiber, Bidder to take care utmost care as 90 Deg C bend will not be accepted. If required fiber runners can also be proposed in the solution. All cable Trays up to 300mm shall be perforated type & above 300mm ladder type trays shall be used. The Trays shall be pre-fabricated hot-dipped galvanized. Cold galvanizing at site is acceptable only for touch-ups. The Trays shall have suitable provision for clamping at an interval of 500 mm. The Earthing Strip for the earthing ring shall be run along the side of the Tray. The connection between individual equipment to the ring shall be by bracing or with lugs. The bending of trays shall be smooth and the curvature sufficient for each bending of cables in it. Pre-fabricated accessories such as Tees, bends, risers, couplers, reducers, etc. shall be used at all junction & branches. Cutting & welding of trays at site is not permissible. Similarly, the trays shall not be welded on the supports but bolted only. Electrical Cable Tray routing shall be coordinated by Electrical Contractor at site to check fouling with pipes, equipment, light fittings, HVAC, etc. before fixing the trays.

8.16 Cables

All Low tension cables should be of 1.1 KV grade, All power cables from 25 Sq.mm to 400 Sq.mm should be with stranded, compact aluminum conductor, with XLPE insulated, PVC inner sheathed, galvanized steel strip armored and overall PVC sheathed conforming to IS:7098 /88. As stated in Electrical single line diagram for Cu flexible cables should be of Solid/Stranded Copper conductor, XLPE Insulated, cores laid up, PVC tape/PVC Extruded Inner sheathed for Multicore Cables, Unarmoured, extruded PVC Type ST2 Sheathed as per IS 7098 (Part 1) 1988. Cables shall comply with the latest editions of following standard, as applicable-BIS: 1554 Part 1 PVC insulated electric cables (Heavy duty), BIS: 7098 Part 2 Cross- Linked Polyethylene Insulated PVC sheathed cables, BIS: 8130 Conductors for insulated electric cables and flexible cables.1.1 KV grade cables: All LT power cables shall be 660/1100V grade, with aluminum conductor for size 10 Sq.MM and above. Power cables of sizes up to 6 Sq.mm. shall be with copper conductors, All Cables shall be externally marked at either end with the respective identification numbers by means of non-deteriorating material. Cable Markers shall be approved by Client. IS: 1554 - PVC insulated (heavy duty) electric (Part I) Cables - Part I for working voltages up to and including 1100V.IS: 1753 -Aluminum conductors for insulated cables.IS: 3961 -Recommended current ratings for (Part II) cables: Part-II PVC insulated and PVC sheathed heavy-duty cables.IS: 3975 -Mild steel wires, formed wires and tapes for armouring of cables.IS: 5831 - PVC insulation and sheath of electrical cables.IS: 7098 -Cross-linked Polyethylene insulated (Part-II) PVC sheathed cables: Part-II for working voltages from 3.3 KV upto & including 33 KV.IS: 8130 -Conductors for insulated electric cables and flexible cords.IS: 9968 - Elastomer - insulated cables, for (Part I) working voltage upto and including 1100V.

8.17 Bus Duct Sandwich Type --

Aluminum Sandwich Type Construction 3P4W 100% N with body Enclosure as Integral Earth. Operating Voltage 1000V Suitable for 50 / 60 Hz with impulse withstand voltage of minimum Insulation Voltage 690V Rated Short time Current as per section and design. Cu conductor or Al Conductor with Tin coating on entire surface or silver-plated Bi-metal cladding on aluminum conductor through high current and high pressure, Neutral conductor shall have same cross section area that of phase conductor. The Earthing shall be aluminum and it shall be one continuous piece, integral earth rated at min 50% of phase. Earthing shall be factory fitted factory tested and Icw rating for the earthing shall also be declared on Type Test Certificate produced by manufacturer. Bus Bar should be insulated with red class F thermosetting plastic material and factory fitted in one side of the each trunking components. The enclosure shall provide a protection not less than IP- 55 as per IEC-60529 for indoor application. . The busbar Trunking shall comply with standard IEC 61439-6 and the rated current of the busbar trunking systems shall be referred to the average ambient temperature of 40 °C .The Bus duct enclosure consists of four C-ribbed section bars, bordered and riveted, with excellent mechanical, electric and heat loss efficiency. The sheet metal is made of 1.5 mm thick hot-galvanizes steel treated according to UNI EN 10327 and painted with RAL7035 resins with high resistance to chemical agents. Tap-off Box with Mechanical Interlocking Feature for MCB Power Isolation is required. Entire system should include but not limited to Straight Length, Flange End, Elbow 90 Deg. End cover, Horizontal hanger, adaptor box, Copper braded flexible, tap off boxes rating and as per Layout Drawing. All these fitting shall be in accordance with IEC 61439-6 and from the same manufacturer. There should not by any risk of exposure to electromagnetic fields. The busbar trunking housing shall be constructed of electro galvanized steel and aluminum to reduce hysteresis and eddy current loses and shall be provided with 7 tank cleaning & powder coating process with a suitable protective finish of ANSI 49 grey epoxy paint. The busbar trunking housing shall be totally enclosed non-ventilated for protection against mechanical damage and dust accumulation.

Sr.No.	Description	Rating
1	System nominal voltage	433 V
2	System frequency	50 Hz
3	Number of phases	TPN
4	Rated Continuous current	4000A
5	Fault Level	50KA for 1 sec
6	a) Minimum phase to phase b) Phase to body clearance (clear) c) Phase to neutral (clear)	As per standards Clearance (clear) As per standards As per standards
7	Neutral Grounding	As per standards

Sr.No.	Description	Rating
8	Insulation level Impulse withstand voltage	1 min dry power frequency-2.5 kV rms Withstand voltage Short time rating (Sym. KA)-(1 sec) - Refer SLD
9	Dynamic withstand current	100 kA peak
10	Cooling	Self-cooled
11	Design ambient temperature	50°C
12	Location	Indoor/outdoor
13	Degree of protection	IP 52/IP64
14	Maximum temperature rise(over 50 deg. C ambient) Bus conductor Bus enclosure and support structures	 35°C 20°C
15	Material Busbar Enclosure	AL MS of minimum thickness 3mm. (CRCA)
16	Bus bar Joints Flexible / expansion	Bolted type To be provided at all joints equipment
17	Insulators	Non-hygroscopic FRP/SMC with high Anti-tracking index. (Hylam Sheet support of any grade is not acceptable.)
18	Heating	Thermostat controlled space heater wired by means of 650V HRPVC 2.5 sq.mm. Copper wire
19	Silica gel breather and drain plugs	Required
20	Applicable standards	IS 8084 IEC 439 IS 8623
21	Acceptance tests	1) As per IS:8084 IS 8623

9 Requirements towards Heating, ventilation, and air conditioning work

9.1 All cooling equipment selection to be done based on American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE n=20) standard. The cooling systems should perform efficiently at variable load conditions. The overall cooling solution should be designed to achieve better cooling and low operating cost. The room air temperature should be maintained at 22 +/- 2 Deg. C and humidity as per ASHRAE TC 9.9 2017 guidelines. Heating and humidifier to maintain correct operating environment throughout the data centre needs to be considered. Relative humidity to be maintained in the data center will be from 45% to 55%.

9.2 **Logic of operation of cooling system will be**- The dedicated temperature sensor will sense the ambient air temperature continuously. As long as the ambient temperature is less than or equal to the "set point temperature", the control system will facilitate the dry cooler to run in "dry mode without PHE". (Set point temperature is water leaving temperature from dry cooler and set point should not be more than 32 Deg. C +1 Deg.C, But equipment should have capacity to set to maximum 33 Deg C and to maintain the same also). Only at times (if any) the ambient temperature increases beyond the "set point" temperature, the control system enables the unit to transition to "wet mode" operation. During "wet mode", the spray water system will be instigated to facilitate pre-cooling of the incoming hot ambient air before entering the heat exchanger coil section. In addition, the control system must also be able to optimize the fan power consumption continuously depending on the ambient temperature and heat load variations. Make provision on HMI to change set points as required. The process water side RTD (PT100) with temperature output signal will have to be fitted at the main water outlet header of the Adiabatic cooler. This temperature sensor will sense the outlet water temperature and accordingly give a signal to EC fans to increase / reduce the speed. At the set temperature the fans will be running at full speed and as soon as it drops then the fan speed will be reduced resulting in saving of power. If the adiabatic dry cooler leaving temperature increases beyond the "set point" temperature in "Wet Mode", the control system /BMS will facilitate the unit to operate in "Wet mode with PHE or Dry Mode with PHE" and enables the PHE primary side (Cold side) 2 Way/3 Way valve to modulate. Valve modulation depends on the temperature of outlet of the secondary of PHE (Hot side). Valve modulation will continue till PHE secondary outlet temperature maintains the set point temperature. Water temperature leaving from PHE and entering in the PHE at primary as well as secondary side to be monitored continuously on BMS and accordingly control needs to be operated even though failure of any one temperature sensor. PHE primary will take chilled water stored in the 2 X 50 KL thermal storage tank. Pump after thermal storage tank to be operated and controlled by BMS system. Existing chillers will maintain water temperature in 2X 50 KL tank. Dry cooler control system should able to optimize the fan power consumption continuously depending on the ambient temperature and heat load variations. Make provision on human machine interface(HMI) of Dry cooler as well as on BMS system to change set points as required.

9.3 **Adiabatic Dry Cooler**: Supply, installation, testing and commissioning of a adiabatic dry cooler with adiabatic cooling pads. The finned coil heat exchangers shall consist of copper phosphorus deoxidised (Cu-DHP) tubes, having copper content 99.9%, made to EN 12735 parts 1 & 2, ASTM B280/b68/b743 specifications. Aluminium fins shall be with advanced rippled-corrugated fin design to create a state of continuous turbulence, with full drawn collars to maintain fin spacing and provide a continuous surface cover over the entire tube. The tubes shall be mechanically expanded into the fin collars to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Headers shall be made of copper tubes having steel-flanged connections as standard. The adiabatic cooling system shall consist of instrumentation and controls, Spray pump, adiabatic cooling pads, SS basin, screen, electrical interface, VFD pumps, EC fans. Increased energy savings shall be achieved by using EC (electronically commutated) motors with permanent-magnet rotors. The fans selected shall be labelled as 'soft commutation'. This must involve a combination of commutation strategy and motor design. It should result in low-noise operation, without structure-borne noise. The noise level shall be limited to 75 dBA at a distance of 1.8 m. With the fans selected, there must be no motor noise variation across the entire speed range. When demand for cooling is low, very low operating speeds must be selected; resulting to extremely reduced absorbed power. Fan shall be Axial type aero foil design with Direct Drive. Fan motors should be total enclosed fan controlled (TEFC) with degree of protection IP – 54 or more. The Adiabatic dry cooler shall have a control system that senses the outdoor ambient dry and the leaving water temperature; selects between dry and adiabatic cooling and varies the speed of the fans to meet the heat rejection needs of the system. The controls shall cause the adiabatic water distribution system to operate when the ambient outdoor dry-bulb temperature does not provide sufficient cooling to maintain the desired leaving water temperature. Due to adiabatic pre-cooling, Inlet air temperature (ambient) enables return temperatures below the ambient temperature or a significantly higher device output with the same space requirement. Once the defined set point of the outlet temperature of water or condensing temperature can't be achieved anymore in dry operation, due to an increasing ambient temperature, the pre-cooling system is activated. The upstream Adiabatic Pads are humidified and air cooled by exchanging the latent heat of evaporation. The water is distributed evenly and without pressure via drainage channels, which are quickly and easily accessible for maintenance and cleaning purposes. The water only wets the stable framed, easy-to-replace and chemically resistant Adiabatic Pads and not the heat exchanger, which protects it from corrosion and in most cases eliminates the need for water treatment.. The Adiabatic Pads are impregnated to prevent microbiological growth. The excess water is drained from the stainless steel sump. The adiabatic pre-cooling system should meets the highest hygienic requirements. Stagnation and dead zones in the water-bearing components needs to be avoided, . The cooling pad section on each air-inlet side shall serve as an adiabatic saturator to cool the incoming air. It shall consist of specially integrated cellulose paper sheets with flute angles that have been bonded together. The impregnation procedure shall also ensure a strong self-supporting product, with high absorbance, protected against decomposition and rotting. An inlet-air edge coating shall be provided to prevent the pad surface from extreme environment such as dirt, sand storm, and risk of bacterial and algae growth.

The water flow through the pads shall be initially regulated by a special metering device, which throttles the correct flow rate. The unit shall have a water tray to collect the not-evaporated water. The unit shall be equipped with two copper tubes /Al tubes that spray water at a low pressure (2 to 3 bar) over the adiabatic pads to keep them wet. A water distributor shall be placed above wet pads to provide a homogeneous distribution of the water on all the pads length. Two fixed speed pumps shall be onboard the unit and they shall be used to circulate the water from the tank to the distribution pipes over the adiabatic pads. The Water used in the adiabatic mode needs to be reused by use of inbuilt filters. Casing is a self-supporting construction. Maximum casing dimensions are adapted to the local conditions Casing material made of Galvanized steel, powder-coated RAL 7035 Casing surface receives a high quality powder coating (RAL 7035) For easy cleaning, all surfaces are smooth. Controller should regulate the humidification and the amount of wetting water. Control ball valve including motorized valve, continuous control and emergency control function. Capacity of the adiabatic dry cooler shall be computed from the measurements of water flow, incoming/outgoing water temperatures and ambient dry bulb temperature and mean coincidental wet bulb temperature using accurately calibrated mercury-in-glass thermometers. Computed ratings shall conform to the specified capacities. Bidder needs to consider appropriate deration due to ambient temperature , altitude etc. factors. Bourdon type pressure gauges with aluminium casing with a minimum 100 mm dial and appropriate range complete with needle valves shall be provided at the inlet and outlets of heat exchangers, and pump sets. Thermometers shall be of dial type weather & water proof type. Thermometer shall be provided at the inlet and outlet of dry cooler.

9.3.1 Minimum I/O Summery for Dry Cooler will be as below:

Inputs	Description
I0.0—I N.N	FAN 1---n RUN feedback
	FAN 1..n fault feedback
	FAN 1..n EC selected
	pump 1 RUN feedback
	pump 1 fault feedback
	pump 2 RUN feedback
	pump 2 fault feedback
	FLOW TRANSMITTER OUTLET
	PRESSURE TRANSMITTER INLET
	PRESSURE TRANSMITTER OUTLET
	RTD 1 UNIT OUTLET
	RTD 2 Ambient
	RTD 3 PROCESS INLET
	Environment Humidity Sensor
Outputs	
O0.0	FAN1--n start / stop command
O0.1	FAN 1--n start / stop command
	closed loop pump 1 start / stop command
	closed loop pump 2 start / stop command

	Hooter
	FAN 1 TRIP
	FAN 2 TRIP
	FAN 3 TRIP
	Alarm signal

9.4 **In Row Cooling Unit**

9.4.1 These specifications describe requirements for an environmental control system. The system shall be designed to maintain temperature and relative humidity conditions within the row(s) of racks. The environmental control system shall be a In row unit factory assembled unit. It shall be floor mounted, optimized for maximum cooling capacity in a minimum footprint. It shall be specifically designed for service from the front and rear of the unit. The system shall be designed to ensure even air distribution to the entire face area of the coil. The unit shall be able to be mounted between the racks or at the end of the row with the use of optional adjustable air supply diffusers. The unit shall modulate cooling capacity and airflow based on requirements.

9.4.2 Each system shall be capable of handling up to 6400 CMH (Calculated)with a horizontal airflow pattern and shall be rated at 5500 CMH (Calculated as per requirement). It shall have a Gross cooling capacity rated not less than 25 kW, based on the returning air condition of 35°C dry bulb, defined Relative Humidity and 22 - 23°C dry bulb supply air temperature. Positive Temperature Coefficient (PTC) ceramic type electric heater shall be used

9.4.3 Electrode humidifier to be factory installed in the cooling unit. The humidifier to include humidifying cylinder kit and humidifying control board. The humidifying control board needs to receives humidifying command from the main control board, controls operation of the humidifying cylinder automatically, and feedbacks alarm information of the humidifier to the main control board. Humidifier to be able to modulate capacity. The humidifier should be self-contained, steam generating type, factory piped and wired, with disposable cylinder and automatic solid-state control circuit. Humidifier canisters shall be replaceable. The humidifier controller needs to communicate directly to the microprocessor controller and provide complete status and control at the operator interface. Humidifier shall control flush cycling and conductivity via automated controls. The unit to be equipped with a factory installed condensate pump. Internal piping is done connecting the pump to the condensate pan. Two types of switch should present where one is to activate the pump and the other for alarm generation in order to protect overflow condensate pan.

9.4.4 There shall be one chilled water circuit, incorporating a high efficiency 2-way chilled water valve – Pressure Independent Valve is preferred. The unit needs to run with variable capacity operation based on the chilled water control capabilities. The cooling coil to be designed with water freezing in mind, in the case of super low temperature, by having leaned or gradient design of coil to ensure removal of water during idle of the system. The evaporator coil to be manufactured from copper

tubes and hydrophilic coated aluminium fins, with a condensate drain pan. The condensate pan to be made up of galvanized steel pan .The evaporator coil shall have sufficient face area and 2 or 3 rows. The hydrophilic coating provides superior water carryover resistance. Coil headers to be equipped with drip plates in the bottom to route the condensate accumulating on the header tubes to the condensation pan. The 2-way modulating valve to control the mass flow of the chilled water within the chilled water circuits with high speed and high precision. The flow needs to controlled by the intelligent micro controller which sends signal based on its sensor feedbacks. The coil is configured in a counter flow arrangement to enhance heat transfer efficiency.

9.4.5 The unit to be equipped with (bidders choice to match flow rate and temperature along with RH Value eight (8)) Hot Swappable DC fan for all the 300mm units. The fan speed to be variable and automatically regulated by the highly intelligent control through all modes of operation. Each fan to have a dedicated motor which provides a level of redundancy. The fans pull air through the coil and should be located on the front side of the unit. Fan Protection: Each fan assembly shall consist of integral fan finger guards. Each fan assembly features a housing with a foam lining to provide passive noise control.

9.4.6 The unit needs to be provided with levelling feet. The perforated inlet and outlet panels need to have 75% open area. All units needs to provide maintenance from the front and rear, allowing units to be placed within a row of racks. The cabinet should be designed to fit the air baffles which helps in modularity design. The design should fit 4 (four) symmetrical air baffles that can be changed to LEFT or RIGHT direction and each baffle is assumed technically to be 25% of capacity cooled. During modular designs, each unit can be configured using the air baffle to divide capacities per 25% range.

9.4.7 The unit to be equipped with two air filters rated G4, located within the cabinet, and accessible from the rear of the unit. The filter should comply to average atmospheric dust spot efficiency of 30% per AHRAE Standard 52.1, MERV 8 per ASHRAE 52.2 A filter clog alarm should be available .

9.4.8 In row unit models needs be controlled by the intelligent control board. The control board needs to be microprocessor based. The controller should allow setting and monitoring of the room parameters. The unit needs to utilizes multiple temperature sensors placed at the rack inlet, to ensure management and control of temperature by the rack. Each unit can be connected to a maximum of 16 remote Temperature Sensors. The sensors needs to provide real-time, direct feedback to the cooling unit to optimize the amount of cooling and airflow required; increasing energy efficiency and ensuring proper rack inlet air temperatures. The sensor data needs to be reported to remote BMS and monitoring system.Status Report of the latest 500 alarm history of the unit. Input for remote on-off and volt-free contacts for simple remote monitoring of low and high priority alarms: high/low temperature, fan/control failure and others shall be available Automatic restart shall be provided after a power failure. Controller should be with the graphic screen display. It shall provide password protection to prevent unauthorized operation effectively. The

operation time of components should be available through the menu. fault diagnosis system can automatically display the current fault information, facilitating maintenance. It provides tracked records of the temperature and humidity. A buzzer provides an audible indication in case of the 'Warning' or 'Alarm' event. Internal supply and return chilled water temperature sensors need to be installed into sealed wells. Wells are filled with thermal conducting heat transfer grease to provide accurate temperature sensors. The data from the water sensors should be processed by the intelligent controller, and to be able to produce the current cooling capacity value in the controller. Internal water flow sensor for chilled water need to be installed into sealed wells to provide accurate flow rate data. The data from the water sensors should be processed by the intelligent controller, and able to produce the current cooling capacity value in the controller

9.4.9 Remote shut down contact to incorporate in the Fire input to be provided along with common alarm potential free input.

9.4.10 The controller needs to allows setting and/or monitoring of the following minimum space parameters:

- Air inlet Temperature
- Air supply Temperature (remote sensors at rack inlet)
- Return Temperature set-point
- Supply Temperature set-point
- Humidity (inlet)
- Humidity set-point
- Fan output
- Heating status
- Humidifier status
- Supply voltage
- Real Time Cooling Capacity (in BTU/h or kW) – water flow sensor required

9.4.11 The list of minimum available warnings/alarms:

- High supply temperature
- Low supply temperature
- High return humidity
- Low return humidity
- Loss of airflow
- Electrical heater high temperature (When applicable)
- Clogged filter
- Supply sensor failure
- Humidifier problem
- Rack sensor failure

9.4.12 In Rows unit should have industry standard communication protocol to communicate to BMS system.

9.4.13 In Row units should have with water leak detection kit.

9.4.14 Thermal Containment should be provided for best in class. Containment of both front and back should be done. Thermal containment should be with access control motorized doors. Motor to have UPS Power.

9.5 **Air Cooled Chiller-**

9.5.1 880 KW/ 250 Tr at Chilled water in out temp: 20 / 15 Deg C Ambient temp: Bangalore (N=20 years) , Minimum EER for chiller should be 3.7 after removing all derations at design condition

9.5.2 Chiller to be factory assembled, factory charged, factory run tested of various capacities. Chiller need to consist of anticorrosive coated fin and tube air-cooled condenser with EC axial fans, to have independent two refrigerant circuits fitted with semi-hermetic screw compressors, In the circuit One compressor should have integrated Inverter mounted on Screw compressor and other should be standard Screw compressor, shell and tube evaporator and pipes, Hydro fluoroo lefins (HFO) refrigerant with global warning potential (GWP) lower than 10, Quick Restart Feature to achieve 100% capacity of unit in less than 150 seconds, steel base frame for mounting the above components, refrigeration piping, fittings, valves, refrigerant and oil, controls and ancillaries. The hydraulic circuit need to consists of grooved hydraulic pipes connected by joints (Grooved type), flow switch and all safety devices. Chiller to be able to operate up to 480C without tripping. Chiller to have an inbuilt Energy meter. Chiller to have an electronic type of Flowmeter. Chillers to specifically designed to suit datacenter requirement; conventional chiller is not acceptable.

9.5.3 Chiller should be equipped with an on-board controller to secure system optimization and energy savings. On board control should allow the programming of temperature and pressure thresholds. All the set-up should be possible from Graphic display, through symbols and codes, should ensures a reliable and flexible man-machine interface. Sequential auto-restart timer should allow phased units restart after power failure. Should have the provision for Double / shift set point. The condenser fan speed control should be such that the compressors always with optimum working efficiency. All settings should be protected through Password system. Input for Remote on-off and Volt-free contacts for simple remote monitoring of alarms and warnings to be available.

9.5.4 Chiller to be designed for outdoor conditions. The base to be made of metal profiles. The top frame of the unit supporting the air exchangers to be made of galvanized sheet metal. The compressors to be positioned in a closed compartment, protected from external agents and isolated from the air flow to avoid the transmission of noise. The compressor / s compartment should be made entirely from galvanized steel. The right and left side panels to be equipped with waterproof seals and to be

locked with triangular insert locks (the appropriate key should be supplied) for easy and quick disassembly. The compressors to be fixed to the base on anti-vibration supports to prevent the transmission of vibrations to the structure. The compressor box should be designed to reduce to the maximum the levels of noise through the use of sound absorbing/damping materials. All exposed sheet metal parts should be painted directly with polyester powder on zinc-plated components, for non-galvanized components they should be painted with polyester powder after a treatment with a suitable primer; so all parts (galvanized and not galvanized) should be set to ensure good corrosion resistance equivalent to a Medium grade (according to ISO 12944) for an application.

9.5.5 All units to be equipped with two independent refrigerant circuits, each consisting of, semi-hermetic screw compressor in which one of the compressor should be with Integrated inverter and other should be standard screw compressor. Refrigerant circuit should have integrated shut-off valve on the discharge line. These compressors should be supplied by the market's leading manufacturers. To reduce harmonic transmission from Inverter compressor a line reactor must be mounted on the electrical panel. Refrigerant used should be HFO and should have GWP less than 10. Each Semi-hermetic screw compressor to have Internal safety valve, and should have inbuilt electronic protection controlling Temperature of motor winding, the oil temperature, screw rotating direction, Oil management to be controlled by providing oil heaters, oil sight glass, oil level control and fine filter 10 µm mesh. Each Integrated Inverter Semi-hermetic screw compressor to have integrated frequency converter, integrated solenoid valve for variable speed control, Internal safety valve, Internal safety valve , External rupture disk for A2L refrigerant , Line reactor to comply C3 of EN 61800-3 and RFI filter to comply C2 of EN 61800-3

9.5.6 Evaporator to be of direct expansion, shell and tube type evaporators, designed, constructed, tested (pressure test on both refrigerant and water sides).The shell to be fabricated from seamless carbon steel with internally finned copper tubes and tube sheets of heavy gauge carbon steel. It should be externally insulated with closed cell elastomer with high resistance to UV rays HT- type for outdoor installations. The evaporators to be equipped with drainage and vent connections and should be protected against freezing by a paddle-type flow switch and an antifreeze sensor directly managed by the microprocessor.

9.5.7 Condenser and Fans Cooling coils to be made with copper tubes and aluminum fins, to provide a larger heat exchange surface, integrated in in modular configuration with multiple “V” geometry with airflow in series with condenser coils. The coil should have Epoxy coating.

9.5.8 Fans should be axial type, with die-cast aluminum blades statically and dynamically balanced and directly coupled to an EC motor with external rotor. Fans should have Electronically Commutated motors (EC-Fans) with IP54 protection, Class F winding insulation and internal thermal protection.

9.5.9 Safety protection grilles and high efficiency nozzles with a specific design should be provided to eliminate cross and recycling airflow. Fans should be of vertical discharge. Stator blades should be provided to allow the redirection of airflow, with a consequent increase in efficiency and noise reduction. Fan speed control should be achieved by means of a continuous fans speed regulation, managed directly with controller for higher energy saving and lower sound emission spectrum.

9.5.10 Electronic Expansion Valve: The electronic expansion valve used in the chiller range to enables accurate control of the overheating of the gas sucked by the compressor under all load conditions, together with the operation at low condensation and compressor unloading. Under such application conditions a mechanical expansion valve can never reach the performance so it must be electronic type, and it should be ensured by an electronic expansion valve (with energy benefits) nor the functional stability, above all during the transients of the load variations (with benefits as for reliability). The superheat set point should be automatically adjusted according to the operating conditions and to the application limit of the compressor. The operating parameters and their programming in the microprocessor dedicated to the EEV control are must.

9.5.11 Quick restart feature -Unit controls to be designed such that during power failure and restart, chiller should be able to provide full load capacity (100% loading) within less than 160 secs from the time of power restoration to the chiller. UPS power supply provision needs to be provided to chillers controllers. In case of external UPS power unavailability, the controller, should be powered by an internal Ultra-capacitor which should store the energy taken from the mains line and make it available during the power failure.

9.5.12 Electrical Panel The electrical panel should be in compliance with IEC standards (EN60204-1). The panel must have a degree of protection equivalent to IP55 and to be cooled by an internal fan (with thermostat).

9.5.13 Control System -Chillers to be controlled by the microprocessor control system and should manage the entire unit operating conditions. The user should be able to change and/or modify the operating parameters through the display keyboard installed on the electrical panel. The electrical control board with fan should be equipped with all the safety and operating devices needed for reliable automatic operation It should have the control for the water temperature adjustment. Chillers must be automatically protected through a series of warning and alarm to prevent damages to the chiller from Pressure control, Out of Envelope alarm, Oil level, Refrigerant charge check function, Compressor protection for various faults like blocking their start if the phase sequence is not correct, or stopping their operation if a thermal relay intervenes etc.

DATA TO BE FURNISHED BY Bidder			
Sl. No.	**ITEM DESCRIPTION**	**UNIT**	**Bidder's INPUT**
1.	Chiller type	-	
2.	Quantity – Working / Stand by	No	

DATA TO BE FURNISHED BY Bidder			
Sl. No.	**ITEM DESCRIPTION**	**UNIT**	**Bidder's INPUT**
3.	Tag Numbers	-	
4.	Location	-	
5.	Place of manufacture		
6.	Model number and make		
7.	Minimum Refrigeration capacity	TR	
8.	Type of Compressor and speed	RPM	
9.	Minimum chilled water flow rate	USGPM	
10.	Maximum chilled water pressure drop	Ft	
11.	Entering chilled water temperature	ºC	
12.	Leaving chilled water temperature	ºC	
13.	Fouling factor for chiller		
14.	IKW / TR at full load based on 5.6 ºC leaving chilled water temperature		
15.	Ambient air Temp.	ºC	
16.	Leaving air Temp.	ºC	
17.	Condensing Temp.	ºC	
18.	Total air flow rate	CFM	
19.	No. of fans & motor power	KW	
20.	Type of starter		
21.	Motor Voltage		
22.	Type of capacity control		
23.	Noise level at 1.86m distance	Db (A)	
24.	Equipment size	(L x B x H)	
25.	Equipment operating weight	Kg	
26.	Full refrigerant charge	Kg	
27.	KW rating (total) of package	KW	
28.	Rated full load amps	RLA	
29.	Maximum inrush current	A	
30.	Computerized printout (certified) from chiller Sub-contractor indicating power consumption in IKW / TR at full load and various part load conditions as per ARI format.		
31.	Catalogues furnishing detailed technical data for compressor, chiller, condenser, micro-processor or micro-computer control panel etc.		
32.	ARI certification	Yes / No	
33.	Minimum tube removal space required on either end of condenser	mm	

DATA TO BE FURNISHED BY Bidder			
Sl. No.	**ITEM DESCRIPTION**	**UNIT**	**Bidder's INPUT**
34.	Minimum service space required		
A	Front	mm	
B	Back	mm	
C	Sides	mm	
35.	Type of Vibration Isolators		
36.	Minimum overhead clearance required for installation and service	mm	

OPERATING PARAMETERS (IKW / TR) as per variant ambient temperatures:

Load	**Outdoor DBT**							
	150C	**180C**	**200C**	**250C**	**300C**	**350C**	**380C**	**400C**
100%								
90%								
80%								
70%								
60%								
50%								
40%								
30%								
20%								
10%								

9.6 **Computer room Precision air System chilled water base (PAHU)-**

The environmental control system shall be Factory assembled unit. It shall be floor mounted, optimized for maximum cooling capacity in a minimum footprint. It shall be specifically designed for service from the front of the unit. The system shall be designed for draw-through air arrangement to insure even air distribution to the entire face area of the coil. The unit shall modulate cooling capacity and airflow based on requirements. The unit shall be ready to allow the installation of shackles for top handling. Forklift handling should be possible as well. The cabinet is manufactured from galvanized steel sheet, externally painted with RAL colour epoxy-polyester powder paint and assembled using stainless steel screws and high tensile rivets. The rear and the fans section panels are double-skinned, with 20mm (frontal fan section panel with 40mm) Class 'O' (A1 EU) fireproof insulation sandwiched between the skins to reduce noise emission and heat loss. The side panels, which are isolated from the inside of the unit to form a complete double-skinned cabinet, the small service panel for electrical heaters, are also lined with 10mm Class 'O' fireproof insulation. Modular

construction Close Control Precision air conditioning unit suitable for Chilled water operation. Unit should be bottom discharge arrangement with Fans section mounted in the false floor with protection grills. The unit should have inlet filters, direct drive Backward curved RADICAL Fans made of Composite material with electronically communicated Motors, Chilled water Cooling Coil with Pressure Independent, Balancing and Modulating valve, Multistage Heater banks & Variable Capacity Electrode type Humidifier to maintain humidity inside the space, condensate drain pan of stainless steel construction with nitrile rubber insulation, Microprocessor panel, and programmable control complete with LCD display. The unit shall be suitable for operation on 415 V, 50 Hz, AC supply. The Precision Air Handling unit shall be High sensible cooling capacity and high SHR (i.e. the sensible to total cooling capacity ratio). Low running costs, achieved by means of sophisticated design and co-design methods, combined with an accurate selection of the components. The whole range of units shall be "environment friendly" because it uses materials that can be recycled, particularly for the plastics and the thermal insulation. Precision units should be selected based on the low noise level basis not exceeding 65 dBA at 1mtr from unit. The directly-coupled electric motor is of the three-phase (or single-phase in outside-rotor type protection grade IP10, and complete with thermal protection (klixon) inside the electric motor winding. Using this type of fan with a highly-reactive fan wheel instead of the one with forward curved blades enables you to reach higher useful static pressures (up to 350 Pa) AS A STANDARD FEATURE. Standard forward curved blower with traditional Belt driven motor arrangement not acceptable. Fan power should not be more than 0.12 kW/TR. Heat exchanger (evaporator coil) shall be designed with an ample front surface area in order to ensure a low air flow velocity through the exchanger so as to prevent the entrainment of droplets of condensation, reduce the air's load losses and ensure a more efficient heat exchange during both the cooling and the dehumidifying processes. Complete Coil should flat and should be fully accessible from front and V or A shape type of coil not acceptable. The exchanger is composed of copper tubes mechanically expanded on aluminum fins, complete with a hydrophilic treatment to reduce the surface tension between the water and the metal surface, thus favoring film-wise condensation. The exchanger is situated upstream from the fans to ensure unhindered air distribution and is complete with an insulated stainless steel condensate tray with a flexible conduit for its drainage and an incorporated trap. Complete Coil should flat and should be fully accessible from front. The filter cells are made of MERV8 following ASHRAE 52.2 (45% by ASHRAE 52.1) or G4 following EN779 with minimum 150 mm thick filters located within the cabinet, and accessible from the front of the unit. Each packaged unit shall be provided with multistage electric heaters with heating elements constructed from aluminum. Electric strip heaters shall be of the low temperature totally enclosed strip type fitted with radiation fins and suitable for operating at black heat with minimum 15kW heaters per unit. If overheating occurs, a safety thermostat should cut off the voltage supply to the heaters and triggers an alarm. This heating system serves a dual purpose: heating the air in order to reach and maintain the set point; reheating in the dehumidifying phase, so as to restore the air temperature to the set point. As a result, the installed heating

capacity is sufficient to maintain the dry bulb temperature in the room during operation in dehumidifier mode. Boiling water in a polypropylene steam generator shall provide humidification. The humidifier shall be capable of providing continuous auto modulation in steam generation from 30-100% as per the steam requirement per hour. The humidifier shall be fully serviceable with replaceable electrodes. Waste water shall be flushed from the humidifier by initiation of water supply valve via U-trap. The microprocessor should be able to display the current drawn and actual steam output in the microprocessor. De-humidification cycle shall operate by increasing the water flow thru the coil so as to lower the coil ADP. The system shall be provided with relevant water detection kit and each of the sensor must be capable to detect individually any water below the false floor near the unit, the sensor must be connected to the unit microprocessor thus enabling the controller to give an alarm in case of wet floor. The system shall be provided with /2way PIBCV valve inbuilt with the machine based on the entire system design. The controller unit should also be capable of starting the standby unit either chilled water based or DX based in case the temperature is not able to achieve with the working units. The cooling coil should be designed for 15-20 Deg. Centigrade (supply and return) chilled water system.

9.7 **PRESSURE GUAGES & THERMOMETERS**

Bourdon type pressure gauges with aluminum casing with a minimum 100 mm dial and appropriate range complete with needle valves shall be provided at the inlet and outlets of heat exchangers, and pump sets. Thermometers shall be of dial type weather & water proof type. Thermometer shall be provided at the inlet and outlet of dry cooler.

9.8 **Water Piping and accessories:** Water pipe should be heavy duty Mild steel (MS) (Black steel) with all necessary fittings like bends, elbows, tees, flanges, reducers, vibration isolators, hanger, supports, PUF Gatti and fitting like flanges, bellows, union, etc. MS 'C' class water piping conforming to relevant BIS codes (IS 1239 up to 150 mm and IS 3589 for 200 mm and above and have the required insulation material with the appropriate thickness), cut to required length or factory manufactured as per length and installed with Grooved joints, including all necessary fittings such as elbows, tees etc. The above piping shall be provided with thermal insulation of 'O class' Nitrile insulation with protective coating on water piping with min 26G of Aluminium cladding. All piping shall be tested to hydrostatic test pressure of at least 1 ½ times the maximum operating pressure but not less than 7 Kg/Sqm for a period of not less than 24 hours. Entire system shall then be retested. After completion of the installation, the pipe lines are to be flushed thoroughly to blow out the entire dirt and muck. The system then shall be balanced to deliver the water quantities. Direction of flow shall be marked on aluminum cladding above pipelines in bold markings.

9.8.1 **MS Pipes with Standard/Light wall thickness** Roll or cut grooved-ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends to be grooved in accordance with grooved coupling and fittings manufacturer. Pipe joining should be with grooved couplings, grooved end fittings

and grooved end valves. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tool to be used from manufacturer of grooved products in order to maintain design integrity.

9.8.2 **Couplings and Fittings for Joining Pipe**

9.8.2.1 Standard Mechanical Couplings, DN50 through DN300: Needs to manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. Mechanical Coupling bolts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and ASTM A-183. . Coupling housings rigid type with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9, and NFPA 13. Installation ready rigid coupling for direct stab installation without field disassembly for DN50 to DN 300. Centre-leg gasket with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth. Gasket shall be EPDM compound designed for operating temperatures from -30 deg F (-34 deg C) to +250 deg F (+120 deg C.For DN250 ttoDN300: Standard rigid coupling and gasket shall be Grade "E" EPDM compound designed for operating temperatures from -30 deg F (-34 deg C) to +230 deg F (+110 deg C). Flexible type coupling to be used at location where vibration attenuation, misalignment to be covered, stress relief are required. Flexible adaptors to be used with grooved end pipe and fittings, flat faced, for mating to ANSI Class 125 / 150 flanges or PN rated flange outlet connections. Rigid coupling key shall be designed to fill the wedge shaped AGS groove to provide a rigid joint that corresponds with support spacing's as defined by ASME B31.1 and B31.9. Systems incorporating rigid couplings require the calculated thermal growth/contraction of the piping system to be fully compensated for in the design of the piping system through use of adequate flexible components.

9.8.2.2 Grooved End Fittings:

Standard fittings shall be cast of ductile iron conforming to ASTM A-536, forged steel conforming to ASTM A-234, Grade WPB 0.375" wall (9,53 mm wall), or fabricated from Std. Carbon Steel pipe conforming to ASTM A-53, Type E or S, Grade B. Fittings provided with an alkyd enamel finish or hot dip galvanized to ASTM A-153. Zinc electroplated fittings and couplings conform to ASTM B633.AGS Fittings shall be supplied with factory AGS grooved ends, for use with AGS couplings and AGS flange adapter. Fittings shall be manufactured of ductile iron conforming to ASTM A-536, forged carbon steel conforming to ASTM A-234, or factory fabricated from carbon steel pipe conforming to ASTM A-53. Fittings shall be manufactured to the dimensional standards ASME B16.9. Orange enamel coated or galvanized.

9.8.2.3 Bolted Branch Outlet: Branch reductions on DN50 through DN200 header piping. Bolted branch outlets shall be manufactured from ductile iron conforming to ASTM

A-536, Grade 65-45-12, with synthetic rubber gasket, and heat-treated carbon steel zinc plated bolts and nuts conforming to physical properties of ASTM A-183.

9.9 Propylene Glycol- Bidder to consider a mixture of 15% Propylene Glycol and 85% pure water in the water loop circuit. It is used not only for antifreeze but also helps in lubrication of the pump what gives a much better, longer, lifetime. Also it prevent the liquid of having bacterial or micro-organism grow so don't have to exchange the liquid every period of time and gives corrosion protection.

9.10 **Plate Heat Exchanger (PHE)**

9.10.1 AHRI specification (Air-Conditioning, Heating, and Refrigeration Institute):The plate heat exchangers shall be AHRI-certified in accordance with the AHRI Liquid to Liquid Heat Exchangers Certification Program. The PHE specifications as selected, shall be verified and registered by AHRI before purchase.

9.10.2 Supply and implement Plate Heat Exchanger system along with piping, valves, controlling mechanism, sensors etc. Plate Heat Exchanger shall be of plate type designed, constructed, and tested in accordance with Pressure Equipment Directive (PED) standards "Equipment category IV". The Heat Exchangers shall be certified and stamped complying with PED. PHE shall consist of a package of copper metal plates with port holes allowing the two fluids to form a flow. The design shall prevent mixing of fluids and leakage to the surroundings. Each plate shall have an efficient flow distribution area, to maximize use of pumping power for efficient heat transfer. This will help reduce the heat transfer area installed and avoid dead spots for longer operation life time. All plates shall be single step pressed to secure uniform thickness, have no weak spots and give accurate seating of gasket in the gasket groove. This enables the plate pack to better handle pressure shocks, vibrations, plate fatigue, high operating pressures and high differential pressures. No multi-stage pressing of one sheet is allowed. The plates shall not have holes for attaching of the gasket. All plates shall be market with a charge number for full traceability. Fluid inlet and outlet connections should be positioned in parallel on the frame plate and not diagonal to allow ease of installation. All plates are being washed after pressing to avoid greasy plates reducing heat transfer. All gaskets shall be locked into the groove. Gaskets shall have a roof top or ribbed top cross section design to ensure superior sealing performance. Gasket profile tailored to fit the plate type and thickness – longer lifetime of gaskets and plates. All gaskets shall be marked with a colour code for identification of gasket material from the outside of an assembled plate heat exchanger. Number of plates should make up the required heat transfer area to meet the operating conditions according to performance request. Test Pressure: 1.5 times the design pressure. Units to be factory tested in accordance with Pressure Equipment Directive Standards. Lifting eyes shall be provided complete with recommendations for lifting the complete unit into position. Recommended connections are 6 inch and above size flange connections Flanges with SS material and rated with PN40 ASME flanges. Frame plate shall have flange stud bolts. Frame and pressure plate shall have side slot tilted bolt hole geometry (not holes in frame) to allow small footprint, easier and safer maintenance. The unit should have feet supplied for fixing at front and back.

9.10.3 Frame material will be as per IS 2062 , Paint will be PU paint. Bidder to submit design Data for selection of PHE will be as below.

		Hot Side			Cold Side	
Fluid Name		Water			Water	
OPERATING DATA		Inlet	Outlet		Inlet	Outlet
Estimated Total Liquid flow	GPM					
Operating Temperature	°C					
Pressure drop (allowed / calc.)	bar					
Total Heat Exchanged	kW					

9.11 **Computer room Precision air System (PAC):** Supply, installation, testing and commissioning of self-contained direct expansion type Precision air conditioning units suitable for operation on R410a/R407C refrigerant & should have advanced microprocessor and electronically communicated. Modular construction Precision air conditioning unit suitable for operation on R-410a / R407C refrigerant with bottom discharge arrangement consisting of inlet filter, draw through direct drive Electronically commutated Motors and Backward curved Plug fans, fan motor assembly to deliver desired air quantity, Inverter / Variable Flow Scroll , Direct Expansion Cooling Coil, Heater banks to maintain humidity inside the space, condensate drain pan of stainless steel construction, Microprocessor panel, programmable control complete with display. The unit shall be suitable for operation on 415 V, 50 Hz, AC supply. The controller unit should also be capable of starting the standby other DX base unit in case the temperature is not able to achieve with the working units. For Basis of Design Bidder to consider site ambient data along with following parameters.

9.11.1 Equipment Parameters

Equipment air inlet : (Input to server rack): 22 DegC +/- 2 Deg & 50% RH

Machine configuration : Bottom discharge

Actual Capacity : As provided

Flow Direction : Bottom discharge

Machine Capacity control : Return Air

Compressor type :One of the scroll will be inverter

Evaporator Fan motor : Blades with Electronically commutated (EC)

Humidification & De-humidification : In built feature of humidification & dehumidification

Filters : Filter to be provided on the Package unit, having 95% efficiency down to 5 Microns

9.11.2 Base panel shall be constructed out of sandwich panels of galvanized steel and painted with epoxy powder coated (Insulation on all 4 sides). All four side panels shall be insulated. Unit shall be complete with space for refrigeration equipment, fans, cooling coils, liquid receiver, Liquid line solenoid Valve, NRV and multistage strip heaters and modulating Humidifiers and water cooled condenser unit. Unit shall be provided with welded tubular steel floor stand with adjustable legs and requisite vibration isolation pads.

9.11.3 The units should be equipped with direct driven backward curved EC radial fans with electronically commutated brushless motors. The technology employed by these motors allows straightforward control of fan speed by means of the electronic controller in order to obtain adjustment of air flow rate and static pressure to ensure correct distribution of the treated air. The filter chamber shall be an integral part of the system and withdraw able from the front of the unit. Low airflow and clogged filter alarm sensors consisting of two pressure switches for controlling the operating conditions of the fans and the build-up of dirt on the air filters inside the unit. The motor's high efficiency should make for less energy absorption, especially at partial loads and during starting (lowering of peak current), which means a reduction in power consumption of approximately 30% compared to AC motor. The motor shall have minimum IP54 Protection. Evaporator Coil Precision packaged unit shall comprise of cooling coil of copper tubes expanded into aluminium fins with corrugated profile and hydrophilic treatment. Face and surface areas shall be such as to assure rated capacity and the air velocity across the coil. Complete Coil should flat and should be fully accessible from front. Drain pan shall be made of stainless steel with nitrile rubber insulation

9.11.4 **Scroll Compressor**: The compressor shall be of the high efficiency scroll design operating with R410A / R407C refrigerant and 415V/3~/50 Hz supply. The compressors are provided with integrated thermal overload protection. The compressor motor control driver is provided with integral electronic protection against over temperature, over current, over or under-voltage with absence of one or more phases.. The compressor shall be charged with mineral oil and designed for operation on environment friendly refrigerantR410a /R407C.The machine should be inbuilt with the liquid receiver & pressure relief valve, Liquid line solenoid Valve, NRV for better performance of the machine. The refrigeration system shall be of the Single/ Multiple circuit direct expansion type and incorporate hermetic scroll compressors, complete with crankcase heaters. Scroll compressors should be variable flow.

The refrigerant circuit comprises:

- Liquid receiver inbuilt in the indoor unit
- Electronically- controlled expansion valve (EEV)
- Solenoid valve for shutting off the refrigerant liquid

- Refrigerant liquid flow indicator
- Solid cartridge freon filter
- Safety valve
- High pressure safety pressure switch with manual reset
- Low pressure switch with automatic reset
- Copper refrigerant pipes with anti-condensation insulation on the suction line
- Pipe taps on suction and delivery side and charging valve on liquid side.
- Each Compressor / refrigerant circuit to have its own independent Evaporator coil and Condenser coil.

9.11.5 Electronic Expansion Valve (EEV) The unit should have Electronic Expansion Valve and should be capable of responding to the varying load conditions.. It should be able to provide following advantages:

- Fast, high precision adjustment of refrigerant flow;
- Fast arrival of the unit at steady-state conditions;
- Superheating value remains constant in variable thermal load conditions;
- Efficient operating conditions of the compressor, especially in the presence of low room temperatures;
- Wide working range with consequent extension of the unit's operating limits. These properties result in enhanced performance of the unit and make it possible to obtain very significant energy savings.

9.11.6 Condenser shall be water-cooled type, suitable for indoor installation and shall be suitable for operating at high ambient of 40 deg C Dry Bulb Temperature (db) and at low ambient of upto 0 deg C db temperatures. The condenser shall be complete with provisions for refrigerant piping connections, shut off valves and any other standard accessories necessary with the equipment supplied. Each Circuit to have its independent set of water cooled condenser coil.. Location of water condenser unit will be inside Data Centre area or in passage. Condenser shall be designed for the required indoor capacity considering Condenser water entry & exit as per P & ID drawing..

9.11.7 Electric heaters-Each packaged unit shall be provided with multi stage heating elements constructed from aluminium. Electric heaters shall be of the low temperature totally enclosed strip type fitted with radiation fins . If overheating occurs, a safety thermostat should cuts off the voltage supply to the heaters and triggers an alarm.

9.11.8 Humidifier-Boiling water in a polypropylene steam generator shall provide humidification. The humidifier shall be capable of providing continuous auto modulation in steam generation from 30-100% as per the steam requirement per hour. The humidifier shall be fully serviceable with replaceable electrodes. Waste water shall be flushed from the humidifier by initiation of water supply valve via U-trap. The microprocessor should be able to display the current drawn and actual steam output in the microprocessor.

9.11.9 De-humidification cycle shall operate by keeping the airflow constant but with the help of EEV to reduce the ADP of the coil.. The system shall be provided with relevant water detection kit which shall have sensors with wire of minimum 1.5mtrs and each of the sensor must be capable to detect individually any water below the false floor near the unit, the sensor must be connected to the unit microprocessor thus enabling the controller to give an alarm in case of wet floor. -A microprocessor shall continuously monitor operation of each Server room air-conditioning unit continuously digitally display room temperature and room relative humidity, alarm on system malfunction and simultaneously display problem. When more than one malfunction occurs, flash fault in sequence with room temperature, remember alarm even when malfunction cleared, and continue to flash fault until reset. Microprocessor to control the following functions:

- Room Temp temperature
- Humidity (HH versions)
- Speed of the delivery fans
- Timing of compressors with automatic rotation
- Alarm signal on two levels
- Controlled automatic reset of high and low pressure alarms
- The machine should be programmable to set the rotation time between the working & standby units as per client requirement.

9.12 **Differential Pressure Transmitters**: Differential pressure transmitters shall be field mounted and shall transmit an isolated 4-20mA DC signal indicative of process variable to the pump logic controller via standard three wire 24 DC system with Emission/Immunity confirming to EN61000-6-2/3. Unit shall have stainless steel wetted parts with two 7/16" process connections. It shall be protected against radio frequency interference and shall have water tight, IP 55 electrical enclosure. Sensor should be capable of withstanding a burst pressure of 25 bar. Accuracy shall be within 2.5% BFSL (Best Fit Straight Line).

9.13 **Cabinet / Duct inline** type centrifugal fans for Fresh Air and exhaust air system complete with Double inlet and Double Width (DIDW) backward curved blower Air Movement and Control Association International, Inc (AMCA)certified totally enclosed, fan cooled, provided with Class F insulation. Fans shall be provided with TEFC Sq. cage direct driven , Class F insulation motor, with minimum IE3 rating suitable for 415 V+/-10 %,50 Hzs 3 phase supply. Fan must be selected for minimum consumption and maximum efficiency. Supply fresh air fan should be with two filters i.e. pre filter and fine filter minimum 10 micron HDPE washable filter. Both the fan motor should be with starter and this should be with timer control through BMS system. Fresh air and exhaust system should be with single blade, motorized fire & smoke damper with spring return actuator. Damper should be with minimum 2 hours fire rating. The damper shall be constructed out of 16 G galvanized sheet steel. Damper control and monitoring operations are thro BMS.

9.14 **Supply, installation, testing & commissioning of Centrifugal Pumps** of Mono block type. The pumps shall be vertical multistage, in-line design which enables installation in a horizontal one pipe system where the suction and discharge ports are in the same horizontal level and have the same pipe dimensions. The pump, electric motor, coupling and coupling guard shall be factory assembled at the pump manufacturer's facility. Pump shall be fitted with a 3-phase, fan-cooled induction motor. Motor shall Include a frequency converter VFD (PI or PID controller)i either in the motor terminal box or in separate Pump panel. The combined motor and frequency converter efficiency shall be to higher than the IE4 level defined for fixed-speed motors in IEC 60034-30-2. Pump and motor shall be of integrated and user-friendly compact design. Sound pressure level of pumps shall be according to EN ISO 3743.The design total head capacity curve shall preferably be continuously rising towards the shut off. In case of unstable (drooping) characteristic the duty point shall be well away from the unstable region. The shut off head shall be at least 110% of the total head. Pumps shall run smooth without undue noise and vibration. The noise level shall be limited to 70 dBA at a distance of 1M. Vibration shall limited to class II C of BS 4675 Part –I. Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division. Components of identical pumps shall be interchangeable. . Flexible bellows at pump inlet and pump outlet as per suction and delivery sizes to be considered. Pump Base shall be a robust construction with integrally-cast support in order to transmit pipe load to the foundation. Liquid passages in the casing shall be smooth finish to ensure high Efficiency. Pump base shall be SS316 grade Stainless steel Flange dimensions are in accordance with EN 1092-2.Pump base shall have tapped hole provision for draining. The impeller shall be AISI 316 stainless steel enclosed type with smooth surface finishes for minimum frictional loss. This ensures high Efficiency. Impeller shall be fixed to the shaft by means of a split cone and a split cone nut/union nut. Shaft shall be AISI 316 or AISI 431 stainless steel with splined design, and shall be adequately sized to with stand all stresses, hydraulic loads, vibrations and torques coming in during operation. Shaft shall be provided with Mechanical seal as default fitment to provide leak free operation. The liquid cavity shall be sealed off at the pump shaft by an internally flushed mechanical seal with Silicon carbide seat and Silicon carbide seal ring, suitable for continuous operation at 50 Deg C. The mechanical shaft seal shall be cartridge type for maintenance free operation and balanced. Pump base shall be EN-GJL-200 or EN-GJS-500-7 grade Cast Iron according to ASTM 25B or ASTM A536-84 70-50-05 or equivalent standard. Motor shall be suitable for operation on a 3 X 380-500V (± 10% variation), 50-60Hz ± 5%, 3phase AC supply. Motor with thermal protection against steady overload and stalled condition (IEC 34-11). Bidder may consider an integrated frequency convertor and a PI controller incorporated within the motor terminal box and also in build DP sensor and flow meter. Pump motor efficiency minimum IE3 and impeller efficiency minimum 85%.

9.15 **Variable Frequency Drive(VFD):** The variable frequency drive(s) shall be pulse width modulation (PWM) type, microprocessor controlled design. VFD, including all factory-installed options, is tested to conform to UL standard 508. VFD shall also meet UL and be CE marked and built to ISO 9001:2000 standards. VFD shall comply EMC directives as per IEC 61800-3:2004, category C1 with 50-meter motor cable (for power less than

or equal to 90 Kw) & category C2 with 50 meter motor cable (for power more than 90 Kw). VFD shall be housed in enclosures for indoor applications. Wall mounted/VFDs with plastic enclosures shall not be acceptable. For outdoor applications, VFDs shall be housed in IP 54 enclosure or if inbuilt pump with frequency inverter the enclosure shall be IP55. VFD shall employ an advanced sine wave approximation and voltage vector control to allow operation at rated motor shaft output speed with no deration. This voltage vector control shall minimize harmonics to the motor to increase motor efficiency and life. Power factor shall be near unity regardless of speed or load. VFD shall have balanced DC link chokes to minimize power line harmonics. VFDs without a DC link choke shall provide a 3% impedance line reactor. VFD shall be compatible for ModBUS/any open standard protocol.

9.16 **Gate and globe valves:** Gate and globe valves up to 50 mm size shall be gun metal construction. Valves above 50 mm diameter shall have cast iron body and bronze/gun metal spindle valve seat. The valves shall have non rising spindle.

9.17 **Butterfly valves**: The butterfly valve shall be supplied along with flow control lever. The valves shall be compact in size and shall conform to BS 5155, MSS SP 67 and API 609. The valves shall be light in weight and easy to install. The body shall of close grain cast iron conforming to IS:210 and the seating shall be of Resilient black, Nitrile rubber / EPDM moulded on to the body. The disk shall be of SG iron nylon coated, whereas the shaft shall be of stainless steel A ISI 431 treated permanently for lubrication. The shaft seals shall be of Nitrile 'O' rings and rubber seals. Valves shall be suitable for a working pressure of 16.5 KSC. Care should be taken during installation to see that the disk is not damaged during installation due to the flanges being incorrectly spaced. Provide gear operated valves for sizes having 300 mm and above. For smaller sizes such as 40 mm and below diaphragm type valves are acceptable. The butterfly valve shall be supplied along with flow control lever.

9.18 **Ball valves:** Ball Valves shall have body of carbon steel. The ball and the shaft shall be of stainless steel. The seat shall be of PTFE. The valve shall be complete with socket weld ends.

9.19 **Check Valves**: Check valves for smaller sizes shall be of swing type of gun metal construction. Lift type check valves shall be used for horizontal lines. Wafer type plate check valves shall be used for bigger sizes. The check valves shall be suitable for 10.5 KSC test pressure

9.20 **Auto Balancing Valve: Balancing valve shall be installed in branch pipe**. These valves shall be factory calibrated. Each valve shall limit flow rates within ±5% accuracy, regardless of system pressure fluctuations. Sufficient number of flanges and unions shall be provided as required to facilities maintenance work once the piping is installed. Piping shall be properly supported on or suspended from stands, clamps, roller hangers, etc. as required. The contractor shall adequately design all brackets, saddles, clamps and hangers and shall be responsible for their structural integrity. Each support shall be isolated from the support by means of anti-vibration springs or durable liner of neoprene rubber. Pipe supports shall be of steel and shall be painted

with rust preventive paint and finish coated with synthetic enamel paint of approved colour. Only factory made supports with Galvanized fully threaded rods with bands are acceptable. The chilled water pipes shall be isolated from the bands by a rubber sheet.

9.21 **Expansion Tank: Closed Expansion** Tank with Expansion Vessel and pressurizing Pumps with one working and one standby. Expansion tank to be of MS with Armaflex / K- Flex Insulation minimum 32 mm thick & minimum 26 Gage Aluminium Cladding with diamond finish with related piping, isolating valves, safety valves, drains, overflow. Tank Shall have Anticorrosive Coating. Close expansion tank should be provided with water capacity to suffice the capacity of volume of water contraction & expansion during operation & rest state of the system while maintaining proper system pressurization under varying operating conditions. Tank should be a closed vessel with rubber bladder/diaphragm to maintain the operating pressure inside the pipelines. System should include PRV and Air Vent also.Standby and working booster pump should be provided with selector switch for pump starting, pressure differential transmitter, pressure gauge & non-return valve at discharge outlet of the pump, suction and discharge manifold.

9.22 **Pressurization unit consisting of** inline vertical multistage, centrifugal water pump with SS 304 casing, SS304 impeller and SS316 shaft, CI base TEFC motor, with mechanical seal, control panel and with duty cycling and dry run protection. pressurization unit is provided for chilled water system as well as Dry Cooler Loop to makeup water is lost through blowdowns or minor leakages. The system consists of an air vented tank into which treated water is supplied through the domestic water system and a pump unit that pressurized and feeds the water into the chilled water loop and Dry Cooler Loop. The system should be skid mounted along with vacuum degasser to remove any dissolved gasses.

9.23 **Thermal Storage Tank-** In order to maintain continuous cooling requirement during power failure and chiller restart sequence, Thermal Energy Storage Tanks are being planned for the project with Variable pumps and server hall cooling units backed by UPS power source.MS tank with capacity as per P & ID to be used as thermal storage for back up supply. The tank to be of M S Construction and with anti-corrosive coating from inside with Armaflex / K- Flex Insulation 32 mm thick & 26 Gage Aluminum Cladding with diamond finish and with related piping, Isolating valves , Safety valves , Drains, Overflow and Guages. 8 mm Shell thickness and 12 mm Dish thickness. The tank shall have necessary ports with flange. Bidder to consider temperature sensor of as well as level sensor in both the tank and same to be integrated in BMS for control as well as monitoring. There will be three operating modes for thermal storage- Normal Mode,Failure Mode (Discharging Mode) and Charging Mode. Piping arrangement will be aided with motorized valves in-order to make system operational and switching from one mode to other. The valve operation logic is detailed out in the chilled water schematic , P & ID.

9.24 **Double Deflection Grilles: Grills** shall be in Aluminium construction. Aluminium double deflection grilles for supply air shall be provided with vertical and horizontal

adjustable bars and an approved blade damper adjustable from the front face of the grille. The finish of the grilles will be powder coated in a shade to be approved.

9.25 **STRAINERS** -Strainers shall be preferably of approved 'Y' type or pot type as specified in the tender schedule with GI or fabricated steel bodies. Strainers up to 50 mm shall be of gun metal type. Strainers shall have a removable bronze screen with 3 mm perforations and permanent magnet. Strainers shall be provided with flanges. They shall be designed so as to enable blowing out accumulated dirt and facilitate removal and replacement of all screen without disconnection from the main pipe. Strainers shall be provided with isolating valves so that they may be cleaned without draining the entire system.

9.26 **Chemical dosing plant** with dosing pumps suitable for the requirement for flushing and treating the water. This should include make up water storage tank, first charge of Dosing chemicals for the commissioning of the system, chemicals for the operation during warranty period. Treated water tank should be of adequate capacity. Entire system should include interconnecting piping, accessories, float and valves complete in all respect. This system is used to remove mill scale, dirt etc. and provide a protective corrosion resistant layer on the inside surface of piping. Chemical dosing system shall be provided to minimize corrosion, biofilm prevention, preventing scale deposition and to control the water quality. Chemical dosing system shall maintain the water quality parameters in Chilled Water circuit loop as well as in Dry Cooler loop as defined in the document under water quality parameters. The online pressurized chemical dosing system will consist Hydro-pneumatic pump set, Pressure vessel inlet/outlet valves, float valve and full way gate valve and drain valve, Factory fabricated, or Site assembled with stand arrangement with connecting Piping with panel arrangement.

9.27 **Air Separators**: Air separator working on basic centrifugal force and low velocity flow, complete with required inlet and outlet connections, high capacity float type air vent, pressure reducing valve, water fill connection, drain valve, flanged connections etc. The air separator shall be suitable for required water flow.

9.28 **Cabinet / Duct inline** type centrifugal fans for Fresh Air and exhaust air system complete with Double inlet and Double Width (DIDW) backward curved blower Air Movement and Control Association International, Inc (AMCA)certified totally enclosed, fan cooled, provided with Class F insulation. Fans shall be provided with TEFC Sq. cage direct driven , Class F insulation motor, with minimum IE3 rating suitable for 415 V+/-10 %,50 Hzs 3 phase supply. Fan must be selected for minimum consumption and maximum efficiency. Supply fresh air fan should be with two filters i.e. pre filter and fine filter minimum 10 micron HDPE washable filter. Both the fan motor should be with starter and this should be with timer control through BMS system. Fresh air and exhaust system should be with single blade, motorized fire & smoke damper with spring return actuator. Damper should be with minimum 2 hours fire rating. The damper shall be constructed out of 16 G galvanized sheet steel. Damper control and monitoring operations are thro BMS. This is required in Data Center Area as well as in UPS, Battery and Panel Area. Bidder to consider 6 ACPH (Air Changes Per Hour) exhaust with equivalent amount of make-up air.

9.29 **Bidder to consider drain pipe along** with pumping arrangement in the data center floor to eliminate the leakage with an automated drain valve controlled based on the water leakage detector's alarm. Isolation valve, filter net for blocking entry from opposite side of pipe etc. to be considered. Pipe should be of uPVC material (Unplasticised Polyvinyl Chloride).Concrete floor inside the data hall as well as inside the UPS and Battery room to be constructed in such a way that slope with sunk/pit to be given to collect the water leakages if any .By using pump this water needs to be drained out. Bidder to calculate the water quantity in worst situation and accordingly number of pits and pumps to be worked out.

9.30 **Rear Door heat Exchanger (RDHX):** The RDHX should ensure optimum thermal and energy performance by removing the heat generated by the active IT/compute equipment directly at source, preventing hot exhaust air entering the data center/server room. It should work independent of IT equipment fan speed to route the warm air flow to the cold-water heat exchanger utilizing maximum 15c degree of water temperature. The heat from the warm exhaust air flow from the IT components need to be dissipated by way of the water heat exchanger with active EC fans mounted on the cooling door. RDHX be fitted to the back of rack , Should be compatible with any OEM Rack of either 600 or 800 mm or 750 mm wide dimension . RDHX should not occupy space in the rack, the full server rack is thus available for the IT equipment. The solution for active EC fan should be self-sufficient with inbuilt controller and sensors to control the flow of water and fan speed depending on temperature data monitored through various sensors mounted in front and rear of the RDHx doors. Cooling output must be designed as per individual rack IT load in terms of kW. It should support the IT Heat load 100% as per design and entering chilled water temperature of 15 +/- 2 degrees C. RDHx must work accordingly to the IT load variations in the rack to optimize energy consumption. Active EC fan solution each RDHx should be equipped with its own intelligent controller which manages the water flow and EC fan speed as per IT load and should be independent of the other coolers. There should not be any over cooling or undercooling irrespective of rack IT load. Controller should ensure adequate cooling to be delivered.. Intelligent RDHx must have in built controller inbuilt within the chassis of the RDHx and receive the feedback from temperature sensors installed at various points (front, rear, and exhaust) and based on the feedback, controller automatically adjust the fan speed, water flow rate. Fans must be Backward curved centrifugal fans Incorporating EC technology, IP44 rated,. Unit Noise should not cross more than 60 dBA @ 1 metre at full load condition and Unit Noise should not cross more than 48 dBA @ 1 metre at normal load condition (30% to 50 % fan speed). RDHX should comply with min IP21 rating and compliance with standards like CE, UL. Vendor to submit the Certificates for the claimed standards and compliances at the time of submission. System should ensure free from condensation which operates above dew point temperature of water inside the environment. Supply and return hose to be made from a mix of galvanized wire, fabric and rubber silicone offering ultra-pliable hoses with a smaller bend radius than most other hoses available, which help prevent twisting while offering the benefit of additional flexibility. Hose testing certificate with pressure of 12 bar & theoretical burst minimum at 30 bar to be submitted. RDHX should have communications protocols in built- Modbus over TCP-IP as standard with options for SNMP, BACNET.

Connection of hose pipe should be from bottom and at connection point at most care to be taken to protect IT hardware incase water leakage inside rack.

9.31 Water Characteristics to be maintained is as below - This will be as per ASHRAE 5.1.2.4

Sr.No.	Attribute	Parameter
	pH	7-9
	Corrosion Inhibitor	Included
	Sulfides	< 100 ppm
	Sulfate	< 100 ppm
	Chloride	< 50 ppm
	Total Hardness	< 200 ppm
	Turbidity	< 20 NTU (Nephelometric Turbidity unit)

9.32 **GENERAL OFFICE AREA COOLING & VENTILATION-** The general office areas and the other common areas shall be provided with comfort cooling for the occupants. Considering the chilled water temperatures of the chiller plant proposed for the DC area, the office areas cannot be served by the same chiller plant and hence these areas shall be provided cooling via VRV based system. The proposed air conditioning system shall consist of air cooled centralized outdoor unit comprising of single / multiple scroll compressors for each area. All air-conditioned spaces shall be provided with required capacity indoor units in the form of cassette units. These indoor units shall be connected to outdoor units through copper refrigerant pipes. Compressor in the outdoor unit shall be connected to a variable frequency drive whereby refrigerant flow through copper pipe shall be varied based on the air conditioning load. The outdoor unit shall have built-in energy efficiency features like capacity control, oil return operation controls, intelligent defrost control and compressor control etc. Refrigerant shall be CFC free (R 410A / 407C) The system shall provide considerable (nearly 30%) energy saving over traditional air-conditioning system (consisting of split units) due to features like -- Inverter drive compressor to modulate refrigerant flow based on requirement., Minimizing heat transfer losses due to superior refrigerant piping system with ecofriendly Refrigerant etc..

10 Requirements towards IBMS work

10.1 Supply and implement physical security (access controls including biometric), Motion sensors etc.

The basic function of access door control is as below.

a) Access control system (ACS) is to be deployed to allow entry for the authorized personnel only and restrict unauthorized people from entering nominated areas of premises. Access privileges to be configured as per the access data stored in Access Door Controllers (ADC). These privileges define the right of access card holder to enter the predefined area upon presenting the card at readers.

b) It shall support distributed architecture with central monitoring and control. If communication to the central control fails, the ACS shall continue providing access based on the predefined security configuration. Until communication is restored, all event logs and alarms shall be stored locally for minimum six months (based on ADC capacity). These events shall be sent to the central control when the communication is regained.

c) It shall have multiple supervised inputs. The dynamic status of each input shall be continuously monitored and each change should be reported immediately.

d) It shall provide programmable inputs, i.e. the ability to apply a variety of conditions to the way in which these inputs are monitored. These conditions shall be expressed in definite terms. It shall be able to produce and communicate various types of outputs (Audible sirens, relay switching etc.) based on the above definition. These outputs shall be standard in terms and shall be interfaced as inputs to other Building Management System. ACS communications should support RS232/ RS485/ TCP/IP. All data over the network between the ADC and the Server end shall be encrypted. All ACS software/firmware upgrades shall be downloadable through the network to the ADC.

10.2 **Supply and implement environmental Controls and other sensors(Air conditioners, humidity controls, etc.)**

a) Humidity Sensor: The humidity sensor shall be in an independent housing or be combined with the room /duct type temperature sensor in the common housing as per application requirement. The sensor should be electronic type with capacitive sensing element. Relative Humidity (RH) sensors shall be of standard 0-10 VDC or 4-20 mA type, well protected against solid and liquid contaminants with a permeable coating. Range of 0-100% RH. Accuracy: +/- 3%Operating temperature range of 0 to 50 °C. Stainless steel sheath construction complete with integral shroud to enable specified operation in air streams of up to 10 m/sec. Maintenance of Sensor to be by a simple field method such as solvent or mild detergent solution washing, to remove anticipated airborne contaminants. Maximum sensor non-linearity of ±3% RH with defined curve.

b) Water Flow Meters - Water flow meter should work on Faraday's law of induction. As soon as the electrically charged particles of a fluid cross the artificial magnetic field generated by two field coils, an electric voltage is induced. This voltage, tapped by two measuring electrodes, is directly proportional to the velocity of flow and thus to the flow volume. The magnetic field is generated by a pulsed direct current with alternating polarity. This ensures a stable zero point and makes the flow measurement insensitive to multiphase or inhomogeneous liquids, as well as low conductivity. The measuring principle is virtually independent of pressure, density, temperature and viscosity. Flow meter should be communicable type and

integrated with preset flow alarm. Accuracy shall be + 2% of actual reading from 0.4 to 20 feet per second flow velocities.

c) Monitoring of Water Quality –This is used for real-time measurement of water quality. This is used to optimize treatment processes, detect water contamination incidents etc.

   i. pH Sensor and monitoring - The pH of a solution indicates how acidic or basic (alkaline) .pH sensor should have measurement range from 0-14.

   ii. Turbidity sensor: Turbidity has indicated the degree at which the water loses its transparency.

   iii. Temperature sensor:

   Above sensors are required in Adiabatic Dry Cooler loop as well as in Chiller Loop.

d) Sensors for HVAC System control and Monitoring

The following are the main sensor types are proposed for the control and monitoring of HVAC System

Sr.No.	Sensor Type	Purpose
1	BTU Meters	Calculate chilled water energy usage as well as Dry Cooler Water at main header level
2	Flow Meter	To Monitor flow of water through chiller as well as Dry Cooler circuit
3	DP Sensors	To modulate Pump speeds or In build
4	Temperature Sensors and Rh Sensor	To monitor temperature and Rh levels in DC areas as well as in USPS and Battery , Also in Hot Aisle
5	Weather Stations	To check ambient temperature, humidity and air quality levels
6	6 Pressure Gauge	To measure pressure on each header (supply/return) Chiller as well as Dry Cooler Loop

10.3 **BMS System: -** The proposed software shall be independent software platform for monitoring the parameters of Mechanical systems, Electrical systems, Dry Cooler ,Chiller, In Row Units, RDHX,DG Sets, PHE etc. system as applicable. The BMS shall monitor the parameters of the data centre mechanical equipment to maintain environmental conditions, such as temperature, pressure, and humidity, within acceptable limits and at optimal energy efficiency. The operation of the system is governed by the Sequence of Operation (SOO), which is based on the mechanical system design. A graphical user interface (GUI) or Human Machine Interface (HMI) needs to provided as a visual representation of local conditions, equipment overrides, set point adjustments, historical trends, and alarms conditions at the equipment level. The BMS also functions to notify the proper recipients, onsite or offsite, in the event of abnormal operation, and archive historical data for use in troubleshooting and

analysing system operation.BMS software must have web client and should be able to access from any standard Web browser (Chrome, Firefox, Edge, Internet Explorer etc.) without any plugins and shall be supplied with minimum inbuilt 5 licences. BMS Software patches update and Version updates to be considered as part of scope during Warranty and AMC Period. BMS should have minimum 3-year historical data storage capacity. BMS software should have activity/auditing functionality so that each user action can be tracked based on login.

Architecture of BMS system shall be of:

- Management Level (BMS Servers/Software)
- Control Level (DDC Controllers)
- Field Level (Field Sensors)
- BMS should have capability to show real time PUE, trends and record historical data of PUE.
- BMS should generate event notifications over emails, data for events based on which uptime and downtime will be calculated.
- BMS should generate alarm signal and tripping signal at abnormal situations. This should be software generated and any one can be utilized for giving tripping command for shutting down the some servers or all.
- Reduce maintenance cost by improving the system performance and efficiency by suitable analytics.
- Allow easy access to documentation such as images, manuals and allows user to locate equipment on floor plans and maps instantly.
- 3D Graphics to be considered. Operator customizable Report/Trend module to be considered. The BMS software shall provide for Extensive Graphics Functionality for HVAC / Electrical / Auxiliary Systems, with online display of parameter values.

There should be real-time reporting of

- Component wise and aggregate power consumption - Energy meters are provided in the Electrical Design in SLD to monitor the usage of the Electrical Energy at various stages.
- Temperature and relative humidity in the data centre and UPS room.
- Instantaneous PUE, hourly PUE, daily PUE, monthly PUE and annual PUE.
- Alarm indicators for component failures.
- GUI with SLD ,P *ID, Equipment's visuals etc.
- BTU Meters are provisioned in the P & ID Design to ensure a Real-time measurement of the BTU being consumed, and this information needs to be available to the BMS System.

The BMS system should allows for the monitoring, control, interrogation, alarm handling and routing for the following equipment's but not limited to:

- HVAC equipment – Chillers/Pumps/Adiabatic Dry Coolers /Pumps /PHE /Valves /Acutators /Inrow /RDHX /Ventilation fans /PAC/PAHU
- Generators & Fuel tanks.

- UPS and Battery system
- HV/LV metering and equipment.
- Fire Alarm Systems.
- Water Leak detection System.
- Lighting Control
- Rodent Repellent System

There should be real-time monitoring and logging of all parameters of the data center as per ASHRAE/TGG 2009 Real time energy consumption measurements in data centres guidelines (best practical). There should be facilities for periodic reports (including uptime reports) of all aspects of the data Centre. All the required hardware and software eco-system which store at least two months of historical data (High end PC, 32" LCD HD Monitor, Key Board, Mouse etc.) has to be supplied by the bidder.

10.3.1 The Integrated Control Platform shall support encrypted password authentication for all web services whether serving or consuming.

10.3.2 Supply, Installation, Testing and Commissioning of BMS System which includes Main Building Automation Graphic Software, BMS Machine, DDC Controllers with necessary Panels, Field Sensors, Third Party Integrations as PAC , Load Manager, Integration with fire alarm panel, Monitoring and control of cooling units , monitoring and controlling of pump and valve operations etc,

10.3.3 The BMS IO summary bidder to prepare and submit with the BID. This summary shall define the actual Digital/Analogue Input/output points and soft points to be considered for the functioning of the BMS. The Actual soft points shall be considered during the detail design stage based on the actual parameters selected and the mapping points. Bidder shall work out the Servers configuration and storage calculation based on the requirements as stipulated in this document considering inputs and the exact count of IO, Soft points.

10.3.4 Bidder to consider soft IOs for Rack DC rectifier system.

10.3.5 BMS should control the operation of oxygen pumping equipment's under fire situation.

10.4 Supply and Implement fire alarm system –

The system and its components shall be Underwriters Laboratories, Inc. listed, and FM APPROVED under the appropriate testing standard, for fire alarm systems and the installation shall be in compliance with the UL 10th Edition listing. The fire alarm system shall comply with requirements of NFPA 72 (National Fire Alarm and Signaling Code). The system shall be electrically supervised and monitor the integrity of all conductors.

When a fire alarm condition is detected and reported by one of the system indicating the affected devices, the following functions shall immediately occur:

- The System Alarm LED to be flashed.
- Built in Agent release circuit with release / Abort module of same make.
- System output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm should be executed, and the associated system outputs (notification appliances and/or relays) to be activated.
- The audio portion of the system should sound the proper audio signal (consisting of tone, voice, or tone and voice) to the appropriate zones.
- Zone identification should be available on BMS system.

The publications listed below are part of this specification.

National Fire Protection Association (NFPA) - USA:

No. 70	National Electric Code (NEC)
No. 72-1996	National Fire Alarm Code
No. 90A	Air Conditioning Systems
No. 92A	Smoke Control Systems
No. 92B	Smoke Management Systems in Large Areas
No. 101	Life Safety Code

Supply, Installation, Testing and Commissioning of Intelligent Addressable Fire Alarm System (FM Approved/ UL Listed) which includes Intelligent Addressable Fire Alarm Panel, FM approved Analogue Addressable Heat Type Smoke Detector, Analogue Addressable Multi Criteria Type Smoke Detector with Inbuit Isolator Base, Addressable Manual Call Point, Sounder (85 Db), Response Indicator (For False Floor Areas), Addressable Control module for activating sounder , Gas release Panel , Access Control De-Activation, Short Circuit Isolator Module, Addressable Monitor Modules, 2 core x 1.5 sq.mm twisted pair shielded multi strand Armored FRLS cable etc.

10.5 **Supply and Implement Video Surveillance systems:**

The surveillance system shall be designed and developed to the following standards: NFPA-70 (National Electric Code), National Electrical Safety Code (NESC), CE Compliant, UL ISO/IEC 27001 etc.- Supply, Installation, Testing and Commissioning of CCTV system along with indoor, outdoor cameras to cover entire DC area as well as outside equipment's area. The complete security system shall provide "smart monitoring" where the reliance on human monitoring is minimized. All security alarm activations shall be brought to the attention of the BMS room and, where specified, live, and recorded images of the event are to be presented to the BMS control room automatically. The objective will be to provide High degree of Electronic surveillance system to the DC area and outside utility. The purpose is to monitor & servile the entire area for unwanted incidents. The objective is also to restrict unauthorized personnel entry & exit through critical areas and facilitate effective people management. Strategically placed video surveillance cameras help to enhance security by providing motion based/continuous monitoring of all parts of premises. The CCTV

system shall comprise of various types of Indoor and Outdoor cameras with 90 days storage capacity with high end recording resolution. In case of network or power failure, camera can automatically switch to auxiliary (local) power source & start recording on the memory card inside the camera & can push the recording back network once the network is up in the same time frame without any loss of recording. Camera should be with true day and night IR lens and suitable IP rated for indoor and outdoor applications.

Below minimum Locations of CCTV camera to be considered -

- Main Entry and Exit gate
- Internal road junction and common areas
- Loading & Unloading area
- Substation area- DG Yard, Transformer Yard, Fuel Storage Yard
- Reception area
- Data hall and critical rooms entrance
- UPS and Battery Room
- Passage Area
- LT and HT panel Area
- Chiller Yard
- Dry Cooler Area
- Water Tank Area/Thermal Storage Tank

10.6 **Supply and implement Very Early Smoke detection system (VESDA**)

Provide an air sampling smoke detection system (Very Early Smoke Detection Apparatus) for each server area. Provide a Laser Focus air sampling smoke detection system for areas as per site condition including but not limited to utility area, server area etc. in accordance with manufacturer's recommendations.

The air sampling smoke detection system shall consist of highly sensitive smoke detectors with aspirating fans, air sampling pipe network, filters, networked controllers and a high-level interface to the building Fire Alarm System, as required.

The air sampling detectors shall provide a nominal obscuration level range from .0015 to 6% /ft., adjustable through the system operator control interface.

Smoke Detector Assembly: The smoke detector, filter, and aspirating fan shall be housed in a Detector Control Assembly Enclosure and arranged in such a way that air is drawn from the protected area through the filter and detector by the aspirating fan.

The Detector Control Assembly shall house the programmable intelligent controller, which will support air flow/detector supervision, automatic and manual sensitivity adjustment, time delay and remote reset functions. Laser COMPACT detector shall communicate with the fire alarm control panel.

The system shall provide 3 field-selectable levels of alarm status: Alert Level 1 (.04% obscuration/ft.), pre-Alarm Level 2 (1.06 % obscuration/ft.) and Alarm Level 3 (2.6%

obscuration/ft.). Actual sensitivity levels will be determined in the field and programmed during system commissioning. Alarm Levels 1 and 2 will initiate a Supervisory Condition on the Fire Alarm System, and Alarm Level 3 will initiate the building-wide evacuation sequence.

- Approval – UL & FM
- 18000 Event logs required.
- Output signal – 5 Relay contact for Fault / Alarm & one analogue output for smoke density
- Large flow rate fan (Max. shutoff pressure: at least 350Pa and max. flow rate: at least 170L.min

10.7 **Supply and implement Rodent Repellent System**:

The objective is to protect the entire premises viz. server area, utility area etc., all the voids against rodents. The purpose is to keep the rodents away from the floor by generating very variable high frequency sound waves which are not audible to human ear but irritate rodents. The objective is to protect all the cables below floor, above ceiling & room void from damage caused by rodents. The system proposed is to protect all the equipment's, areas with relevant type of high frequency sound producing device called satellites or transducers. Once powered up these transducers produce very high frequency variable sound waves continuously which irritate the rodents and are forced to evacuate the place. The devices can be tested periodically by means of a test switch provided on Main console.

10.8 **Supply and implementing Water Leak Detection system:**

It should include electronic alarm modules, water sensing cable, graphic display map, and auxiliary equipment. The system has to be capable of automatically detecting the presence of water at any point across the length of sensing cable. The system should alarm and locate the point of liquid contact on the digital display. This system should capable of communicating to BMS.

10.9 **Supply and implementing NOVEC 1230:**

Supply, install, test and commission NOVEC 1230 (Fluro Ketone FK-5-1-12) based fire suppression system. The fire suppression system shall include and not be limited to gas release control panel, CCOE approved seamless cylinders, discharge valve (with solenoid or pneumatic actuator) as the case may be, discharge pipe, check valve and all other accessories required to make a complete operation system meeting applicable requirements of NFPA 2011 standards and installed in compliance with all applicable requirements of the local codes and standards. Portable fire extinguishers shall be distributed all other areas as passage, office ,office rooms, HT and LT Panel rooms, Dg yard etc. as per NFPA-10 and BIS: 2190. Additional extinguishers shall be provided as per requirements of Local Fire Authorities. The appliances shall be so distributed over the entire area, that a person is not required to travel more than 9 m to reach the nearest extinguisher.

11 Indicative Design Schematic

Minimum rating of major components required for Data Center at site ambient conditions (considering deration factors, taking in to account utilization of 90% under peak load and redundancy condition) along with rating is as shown in below table.

Sr. No.	Name of Components	Rating for each unit	Qty.	Redundancy
1	HT Breaker Panel VCB, 11 KV ,630 Amps each rating with one incomer and four outgoing panels to feed transformer	11 KV,630 Amps	5	
2	11KV/433 V ,2500 KVA Distribution Transformer ONAN with OLTC and RTCC	2500 KVA	3	N+1
3	All LT Panels for Electrical as well mechanical equipment ,isolators, DBs etc.			
4	RTPFC Panels for above three transformers		3	
5	415 V ,2250 (Prime)/2500 (Stand By)KVA -Prime Duty/Standby Duty DG sets along with Synchronization panel, Exhaust Stack as per CPCB guideline and 2 X 25 KL Underground Diesel storage tank along with approval from PECO/CCOE , piping etc.	2250/2500 KVA	3	N+1
6	7 X 500 KVA Modular UPS with each module size 25-50 KW along with 10 minutes back up with LI -Ion Battery for each UPS. Along with UPS output Panels and K4 rated isolation transformer with CU winding as per Electrical SLD drawing. These UPSs are for IT load.	500 KVA	7	N+1
7	2 X 500 KVA Modular UPS with each module size 25-50 KW along with 10 minutes back up with LI -Ion Battery for each UPS. Along with UPS output Panels and isolation transformer with	500 KVA	2	N+N

Sr. No.	Name of Components	Rating for each unit	Qty.	Redundancy
	CU winding as per Electrical SLD drawing. These UPSs are for NON IT load.			
8	Sandwich Bus Duct above each POD and above each rack Row of CPU + GPU Rack 630 Amps Al/Cu			
9	3 X 700 KW Adiabatic Dry Cooler with water temperature profile as per P & ID along with flow rate with all accessories.	700 KW	3	N+1
10	880KW / 250 Tr. Air Cooled Chiller suitable for Data Center application with LOW GWP REFRIGERANT with all other accessories.	880 KW/250 Tr	4	N+N
11	Plate Heat Exchanger AHRI Approved 1500 KW with temperate profile and flow at per P & ID drawing provided	1500 KW	2	N+N
12	Chiller Water Based In Row Unit of 25 KW each rating for (Temperature profile and flow rate as per P & ID drawing)			
	POD-1	25 KW	10	N+1
	POD-2	25 KW	10	N+1
	POD-3	25 KW	10	N+1
	POD-4	25 KW	10	N+1
13	Rear Door Heat Exchanger RDHX for CPU + GPU rack each of rating 30 KW ,Temperature profile and flow rate as per P & ID drawing	30 KW	16	
14	PAHU Unit in UPS and Battery Room as per Provided Layout and P & ID each of 25 Tr	20 Tr	5	N+1
15	DX based PAC unit with each rating of 10 TR	10 Tr	6	

Sr. No.	Name of Components	Rating for each unit	Qty.	Redundancy
16	Thermal Storage Tank 2 X 50 KL along with expansion tank, variable flow pumps with inbuild FI, pressurization unit, chemical dozing unit, air separator etc. components in Chiller circuit loop.			
17	Expansion tank, pressurization unit, variable flow pumps with in build FI, chemical dozing unit, air separator, adiabatic water tank etc. components in Adiabatic Dry Cooler circuit loop.			
18	MS C Class Grooved pipe along with all fittings, valves , gaskets, insulation in the pipe etc. for Chiller loop			
19	MS C Class Grooved pipe along with all fittings, valves , gaskets, insulation in the pipe etc. for Adiabatic Dry Cooler loop			
20	Integrated BMS system including soft I/O points, Hard I/O Digital and Analog points, PLC system, BMS software, Fire Alarm System, Fire Suppression system, VESDA system, CCTV system with Display unit / TV system, Water Leak Detector , Rodent Repellant system ,Access control system with access cards etc systems			
21	Raised floor and false ceiling in Data Center Area + UPS and Battery Area			
22	Getting power from two substation including load section, load release, approvals, substation modifications if any , cable laying, civil work, approval for Civil work, road cutting, hume pipe, RMU panel, metering panel, supporting structure for RMU Panel, Metering kiosk etc.			

12 Refer annexure for all drawings

- Ground Floor Plan
- Ground Floor Plan with Equipment's
- Ground Floor-- Column & Beam Layout
- Section –Drawing
- Site Layout
- Site Layout with Equipment's
- Ground Floor Column Centre Line
- Electrical SLD
- Cooling P & ID
- DRY COOLER LOCATION ABOVE UPS AND PANEL ROOM
- Structural Drawing and Design -- Will be provided as Tender Addendum

Sr. No.	Code Number	Description
1	IS 2309	Protection of buildings and allied structures against lightning.
2	IS 3043 /IEEE 80	Code of practice for earthing.
3	IS 5216	Safety procedure and practices in Electrical work.
4	IS 3106	Code of practice for selection, installation and maintenance of fuses (Voltage not
5	IS 1646	Code of practice for fire safety of buildings (general) Electrical installation.
6	IS 9921	Alternating Current Dis connectors above 1000 V.
7	IS 2551	Danger notice plates.
8	IS 1248	Electrical indicating instruments.
9	IS 722	AC Electric meters.
10	IS 3156	Voltage transformers.
11	IS 10118	Installation and maintenance of switchgear.
12	IS 398 /IEC 1089-1991	ACSR conductors
13	IS 7098	Cross linked polyethylene insulated PVC sheathed cables up to 33 KV
14	IS 12943	Brass glands for PVC cables
15	IEC 99-4	Gapless Surge Arrestors
16	IS-900	Code of practice for Installation and Maintenance of Induction Motors

Sr. No.	Code Number	Description
17	IS-1255 -1983	Codes of practice for Installation and Maintenance of Power Cables up to and including 33 KV Rating.
18	IS-732 1989	Code of practice for Electrical Wiring Installation. (System Voltage not exceeding660 Volt).
19	IS-1913	General and Safety Requirements for Luminaries.
20	IS-1646	Code of Practice for Fire Safety of Building (General) Electrical Installation.
21	IS 8130	Conductors for insulated electrical cables and flexible cords.
22	IS 3975	Specification for mild steel wires, strips and tapes for armouring of cables
23	IS-2667	Specification for Fittings for Rigid Steel Conduits for Electrical Wiring.
24	IS 3615	Glossary of terms used in Refrigeration and Air-conditioning.
25	IS 325	Three phase induction motor.
26	IS 1239	Mild steel tubes, tubular and other wrought steel fittings.
27	IS 639	Steel pipe flanges.
28	IS 277	Galvanized sheet steel.
29	IS 5831	Specification for PVC insulation sheath for electric cables.
30	IS 655	Metal air ducts.
31	IS 732	Code of practice for electrical wiring and fittings for buildings.
32	IS 900	Code of practice for installation and maintenance of induction motors.
33	IS 1248	Direct acting electrical indicating instruments.
34	IS 6392	Steel pipe flanges.
35	IS 1367	Technical supply conditions for threaded steel fasteners.
36	IS:10462	Thickness of the PVC outer sheath
37	IS 4894	Centrifugal fan.
38	IS 1554	PVC insulated (heavy duty) electrical cables for working voltages up to and including 1100 V.
39	IS 659	Air-conditioning safety code.

Sr. No.	Code Number	Description
40	IS 616	Mechanical refrigeration safety code.
41	IS: 1554 -	PVC insulated (heavy duty) electric (Part I) Cables - Part I for working voltages up to and including 1100V.
42	IS: 1753 -	Aluminum conductors for insulated cables.
43	IS: 3961 -	Recommended current ratings for (Part II) cables: Part-II PVC insulated and PVC sheathed heavy-duty cables.
43	IS: 3975 -	Mild steel wires, formed wires and tapes for armouring of cables
44	IS: 5831 -	PVC insulation and sheath of electrical cables.
45	IEEE 519:1992	Harmonics
46	IS 277	Galvanized Steel Sheet (Plain and corrugated).
47	IS 655	Metal Air Ducts.
48	IS 737	Wrought Aluminum and Aluminum Alloy sheet and strip for general engineering purposes.
49	UL 181	Factory – Made Air ducts and connectors.
50	UL 555	Fire Dampers.
51	ASHRAE 70	Method of testing for rating the performance of Air Outlets and inlets.
52	BS 649	Diesel Engines for general purpose.
53	BS 2613	Rotating Electrical Machinery.
54	IS 4722	Electrical performance of rotating electrical machinery.
55	IS 4728	Terminal markings for rotating electrical machines.
56	IS 4729	Measurement of vibrations of rotating electrical machines.
57	IEC60034	Rotating Electrical Machines
58	IEC60034.1	Rotating Electrical Machines Part1: Rating and Performance
59	IEC60947	Low Voltage Switchgear and Control Gear
60	ISO 8528 Part 1 to 10:	Reciprocating Internal Combustion engine Driven Alternating current Generating Sets
61	IS-375	Marking and arrangement for switchgear bus bars, main connection and auxiliary wiring.

Sr. No.	Code Number	Description
62	IS-722 Part – I	AC Electricity Meters
63		Part - I General requirements and tests
64	IS-1248	Direct acting indicating analogue electrical measuring instruments and their accessories.
65	IS-1822	AC Motor starters, of voltage not exceeding 1000 volts.
66	IS-2147 IS-2208	Degrees of protection provided by enclosures for low voltage switchgear and control gear.
67		HRC cartridge fuse links for voltage above 650V.
68	IS-2419	Dimensions for panel mounting indicating and recording electrical instruments.
69	IS-2516	Circuit Breakers - Requirements and Test voltages not exceeding 1000V AC or 1200V DC.
70	IS-2607	Air break isolators for voltages not exceeding 1000 volts.
71	IS-2959	Contactors for voltages not exceeding 1000V AC or 1200V DC
72	IS-3072	Code of practice for installation and maintenance of switchgear.
73	IS-3106	Code of practice for selection, installation, maintenance of fuses (voltage not exceeding 650V).
74	IS-3156, Part - I	Voltage Transformer - General Requirements.
75	Part – II	Voltage Transformer - Measuring Voltage Transformers.
76	Part – III	Voltage Transformer - Protective Voltage Transformers.
77	IS-3231	Electrical Relays for Power System Protection.
78	IS-3914	Code of practice for selection of AC Induction Motor Starters (Voltage not exceeding 1000V)
79	IS-4047	Heavy-duty air-break switches and composite units of air-break switches and fuses for voltages not exceeding 1000 Volts.
80	IS-4064	Air break switches, air break disconnections, air break switch disconnections and fuse combination units for voltages not exceeding 1000V AC or 1200V DC.

Sr. No.	Code Number	Description
81	Part – I	Part I - General Requirements.
82	IS-4146	Application guide for Voltage Transformers.
83	IS-4201	Application guide for Current Transformers.
84	IS-4237	General Requirements for Switchgear and Control Gear for Voltages not exceeding 1000V AC or 1200V DC.
85	IS-4483	Preferred panel cut-out dimensions for electrical relays - flush mounting IDMTL relays.
86	IS-4794, Part- I	Push Button Switches - General Requirement and Tests.
87	IS-5082	Wrought aluminum & aluminum alloy bars, rode, tubes and sections for electrical purposes.
88	IS-5987	Code of practice for selection of switches (Voltage not exceeding 1000V).
89	IS-6236	Direct recording electrical measuring instruments.
90	IS-6875	Control switches (switching devices for control and auxiliary circuits including contactor relays) for voltages up to and including 1000V AC and 1200V DC.
91	IS-8623	Factory built assemblies of switchgear and control gear for voltages up to and including 1000V AC and 1200V DC.
92	IEC 62040-3	(International Electro technical Commission) – Uninterruptible power systems (UPS) – Part 3: Method of specifying the performance and test requirements.
93	IEEE 587 (ANSI C62.41)	Category A & B (International Electrical and Electronics Engineers) – Recommended practices on surge voltages in low voltage power circuits.
94	ANSI B 31.5	Code for Refrigeration Piping
95	ASHRAE 30	Methods of Testing Liquid Chilling Packages
96	ASHRAE 15	Safety Code for Mechanical Refrigeration

Bidder is required to submit compliance sheet in the tabular format for the selected products against above applicable code provision.

13 Recommended Makes:

List of Recommended Makes / Models of the major components/ equipment is given in **Annexure – D**. Bidders should use the makes and models having successful deployments in Data Centre applications in India. It is bidder's responsibility to comply with tender specifications and conditions, while selecting make and model of the product. However, bidder may offer equipment of any suitable make and model that complies with the tender specifications and conditions.

14 Building Acceptance Criteria:

As per approval by CDAC appointed PMC.

15 DC Acceptance Criteria:

Based on demonstration of following technical parameters, the DC implemented solution will be accepted.

15.1 Equipment's supplied and installed as per tender specifications defined in respective sections.

15.2 PUE

PUE (Dry Cooler) should not be more than 1.2 during Linpack benchmark testing. (Only dry cooler is in operation)

PUE (Dry Cooler + Chiller) should not be more than 1.4 during Linpack benchmark testing.

15.3 Validating UPS redundancy operation by switching on and OFF some breakers.

15.4 Room Temperature – Measurement at various points inside data centre to work out the hot pockets.

15.5 Demonstration of UPS system for IT as well as NON IT loads -on balanced as well as unbalanced load conditions along with FFT analysis which include harmonics in voltage as well as Current, voltage regulations under No load to full load. Neutral to Earthing Voltage at UPS output should not be more than 3 volts.

15.6 FAT report of equipment.

15.7 Demonstration of UPS operation under EB failure condition and EB restoration condition.

15.8 Demonstration of Battery backup under full load condition.

15.9 Demonstration of operation of Adiabatic Dry cooler.

15.10 Demonstration of temperature profile at Plate heat exchanger, operation of modulating valve if outlet at secondary of PHE temperature is beyond permissible limit. (Value of permissible limit should be programmable). Logic checking by changing the permissible limit parameters. Demonstration by creating false failure input of temperature sensors connected at PHE.

15.11 As build Drawing

15.12 Demonstration of creating false fire signal (Cross Zoning Input)and checking operation of magnetic coil on NOVEC cylinder manifold.

15.13 Demonstration of VESDA, Water Leak Detector system

15.14 Safety during Project Execution

15.15 Submission of Warranty Certificate from manufacturer of DG set, UPS , Battery , Pumps etc. as per RFP

15.16 Effective GUI in BMS screen, Effective implementation and utilization of BMS system. Monitoring of all field devices including Humidity, temperature sensors etc. on BMS screen, Control thro BMS in Automatic mode as well as Manual mode (Manual mode should be on BMS screen as well as Hard Wiring) of all actuators equipment's etc as per operating, failure and failsafe logic..

15.17 Demonstration of water quality sensors by checking the water quality at external lab and cross checking the parameters.

15.18 Data Centre aesthetics and interiors

15.19 Demonstration of DG operational logic along with Transformer failure condition as per SLD

15.20 Demonstration of Transformer operational logic along with Transformer failure condition as per SLD and Truth Table provided

15.21 Demonstration of Chiller operation , In row operation, redundant sequencing logic for IN Row , RDHX operation - Server In and Out maintaining Temperature as per requirements.

15.22 Checking of all types of redundancy by switching off one of the redundant equipment

16 Safety Regulations

The contractor shall at his own expense, arrange for the safety provisions as per the codes of Indian Standard Institution, Indian Electricity Act / Rule and such other Rules, Regulations and Laws as may be applicable in respect of all labour, directly or indirectly employed in the work for performance of the Contractor's part of this agreement.

While the Indian Electricity Rules 1956, as amended up to date, are to be followed in entirety, any installation or portion of the installation that does not comply with these Rules, should be rectified immediately.

The contractor shall be responsible for and indemnify the buyer against all injury to persons – both his own workmen and others and for all damage to structural and / or decorative part of the buyer's property during erection and commissioning of the equipment. The contractor shall repair / reinstate all such damage at his own cost.

It shall be ensured that the control switches and distribution boards are duly marked, the distribution diagrams of substations are prominently displayed, and the substation premises, main switch rooms and D.B. enclosures are kept clean. Particular care should be taken to prevent the substation being used as store for inflammable materials, broken furniture, waste materials etc.

No inflammable materials shall be stored in places other than the rooms specially constructed for this purpose in accordance with the provisions of the Indian Explosives Act. If such storage is unavoidable, it should be allowed only for short period and in addition, special precautions such as cutting off supply such places at normal times, storing materials away from wiring and switch boards, giving electric supply for a temporary period with due permission of engineer- in charge shall be taken.

Protective and safety equipment such as rubber gloves, earthing rods, line men's belt, portable respiration apparatus, necessary number of caution boards such as " Man on Line", "Don't switch on" etc. should be provided in easily identifiable locations. Where electric welding or such other nature of work is undertaken, goggles shall be provided.

Rubber or insulating mats should be available in front of the main switchboards or any other control equipment of medium voltage or above.

Standard first Aid boxes containing materials as prescribed by Indian red cross should be provided in easily identifiable locations and should be easily available.

Periodical examination of the first aid facilities and protective and safety equipment provided should be undertaken and proper records shall be maintained for their adequacy and effectiveness.

Charts (one in English and one in regional language) displaying methods of giving artificial respiration to a recipient of electrical shock shall be prominently displayed at appropriate places.

A chart containing the names, addresses and telephone numbers of nearest authorized medical practitioners, hospitals, fire brigade and also officers in charge shall be displayed prominently along with the first Aid box.

Steps to train supervisory staff and authorized persons of the engineering staff in the first Aid practices, including various methods of artificial respiration with the help of local authorities such as fire brigade, St. John's Ambulance Brigade, Indian Red Cross or

other recognized institutions equipped to impart such training shall be taken, as prompt rendering of artificial respiration can save life at the time of electric shock.

Electrical wiring and control switches should be periodically inspected and any defective wiring switches which will expose live parts should be replaced immediately to make installation safe.

No work on live L.T. bus bars or pedestal switch boards should handle by a person below the rank of a wire man and such a work should preferably be done in the presence of the Engineer in charge of the work.

- When working on or near live installation, suitable insulated tools should be used, and special care should be taken to see that these tools accidentally do not drop on live terminals causing shock or dead short.
- The electrical switchgear and distribution boards should be clearly marked to indicate the area being controlled by them.
- Before starting any work the existing installation, it should be ensured that the electric supply to that portion in which the work is undertaken is preferably cut off. Precautions like displaying “Men at Work” caution boards on the controlling switches, removing fuse carrier from these switches and these fuse carriers being kept with the person working on the installation, etc., should be taken against accidental energization. “Permit to Work” should be obtained from the Engineer-in-charge. No work on H.T. main should be undertaken unless it is made dead and discharged to earth with an earthing lead of appropriate size. The discharge operation shall be repeated several times and the installation connected to earth positively before any work is taken up.
- Before energizing any installation after the work is completed, it should be ensured that all the tools have been removed and accounted and no person is present inside any enclosure of the switchboard. Any earthing connection made for carrying out the work should be removed. "Permit to work” should be received back duly signed by the person to whom it was issued in token of having completed the work and the installation being ready for energisation and “Men at Work” caution Boards removed.
- In case of electrical accidents and shock, the electrical installation on which the accident occurred should be switched off immediately and the affected person should be immediately removed from live installation by pulling him with the help of coat, shirt, and wooden material or with any other dry cloth. He should be removed from the place of accident to a nearby safe place and artificial respiration continuously given as contained in BIS code and standard prescribed by St John Ambulance Brigade or Fire Brigade.
- While artificial respiration on the affected person is started immediately, help of Fire Brigade and Medical Practitioner should be called for an artificial respiration should be continued uninterrupted until such help arrived.

- These instructions should be explained in Hindi / local language to those staff who does not understand English.

The contractor shall ensure that all portable power tools used by the workman are rated 230 volts, double insulated and have to be taken through 100 mA Earth Leakage Circuit Breaker (ELCB). Also all temporary lighting shall be supplied through 30 mA ELCB. Inserting wire into the sockets without the plug tops is not allowed. The length of the extension cord for portable tools should not be more than 5 feet. Temporary cables and flexible wires of short length should be bunched up and supported at inaccessible height. Temporary lamps should be mounted at inaccessible height. If lamps are incandescent, they should be protected by wire-mesh.

All power supply / Distribution Boards shall have canopy for protection against weather if located outdoors.

While carrying out work in Vessels / AC ducts or any other confined place, hand lamps with metallic guard suitable for 24 Volts AC supply shall be used All non-current carrying metallic parts of electrical system and equipment shall be earthed with two separate earthing wires of adequate capacity.

a. GENERAL RESPONSIBILITY

The contractor shall obtain a “Work Permit” from the Site Engineer / Client before starting any work at site. The work permits are issued to prevent any one working in unauthorized areas and they are valid for specific period.

The contractor shall produce test certificates from Government approved certifying authorities for all the lifting gear & hoists (slings, chains, hooks, chain pulley blocks, winches, cranes etc.) before starting the work. The contractor’s supervisor for subsequent spot checks shall retain the certificates.

The gas cylinders should be used in safe manner. They should not be dropped from heights. Acetylene cylinder should be kept upright position. Oxygen cylinders should not be kept near inflammable materials like oil etc.

The contractor is to remove all waste materials from and around the work site and leave the work spot spick and span.

Works like Gas cutting, welding etc.

Before carrying out any work like gas cutting, welding etc. the contractor shall contact the site-in -charge to ascertain about the safety of the area for welding work.

The contractor shall produce certificates for his welding sets checked by the site in charge before starting the work. The certificates shall have to be renewed every two months. A copy of the current certificate shall be displayed on the welding sets.

Only cables in good condition and insulated holders are to be used. The length of the supply cable shall not exceed 25 feet and the welding set body shall be properly

earthed. Under no circumstance building structure pipeline should be used as a return path of the current.

A charged fire extinguisher of CO2 type is to be carried with each welding set.

The welder is to wear good quality insulated welding gloves, shoes & goggles while at work.

Tarpaulins are not be used in the vicinity of welding / gas cutting jobs.

b. EXCAVATION

In the event of an excavation being made, it is the responsibility of the contractor to see that any opening, sump or pit caused by them is securely fenced as required by the Factory Act.

c. WORKING AT HEIGHT

For carrying out work at heights exceeding 6 feet or over and near the opening in floors, roofs, etc the following precaution to be taken.

The written permission of the Departmental Manager is to be taken before carrying out any work. Adequate safety precautions like use of safety belts, crawling ladders etc are to be taken.

All personnel engaged on overhead work shall be men experienced in such work.

Whenever possible timber staging or platform shall be erected with planks of minimum thickness 2 inches and minimum width 12 inches when the nature of work demands staging of a greater width than plank provided then additional planks shall be added and lashed securely.

Staging shall be provided with simple safety rails or ropes throughout its length, at waist height and on each open side.

Staging supports shall be of standard steel scaffolding safely secured and supported on firm level footings or slung from overhead beams. The supports shall be situated at a maximum distance of 8 feet apart and staging shall be secured to each support.

In case the site or nature of work is unsuitable for erection of proper staging all workers shall wear safety belts around their waists and secure their lifelines to strong scaffolding or structural members.

Wherever it is not possible to put up staging and / or use safety belts, safety nets or sheets shall be slung beneath the place of work.

When working in open process vessels or tanks, safety belts or safety nets shall always be used whether or not staging and scaffolding is provided.

Safe access to all points of work should be provided in the form of suitable ladders, stairways etc.

Contractor's employee of at least status of a foreman shall examine all arrangements before starting such work is commenced and shall satisfy himself that all reasonable safety precautions have been taken.

d. FIRE INSTRUCTIONS

Before carrying out any gas cutting, welding etc, the contractor shall contact the site-in -charge to ascertain about the safety of the area for welding work.

Smoking is strictly prohibited in premises. Severe action will be taken if any of the contractor's workmen is found smoking at the work site area.

In case fire is discovered, dispatch additional force & site Engineer. Wherever possible switch off any electrical and gas apparatus near the fire.

Check the nature of fire, pick up appropriate fire extinguisher and try to put out fire. For Electrical fire use carbon dioxide fire extinguisher.

e. PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment should be worn wherever necessary.

f. REVIEW MEETINGS

Periodic safety review meeting shall be conducted to review safety and for better coordination with other agencies.

Periodically safety review will be held with Site Engineer and issues will be discussed and action points shall be monitored and recorded in a separate safety Register / File.

g. WORK AFTER NORMAL WORKING HOURS

Extra care need to be taken for jobs being carried out after normal working hours with due revalidated work permit.

h. ACCIDENTS

In case of injury or serious illness, the department should be informed immediately. All injuries are to be reported by filling in the "injury report" form, which will be available with the respective department / site engineer.

These safety conditions should not be regarded as exhaustive. These have been issued for the guidance of the contractor and will not in any way absolve the contractor from any obligations or liabilities that might incur or transfer such obligations on liabilities to the company.

17 Environment, Health &Safety (EH&S) Guidelines

PURPOSE

- To outline EH&S rules and responsibilities of contractors while performing work in facility of Client/end user.

Project Manager Responsibilities

- Project Manager is responsible for the safe execution of the contractual job as documented in this procedure.
- Project Manager shall discuss the EH&S requirements with other sub-contractors as well as oversee as the principal contractor compliance with all legal and regulatory issues in Client Premises.
- Project Manager may suspend or terminate the sub-contractor should he/she find gross negligence in the part of them to observe EH&S rules outlined in this procedure.

- The rules indicated here under shall be binding for the sub-contractors as well.

Principal Contractor's Responsibilities

- Contractor shall carry out the work with safety and health of all personnel and properties in mind. Contractors shall therefore notify conditions that constitute hazards to those potentially affected.
- Contractor shall control the manner and methods of its operations and is directly responsible for the actions of its employees.
- Contractor shall comply with applicable national, local EH&S legislation & regulations and ensure that it employees receive proper training on the work to be done.
- Contractor shall provide proper personal protective equipment, tools and equipment and ensure that such equipment can accomplish the work safely.
- Contractor shall demonstrate good work ethics and shall not circumvent engineered safety devices and control.
- Contractor Safety Representative shall visit the site (once in a week) to oversee EH&S on site. And Communication related to EH&S will be between the Project Manager and Contractor Safety Representative.
- Project manager shall prepare and submit a weekly work progress report on each weekend, including number of employees working on site and the man hour worked, any activities that has positively or negatively affect EH&S at the work site. This weekly report shall be submitted to the client/ Consultant.
- Project manager shall immediately inform the client / Consultant when an accident happened to its employee or Client personnel and properties. A brief accident report shall be submitted within 24 hours and a detailed report within 72 hours.

Environment, Health and Safety Rules for the Principal Contractor/ Sub-vendors

Passageway

- Do not enter other work areas without proper authorization.
- Use established aisles and walkways, do not take short cuts between desks and equipment.
- Passageway and emergency exit doors must be kept clear at all time.
- Material temporarily left at site must be stacked properly with a sign placed to warn others.

- Good housekeeping shall be maintained at all work areas. Clean up at the end of the day and completely before handing over of job. Food & drink are not generally allowed in Client/Consultant's Offices.

Smoking

- Smoking is not allowed at site.

Chemicals

- Chemicals brought to Client site must be labelled for its contents, its hazards and the Material Safety Data Sheet (MSDS) are provided to Project Manager. Common household chemicals are exempted from this requirement.
- Large container of chemicals is not allowed to be brought into Client Site. Use small container holding only the enough quantity for the day work. Store flammable chemicals properly and ensure it is capped when not in use.

Electrical Safety

- Do not tap electricity directly from the distribution boxes without first informing the Project Manager and/or Client's representatives.
- To avoid electrical hazards, be alert for conditions that allows electricity to cause harm: loose or broken insulation on wires, improper connection between devices, broken or defective plugs, improper ground at the plug, and loose or broken switches should not be used.
- Do not place liquid chemicals near electrical equipment. Liquids spillage onto electrical equipment could create a fire or electrical hazard.

Fire Safety

- Contractor shall study the emergency exit floor plan located at the office or work site.
- Contractor is not allowed to shut down essential firefighting systems, e.g., sprinkler systems, fire alarm at any time. If there is a need, coordinate with Client /Consultant.
- When detecting a fire, immediately activate the nearest fire alarm by pulling the lever or break the glass. Only when it is safe to do so, use fire extinguishers to fight the fire.
- When fire alarm is activated, leave your work area immediately, walk to the nearest emergency exit and report to Client designated assembly area.
- All alarms must be regarded as true alarms.
- Only when the 'all clear' signal is given by Client, can one re-enter the building.

Equipment & Operational Safety

- Contractor shall provide suitable personal protective equipment when the job requires. This includes but is not limited to safety helmets, safety glasses, face shields, earplugs, respirators, hand gloves & safety shoes.
- Loaning of tools or equipment from Client is not allowed.
- When working on machines that are provided with safety covers or safety guards, operate these machines only when the guards are in place.
- When license or permit to work are issued by the government agencies, a copy must be displayed at the work site.
- Contractor performs hot work where sparks or heat is produced (e.g. using welding equipment, open flame cutting and incendiary devices) shall implement safety measures to prevent accident. Project Manager shall be informed of the location & duration via a written request from sub-Contractor at least 1 day before the hot work is done.
- Ladders used in Client office shall have slip-resistant bases and defect free. Inspection of all ladders must be carried out. A ladder is considered damaged if it has broken rungs, missing steps or other construction defects.
- Do not stand on the top two steps of a ladder as it can become unstable. Use ladder of the correct height. Ask for help when in doubt.

Asbestos

- Contractor, if suspect of doing work that involves the removal, encapsulation, maintenance, clean up, transportation, disposal of structures that contain asbestos, must stop work immediately and inform Project Manager (such work shall not be undertaken by Client or Consultant).

When Accident Happens

- When accident, incident or injury happens, all work shall be stopped immediately. Attend to the injured first and seek help immediately.
- First aid treatment should be provided even for the slightest injury.
- Work related accidents and injury should be reported immediately to Project Manager.
- Investigation shall be carried out for injury that resulted in lost working days. Investigation must be forwarded to the Project Manager.

Wastes

- Contractor on a daily basis must remove all wastes generated as a result of the contract. Inform Project Manager when there are hazardous or contaminated wastes to be removed.

(End of Section- IV)

SECTION V – Price Schedule

Summary Format- Construction, Supply, Installation, Testing and Commissioning along with Loading, Unloading, Transport, Transit Insurance etc.

Sr. No.	Particulars	Unit	Qty.	Supply Price Rs.	GST Rs.	Installation Price Rs	GST Rs.	Total Price Rs.
A	**Building Work**							
1	Earth Works	Job	1					
2	Plane Cement Concreate Work	Job	1					
3	Masonry Works	Job	1					
4	Reinforced Cement Concrete Works	Job	1					
5	Steel Fabrication Works	Job	1					
6	Centering & Shuttering Works	Job	1					
7	Doors, Windows Work	Job	1					
8	Flooring and Cladding Works	Job	1					
9	Plastering and Painting Works	Job	1					
10	Water Proofing Works	Job	1					
11	Fabrication Works including steal and fabrication for pipe bride /pipe rack	Job	1					
12	Plumbing work - including Sanitary fixtures, fitting, tee, elbow etc.	Job	1					
13	External Development work including road, gutter, hume pipe etc.	Job	1					
14	Landscape Works - Including grass, shurbs, trees with trenching and digging hole in soil for tree and paver blocks etc.	Job	1					
15	Office area interior work, furniture work etc. to complete the job	Job	1					
16	Any other item missing to complete the projects including all statutory approvals, equipment's foundations etc.	Job	1					
	Sub Total-1							
B	**Data Center Work -Bidders to calculate the quantity as per Drawing Layout, SLD,P & ID and Site visit**							
1	HT Line work including load sanction of 4760KVA , load release, connection from two substation Estimate approval from BESCOM and KPTCL , substation modification work like	Job	1					

Sr. No.	Particulars	Unit	Qty.	Supply Price Rs.	GST Rs.	Installation Price Rs	GST Rs.	Total Price Rs.
	addition of spun poles addition of RMU units and any other work, supply ,laying of 11 KV HT cable 3 C 400 Sq. mm A2XFY cable round armoured (estimated length of cable around 1.4 Kms from Kionics Musk and 1.8 Kms from Velankani Musk but may change -Bidder to work out), cable should be without joint, termination kit ,Civil work as road crossing, Hume pipe, digging etc. Approvals if any for road work etc. to complete the job. Work to be carried out as per instructions/ estimation from local electricity authority (BESCOM).							
2	SITC (Supply, Installation, Testing and Commissioning) of metering kiosk along with CT PT, meter, 11 KV RMU unit as per local electricity board requirement and approval. Civil work if needed as plinth, overhead structure etc will be in bidders' scope. Work to be carried out as per instructions/ estimation from local electricity authority (BESCOM).	Job	1					
3	SITC(Supply , Installation, Testing and Commissioning),ICOG panel , HT Panels along with 11 KV HT Cable from RMU unit to metering Kiosk to HT ICOG panel to HT panels and to transformer along with Termination kit and jointing kit.	Job	1					
4	SITC of 3 X 2500 KVA, 11 KV /433 V Distribution Transformer with RTCC and OLTC. Civil work if needed as plinth/foundation, rails, overhead structure etc will be in bidders' scope.	Job	1					
5	SITC of 7 X 500 KVA, UPS system along with K4 Rated Cu winding isolation transformer, Li Ion Battery etc. to complete the job.	Job	1					
6	SITC of 2X 500 KVA, UPS system along with Cu winding isolation	Job	1					

Sr. No.	Particulars	Unit	Qty.	Supply Price Rs.	GST Rs.	Installation Price Rs	GST Rs.	Total Price Rs.
	transformer, Li Ion Battery etc. to complete the job.							
7	SITC of all LT panels , UPS outputs panels, RTPFC panels, Raw Power DBS,UPS DBS, synchronisation panel, Isolator Panels for Transformer, Chiller, Dg sets, Dry Cooler etc.	Job	1					
8	SITC of 3 X 2250/2500 (Prime/Standby rating) KVA,415 V DG sets along with exhaust stack, flasher light ,DC supply ,Lighting arrestor, underground 2 X 25 KL fuel storage tank, fuel pump etc. Approvals like CEIG, CCOE, PESO, Scope should include civil work for DG, pump and stack foundation, for fuel storage tank, chain link fencing , water sprinkling system etc.	Job	1					
9	SITC of Sandwich Bus Duct for internal panel tie breaker, bus bar in Data Centre area above all POD and above CPU and GPU racks as per Electrical SLD given,	Job	1					
10	SITC of all CU and Al- LT cables and wires along with terminations, glands, cable marker etc.	Job	1					
11	Internal and External Illumination system along with DBs, wiring, switch and socket boards, conduits, Galvanised Octagon pipes etc.	Job	1					
12	SITC of Adiabatic Dry Cooler along with pressurization tank , expansion tank, FI pumping, air separator , adiabatic water tank chemical dozing unit etc. as per P & ID provided	Job	1					
13	SITC of MS C class grooved pipe along with grooved coupling, gasket, connection bellows, all types of valves,(motorised and manual) ,end flanges, reducer, expansion joint , pipe insulation, instrumentation etc. to complete the job	Job	1					
14	SITC of Air Cooled Chiller for Data Centre application with low GWP	Job	1					

Sr. No.	Particulars	Unit	Qty.	Supply Price Rs.	GST Rs.	Installation Price Rs	GST Rs.	Total Price Rs.
	refrigerant along with pressurization tank , expansion tank, FI pumping, air separator , thermal storage tank, chemical dozing unit etc. as per P & ID provided							
15	SITC of MS C class grooved pipe along with grooved coupling, gasket, connection bellows, all types of valves,(motorised and manual) , reducer, expansion joint ,instrumentation end flanges etc. to complete the job	Job	1					
16	SITC of In Rows in POD-1 with containment	Job	1					
17	SITC of In Rows in POD-2 with containment	Job	1					
18	SITC of In Rows in POD-3 with containment	Job	1					
19	SITC of In Rows in POD-4 with containment	Job	1					
20	SITC of RDHX for CPU+ GPU Rack	Job	1					
21	SITC of PAC Units DX Based with ODU , Cu Piping etc. to complete the job	Job	1					
22	SITC of PAHU Units Chilled Water Based	Job	1					
23	SITC of Plate Heat Exchanger Units	Job	1					
24	SITC of Cable Trays of all size including SS Cable Trays along with Supports, Hangers etc.	Job	1					
25	SITC of Actuators Instrumentation and Control for entire Cooling System	Job	1					
26	SITC of Fire Alarm system including Detectors, panels, cabling and associated accessories etc.	Job	1					
27	SITC of Fire Suppression system for Data Centre area including Gas release panel, cylinders, Manifold, piping, NOVEC GAS and associated accessories etc. for UPS and Battery and Data Centre Area	Job	1					
28	SITC of CCTV system including camera, switch, NVR, Cables, monitors/TV etc.	Job	1					

Sr. No.	Particulars	Unit	Qty.	Supply Price Rs.	GST Rs.	Installation Price Rs	GST Rs.	Total Price Rs.
29	SITC of IBMS software including system (Computer ,Monitor) integration of third party devices, I/O modules, all control and communication cabling etc.	Job	1					
30	SITC of Other IBMS including Water leak detectors, Rodent Repellent, Vesda Water quality sensor system , Door Access Control system etc.	Job	1					
31	SITC of Any other item, material required to complete the solution in Adiabatic Dry Cooler Loop	Job	1					
32	SITC of Any other item, material required to complete the solution in Air cooled chiller Loop	Job	1					
33	SITC of Any other item, material required to complete the solution in Electrical requirement	Job	1					
34	SITC of Any other item, material required to complete the solution in I-BMS requirement	Job	1					
35	SITC of raised floor and false ceiling system for Data Centre area , UPS and Battery Room Area	Job	1					
36	VRV Cooling System in Office, Meeting Room, Conference hall etc.	Job	1					
37	Utility structural steel required for overhead pipe bridge for Piping and for cables. All LT Cables coming from transformer yard and DG yard needs to be routed on this pipe rack.	Job	1					
38	Any other item missing to complete the project	Job	1					
39	Operation and Maintenance –Year-1	**Job**	**1**					
40	Operation and Maintenance –Year-2	Job	1					
	Sub Total-2							
41	**Grand Total Rs**							

Optional Items (These items will not be considered for computing L1)

Sr. No.	Particulars	Quantity	Quoted Price Rs.	GST Rs.	Total Price Rs.
1	Comprehensive Annual Maintenance Contract -Year-3				
2	Comprehensive Annual Maintenance Contract -Year-4				
3	Comprehensive Annual Maintenance Contract -Year-5				
4	Operation and Maintenance –Year-3				
5	Operation and Maintenance –Year-4				
6	Operation and Maintenance –Year-5				

Detailed Commercial Bid is to be submitted in the format as appearing on www.eprocure.gov.in/eprocure/app.

Notes:

1. **Prices for individual line items of the BoQ should be mandatorily submitted. CDAC Pune reserves the right to reject the bid in case bidder fails to quote all the required items**.
2. Bidder must fill the supply and installation prices separately as per the above table.
3. The prices quoted should include the charges towards testing of equipment's, installations and approvals from local electricity board/PWD, electrical/ civil engineering authority, pollution control board – as applicable, all statutory approvals from local corporation , local bodies, state and central government, approvals from KPTCL and BESCOM, Load sanction, load release , CEIG etc . The certifications, NOC etc. shall be in the name of C-DAC .
4. The invoice can be raised in compliance with GST requirements, giving full bill of material.
5. In no case additional amount will be paid except as quoted above . bidders are requested to verify the requirements about the quantity as per RFP and quote the prices after any clarification if required

(End of Section- V)

ANNEXURE A – COVERING LETTER

Date:
To:
Director General,
Centre for Development of Advanced Computing(C-DAC)
Innovation Park, Panchavati, Pashan,
Pune – 411008.

Subject: Submission of the Technical bid for Constructions, Supply of Data Centre Solutions

Dear Sir,

We, the undersigned, offer to supply Data Centre Solutions and allied services in response to your Tender No. CDACP/NSM-20PF-DC/22-23/357. We are hereby submitting our proposal for same, which includes this Technical bid and the Financial Bid through www.eprocure.gov.in/eprocure/app portal.

We hereby declare that all the information and statements made in this Technical bid are true and we accept that any misinterpretation contained in it, may lead to our disqualification.

We undertake, if our proposal is accepted, to submit a Security Deposit of 5 % of the contract / order value, as per terms stipulated in the tender.

We confirm that the deliveries, installation will be done within 9 months (36 weeks), if the order is placed.

We hereby certify that my/ our firm has not been disqualified and / or blacklisted by any Office/ Department/ Undertaking of the State Government / Central Govt. of India, PSU/ Autonomous Body of Government of India, as on the date/time of submission of this bid.

We undertake, if our proposal is accepted, to initiate the Implementation activities towards supply of material and services, as stipulated in the referred RFP.

We hereby accept the applicable protocols while delivery, installation, implementation, commissioning of the entire `Turn-key' job with regards to `COVID-19' conditions at the Institution/site. (The same will be informed in the supply/work order(s) placed, if any).

We agree to abide by all the terms and conditions of the RFP document, including corrigenda. We would hold the terms of our bid valid for 180 days as stipulated in the RFP document.

We understand you are not bound to accept any Proposal you receive.

The undersigned is authorized to sign this bid document. The authority letter to this effect is enclosed.

Yours sincerely,
Authorized Signatory:
Name and Title of Signatory:
E-mail: Mobile No:

ANNEXURE B – AUTHORITY LETTER

Date:

To:

Director General,
Centre for Development of Advanced Computing(C-DAC)
Innovation Park, Panchavati, Pashan Road,
Pune – 411007.

Subject: Authority Letter

Reference: Tender No. CDACP/NSM-20PF-DC/22-23/357

Dear Sir,

We, M/s _____ (Name of the bidder) having registered office at _____ (address of the bidder) herewith submit our bid against the said RFP document.

Mr./Ms. _____ (Name and designation of the signatory), whose signature is appended below, is authorized to sign and submit the bid documents on our behalf against said RFP

Specimen Signature:

The undersigned is authorized to issue such authorized on behalf of us.

For M/s _____ (Name of the bidder)

Signature and company seal

Name

Designation

Email

Mobile No.

ANNEXURE C – UNDERTAKING BY PRINCIPAL MANUFACTURER

(To be submitted in Original on Letterhead- for all major equipment/devises/products – separately.)

Date:

Director General,
Centre for Development of Advanced Computing(C-DAC)
Innovation Park, Panchavati, Pashan,
Pune – 411008.

Subject: **Undertaking by Principal Manufacturer against tender no. CDACP/NSM-20PF-DC /22-23/357 for Construction, Supply, Installation & Commissioning of Data Centre Solutions.**

Dear Sir,

We, M/s _____ (Name of the manufacturer) having registered office at _____ (address of the manufacturer) by virtue of being manufacturer for _____ (Name of the product/s), hereby authorize M/s _____ (Name of the bidder) having their office at _____ (Address of bidder) to submit quote, supply, install and provide after sales support for our range of products quoted by them to meet the above mentioned tender requirements.

M/s _____ (Name of the manufacturer) within the scope of requirement as per the tender mentioned above undertake to provide technical & other support towards fulfilling the requirements of installation, commissioning, acceptance criteria and product warranty services of the Data Centre Solutions to be supplied and installed at site(s) by our authorized representative M/s (Name of bidder) against said tender.

The undersigned is authorised to issue such authorisation on behalf of M/s _____ (Name of the manufacturer).

For M/s _____ (Name of the manufacturer)

Signature & company seal

Name

Designation

Email

Mobile No.

ANNEXURE D – LIST OF RECOMMENDED MAKES

Sr. No	Description List of Makes - Electrical	Recommended Makes
1	UPS System	Schneider/Vertiv/Eaton/Numeric/ FUJI /TMEIC/Delta/Socomec/ Riello Power India Pvt. Ltd
2	SMF Batteries for UPS	Rocket / Amar Raja / HBL /Quanta/Exide
3	LT CABLES	RPG /KEI /FINOLEX/POLYCAB/Ravin/Lapp
4	Multifunction Meter (Digital Type)/Load Manager	Schneider/Socomec/Secure Meter/HPL/Siemens/L&T
5	MS/GI CONDUITS	BEC/BHARAT/AKG/UNIVERCELL
6	PVC CONDUITS	AVON PLAST//Precision/Dimond
7	MODULAR SWITCH SOCKET WITH SWITCH BOXES	ANCHOR/Legrand/Schneider
8	BRASS DOUBLE COPRESSION GLANDS	DOWELLS/COMMET/Siemens/Phoenix
9	MCCB/MCB/ACB	Schneider/L&T/ABB/Siemens/Eaton/Legrand
10	ELCB/MCB	Siemens/ Schneider / Legrand/Eaton
11	MCB DBS	Siemens/Schneider/Legrand/L&T /Eaton/ABB
12	METAL CLAD SOCKET OUTLETS	Legrand/SALZER/HAVELLS/L&T HAGER/Schneider
13	CABLE TRAYS	PROFAB/Indiana/OBO Bettermann
14	LUMINAIRIES	PHILLIPS/WIPRO/BAJAJ/HAVELLS/Syska
15	PROTECTIVE RELAYS	Siemens/ABB/L&T/Schneider/Eaton
16	CT's	VOLTAMP/AE/KAPPA
17	SURGE PROTECTION DEVICES	Schneider/Siemens/Legrand/Eaton
18	Auto Transfer Switch (ATS)	Siemens/Socomec/Schneider (ASCO)
19	LT Switchboards	License of IEC 61439 Panel Builder
20	Power Distribution Unit (PDU-Inside the Rack)	Vertiv/APC-Schneider -/Raritan/Eaton/Numeric/enlogic/Dhananjay Group
21	FRLS PVC insulated stranded copper conductor wires and	Finolex|Lapp Kabel|Skyline|L&T|National |Echo |

Sr. No	Description List of Makes - Electrical	Recommended Makes
	cables	Havells|
22	Terminal blocks & cage clamps	Elmexx|Phoenix|Wago
23	Star Delta starter	L&T|ABB|Siemens| Schneider/Eaton
24	Soft starters/VFD Drives	ABB|Schneider|L&T/Siemens/Eaton/Danfoss/Grandfoss
25	Single phase preventor	L&T|Minilec|Syntron |Beluk
26	Electric Motors	Siemens|Crompton| ABB |Bharat Bijlee|Alstom
27	HT Breaker Panel, RMU Panel	Schneider/Siemens/ABB
28	Transformer	Voltamp/Crompton/Mahati
29	DG Sets	Cummins/Caterpiller/Parkins/Rolls Royce
Sr. No.	**Details of Material- Civil and Interior**	
1	Cement	Ultra Tech / Birla super (OPC 43 grade and 53 grades)
2	WALL PUTTY	GOLDSIZE PUTTY BY SHALIMAR PAINTS LTD., J K WALL PUTTY, Birla White
3	Structural Steel	As per IS 226 –19 (a) Hollow sections - TATA/Apollo. (b)For plates,Built sections,Rolled section - TATA/SAIL/Jindal
4	Reinforcement Steel	TISCO, SAIL, RINL, JINDAL, ESSAR, Tata Steel -As per IS 1786 Fe 500/550 grade STEEL
5	ANCHOR FASTNER	HILTI, FISHER
6	ALUMINIUM SECTIONS	INDAL, HINDALCO, JINDAL,
7	DISTEMPER & PAINTS	ICI-Dulux, ASIAN PAINTS, BERGER PAINTS, NEROLAC, British Paint
8	GYPSUM BOARD and Fire Rated partition	INDIA GYPSUM, LAFARGE BORAL, RAMCO LTD
9	Fire Sealants	3M,Hilti,Fischer

Sr. No	Description List of Makes - Electrical	Recommended Makes
10	GLASS	SAINT GOBAIN, Schott, Pilkington
11	FALSE CEILING	INDIA GYPSUM, ARMSTRONG,AMF
12	Raised/False Flooring	Unitile/Uniflair/ USG/Access Floor Systems/AET Flexiable
13	Fire Door	Shakti Mat, Radiant, ProMat, Godrej,
14	Insulation	Armaflex/K-Flex
15	Ready Mix concrete	Ready mix (India) Pvt.Ltd/ Ultra Tech
16	UPVC Windows	Lingel/Fenesta
17	Ceramic tiles	Kajaria /Varmora /Simpolo
18	Door fittings & hardwares	Door Set/Ozone/Dorma
19	Lamination/Veneer	Century/Green ply/Archid
20	Waterproofing	Tech Dry/Fosroc/
21	Waterproofing compound	Snowcem/ Nitroman/Tech Dry/Fosroc
22	Paint	Asian Paints/Berger
23	SANITARY WARE:	Jaquar Continental / Approved by client or Architect/ Hindware
24	CP FITTINGS:	Jaquar Continental / Approved by client or Architect / Hindware
25	CPVC PIPES	ASHIRWAD / ASTRAL / TRUFLO
26	CPVC FITTINGS	ASHIRWAD / ASTRAL / TRUFLO
27	BALL VALVE	ASHIRWAD / ASTRAL / TRUFLO
28	ANCHOR FASTNER / 'U' CLAMPS	HITECH SUPPORTS
29	RCC HUME PIPES	SUDARASHAN HUME PIPE / INDIAN HUME PIPE
30	PVC PIPES (SWR Quality)	ASHIRWAD / ASTRAL / TRUFLO
31	PVC PIPES (Agricultaural series)	ASHIRWAD / ASTRAL / TRUFLO
32	PVC FITTINGS (Fabricated)	CLARION / SRI VINAYAKA
33	PVC FITTINGS (Moulded)	ASHIRWAD / ASTRAL / TRUFLO

Sr. No	Description List of Makes - Electrical	Recommended Makes
34	PVC FLOOR TRAPS (Moulded)	ASHIRWAD / ASTRAL / TRUFLO
35	MANHOLE COVER - FRP	AAGAM/ THEROMO DRAIN
36	ENAMEL PAINT	ASIAN PAINTS / SHALIMAR
37	Door fittings & hardwares	Door Set/Ozone/Dorma
38	Lamination/Veneer	Century/Green ply/Archid
Sr. No.	**System / Description-IBMS**	
A	Intelligent Fire detection System	
1	Analogue Addressable Fire detection Panel	Tyco , Honeywell, Siemens , Schneider, Johnson Control
2	Analogue Addressable Thermal /smoke Detector	Tyco , Honeywell, Siemens , Schneider
3	Analogue Addressable Manual Call Point	Tyco , Honeywell, Siemens , Schneider
4	Analogue Addressable Abort cum Gas Release Station	Tyco , Honeywell Siemens , Schneider
5	Analogue Addressable Control / Relay / Isolator Modules	Tyco , Honeywell Siemens , Schneider
6	Building Management Interface	Tyco , Honeywell, Siemens , Schneider
7	Fire Extingusher's	Cease Fire / Minimax
8	Aspiration Smoke Detection System	Xtralis, ICAN, Tyco,Siemens
9	Response Indicators	Daksh, Polixel, Agni
10	Gas Release Modules	Tyco , Honeywell, Siemens , Ravel
11	Fire Detection Cables	Polycab, Excel, LAPP kabel
B	**IP CCTV Surveillance System**	
1	IP Dome Cameras with Varifocal lense	BOSCH, Honeywell, Siemens ,Samsung

Sr. No	Description List of Makes - Electrical	Recommended Makes
2	IP BOX Camera	BOSCH, Honeywell, Siemens
3	IP PTZ Camera	BOSCH, Honeywell, Siemens
4	Video Management, Recording Software	Pelco, BOSCH, Axis, Indigo Vision, Polixel, Milestone
5	32” Monitors	Samsung, LG, Sony
6	Network Switch	Comnet, RuggedCom, Moxa
7	CAT 6 Cable	AMP, Molex, ,Schneider
8	OFC Cables	Finolex, Sterlite, HFCL
9	Power Cables	Polycab, Excel, LAPP kabel
10	MS Conduit	BEC, AKG, Dimond
11	PVC Conduits	BEC, AKG, Precision
12	Storage Device	DELL, HP, IBM
13	Servers / Workstation	DELL, HP, IBM
C	**Access Control System**	
1	Intelligent Access Controller	Siemens, Honeywell, Daccess
2	Time and Access Management Software	Nexwatch, Software House, Siemens, Honeywell, Daccess
3	Biometric Readers	Nexwatch, HID, DDS, Siemens, Honeywell, Daccess
4	Cards	Siemens, Honeywell, Daccess
5	Proximity Readers	Nexwatch, DDS, HID, Siemens, Honeywell, Daccess
6	Electromagnetic Locks	Dafikas,BELL, Trimec, Insyn
7	Network Switch	Comnet, RuggedCom, Moxa
8	Emergency Glass Break Station	KAC
9	CAT 6 Cable	AMP, Molex, Schneider
10	OFC Cables	Finolex, Sterlite, HFCL
11	Servers / Workstation	DELL, HP, IBM

Sr. No	Description List of Makes - Electrical	Recommended Makes
12		
D	**UL Listed Novec 1230 Clean Agent Fire Suppression System**	
1	UL Listed & PESO Approved Seamless Cylinders	Ansul, UTC, Siemens, Tyco
2	Novec 1230	Ansul, UTC, Siemens, Tyco,Siemens
3	Nozzles	Ansul, UTC, Siemens
4	Electronic/ Pneumatic Acutators	Ansul, UTC, Siemens
5	Discharge Valves	Ansul, UTC, Siemens
6	M.S Seamless Pipes	Jindal, Tata
7	Discharge Hose	Ansul, UTC, Siemens
8	Manifold Check Valve	Ansul, UTC, Siemens
9	Warning Sign Boards	Ansul, UTC, Siemens
10	Manual Abort & Release Station.	Daksh, Agni
E	**Building Management System**	
1	Main Control System/DDC Controllers	Honeywell, Schneider, Siemens, Rockwell, Mitsubishi
2	Temperature, Air humidity Sensors (Duct, Room)	Azbil (Yamatake), ALC, Sauter, Siemens, Endress-Hauser
3	Building Management Software	Honeywell, Siemens, Schneider , Rockwell, Mitsubishi
4	Differential pressure switch Air flow / Water Flow switch/water Level switch	Azbil (Yamatake), ALC, Sauter, Honeywell,Emerson Process
5	Water Flow meter	Emerson -Process/Endress-Hauser/ Honeywell/ Sontay/Forbes Marshal
6	Water Pressure Transmetter/ Level Transmitter	Invensys/Kele/ Honeywell/ Sontay/Forbes/Marshal
7	Motorized Butterfly valves/	Rapid Cool/Audco/ Johnson/Siemens/Belimo

Sr. No	Description List of Makes - Electrical	Recommended Makes
	actuators	
8	Current/Voltage/Power Factor/FrequencyKWH Transducers with digital display/Electronic Meter	Situ Electro Instuments Pvt.Ltd./ Secure metres Ltd./ Enercon/L&T
9	Printer	HP/Epson
10	Switching Relays	PLA/OMRON
11	Flame proof level switch	Veksler/Minilec
12	Electromagnetic Lock	Trimec/Dafickas
13	Current Relays	Sitn/Minilec/Sentry
14	Electric Actuators for 2-way ON/OFF valves	Danfoss/ Emtrack/ Johnson/ Honeywell/ Siemens/ Trane/ Cyclon Controls.
15	Transducer/Sensors/Water Quality system– pH,Conductivity,Dissolved Oxygen etc	Emerson – Process,Endress-Hauser,Siemens,ABB,Thermax
16	CAT 6 Cable	AMP, Molex,Schneider
17	OFC Cables	Finolex, Sterlite, HFCL
18	Servers / Workstation	DELL, HP, IBM
F	**Water Leak Detection System**	
1	Sensing Cables	Tracetek, Liebert, Sontay
2	WLDS Controller	Tracetek, Liebert, Sontay
3	Jumper Cables	Tracetek, Liebert, Sontay
G	**Rodent System**	-
1	Controller	MASER (Torrant Range), C Systems, Verma Craft
2	Sattelites	MASER (Torrant Range), C Systems, Verma Craft
3	GUI Software	MASER (Torrant Range), C Systems, Verma Craft
	Mechanical Components	
1	Variable Speed Pumping	Grundfos | Armstrong

Sr. No	Description List of Makes - Electrical	Recommended Makes
	system with Pump sets	
2	Plate Heat Exchanger (PHE)	SWEP, Tranter, Alfa Lavel
3	Variable Speed Pumping system with Pump sets	Grundfos | Armstrong
4	PAC and PAHU	Schneider | Blue Box| Vertiev | Climaveneta
4.1	Fan section-Blower	Kruger| Flaktwood |Nutech|TCF Nadi|
4.2	Variable frequency drives	Danfoss |ABB/Eaton
4.3	Air Handling Unit (AHU)	Trane/Voltas/BlueStar/Blue Box
4.4	Variable Air Volume (VAV) Boxes	Caryaire-Titus| Trane| Johnson Control | Belimo
5	Racks (42 U and BMS)	Schneider, Valrack,,EFS,Rittal,Netrack,Dhananjay Group
6	Adiabatic Dry Cooler	Thermax| Paharpur | Schneider| Thermofin/Vertiev
7	G.I.	Jindal (Hissar)|TATA|GST
8	M.S. upto 300 mm	Jindal (Hissar)| TATA|GST
9	M.S. Above 300 mm	Maharashtra Seamless| TATA|GST
10	**Grooved End Valves and fitting**	
10.1	Butterfly Valves	Audco|Advance |C&R|Oventrop|TA Hydronics|Flowcon/ Tyco/Victaulic
10.2	Valve	Audco|Advance |Leader
10.3	Non Return Valve	Audco|Advance|C&R|Cim/ Tyco/Victaulic
10.4	Balancing Valves	Advance|Oventrop|Flowcon|T&A Hydronics|Honeywell|Danfoss
10.5	Ball ,Gate,Globe Valve	Audco | Emerald | Oventrop | Rapidcool |Cim|Zoloto/ Tyco/Victaulic
10.6	Ball Valves with Y Strainer	Rapidcool |Cim|Zoloto/ Tyco/Victaulic
11	**Accessories**	
11.1	Pressure Gauges	H.Guru|Fiebig|WAREE

Sr. No	Description List of Makes - Electrical	Recommended Makes
11.2	Thermometers	Emerald| Fiebig|WAREE
11.3	Flow Switch	Anergy|Honeywell|Siemens|Johnson|Schneider
11.4	Motorized butterfly valve	Siemens|Danfoss|Schneider |Advance|Audco
11.5	Dash Fastners	Hilti|Fischer
11.6	Vibration Isolators (Bellow Type)	Resistoflex |Cori| Easyflex
11.7	Spring Mounts	Emerald| Resistoflex
11.8	Rubber Groumat/ Clamps/ Hangers	Emerald/ Resistoflex/ Kanwal
12	**Air Filters**	
12.1	Filters	Airtech|Purolator|Puromatic|Thermodyne |Spectrum|Dynafilters
13	**Insulation**	
13.1	Glass Wool	Owens Corning |U.P. Twiga|Kimmco
13.2	Mineral Wool	Lloyd Insulation
13.3	Closed Cell Elastomeric Insulation	Armaflex|Aeroflex|Vidoflex|Kflex
13.4	Aluminium Sheets	TATA|Nippon|Hindalco|Indalco
13.5		
14	Balancing Valve	TA Hydronics | Danfoss |Oventrop| Flowcon
15	Chillers	Schneider/BlueBox/Train/York/Vertiv/JCI

ANNEXURE E – PERFORMANCE BANK GUARANTEE
(on non-judicial paper of appropriate value)

To,

Director General,
Centre for Development of Advanced Computing(C-DAC)
Innovation Park, Panchavati, Pashan,
Pune – 411008.

BANK GUARANTEE NO:

DATE:

Dear Sir(S)

This has reference to the Purchase Order No. _____ Dated _____ been placed by C-DAC on M/s_____ (Name & Address of vendor) for supply, installation, commissioning warranty of _____ (description of items) at C-DAC Pune.

The conditions of this order provide that the vendor shall,

1. Arrange to deliver the items listed in the said order to the consignee, as per details given in said order, and
2. Arrange to install and commission the items listed in said order at client's site, to the entire satisfaction of C-DAC and
3. Arrange for the comprehensive warranty service support towards the items specified in purchase order.

M/s (Name of Vendor) has accepted the said purchase order with the terms and conditions stipulated therein and have agreed to issue the performance bank guarantee on their part, towards promises and assurance of their contractual obligations vide the Supply Order No. _____ M/s. _____ (name of vendor) holds an account with us and has approached us and at their request and in consideration of the promises, we hereby furnish such guarantees as mentioned hereinafter.

C-DAC shall be at liberty without reference to the Bank and without affecting the full liability of the Bank hereunder to take any other undertaking of security in respect of the suppliers obligations and / or liabilities under or in connection with the said contract or to vary the terms vis-a – vis the supplier or the said contract or to grant time and or indulgence to the supplier or to reduce or to increase or otherwise vary the prices or the total contract value or to forebear from enforcement of all or any of the obligations of the supplier under the said contract and/or the remedies of C-DAC under any security (ies) now, or hereafter held by C-DAC and no such dealing(s) with the supplier or release or forbearance whatsoever shall have the effect of releasing the bank from its full liability of C-DAC hereunder or of prejudicing right of C-DAC against the bank.

This undertaking guarantee shall be a continuing undertaking guarantee and shall remain valid and irrevocable for all claims of C-DAC and liabilities of the supplier arising up to and until _____ (date)

This undertaking guarantee shall be in addition to any other undertaking or guarantee or security whatsoever the that C-DAC may now or at any time have in relation to its claims or the supplier's obligations/liabilities under and / or in connection with the said contract and C-DAC shall have the full authority to take recourse to or enforce this undertaking guarantee in preference to the other undertaking or security (ies) at its sole discretion and no failure on the part of C-DAC in enforcing or requiring enforcement of any other undertaking or security shall have the effect of releasing the bank from its full liability hereunder.

We _____ (Name of Bank) hereby agree and irrevocably undertake and promise that if in your (C-DAC's) opinion any default is made by M/s _____ (Name of Vendor) in performing any of the terms and /or conditions of the agreement or if in your opinion they commit any breach of the contract or there is any demand by you against M/s _____ (Name of Vendor), then on notice to us by you, we shall on demand and without demur and without reference to M/s _____ (Name of Vendor), pay you, in any manner in which you may direct, the amount of Rs. _____/- (Rupees _____ Only) or such portion thereof as may be demanded by you not exceeding the said sum and as you may from time to time require. Our liability to pay is not dependent or conditional on your proceeding against M/s _____ (Name of Vendor) and we shall be liable & obligated to pay the aforesaid amount as and when demanded by you merely on an intimation being given by you and even before any legal proceedings, if any, are taken against M/s _____ (Name of Vendor)

The Bank hereby waives all rights at any time inconsistent with the terms of this undertaking guarantee and the obligations of the bank in terms hereof shall not be anywise affected or suspended by reason of any dispute or disputes having been raised by the supplier (whether or not pending before any arbitrator, Tribunal or Court) or any denial of liability by the supplier or any order or any order or communication whatsoever by the supplier stopping or preventing or purporting to stop or prevent payment by the Bank to C-DAC hereunder.

The amount stated in any notice of demand addressed by C-DAC to the Bank as claimed by C-DAC from the supplier or as suffered or incurred by C-DAC on the account of any losses or damages or costs, charges and/or expenses shall as between the Bank and C-DAC be conclusive of the amount so claimed or liable to be paid to C-DAC or suffered or incurred by C-DAC, as the case may be and payable by the Bank to C-DAC in terms hereof.

You (C-DAC's) shall full liberty without reference to us and without affecting this guarantee, postpone for any time or from time to time the exercise of any of the powers and rights conferred on you under the contact with the said M/s _____ (Name of Vendor) and to enforce or to forbear from endorsing any power or rights or by reason of time being given to the said M/s _____ (name of Vendor) which under law relating to the sureties would but for the provisions have the effect of releasing us.

You will have full liberty without reference to us and without affecting this guarantee, postpone for any time or from time to time the exercise of any of the powers and rights conferred on you under the contract with the said M/s _____ (Name of Vendor) and to enforce or to forbear from endorsing any power or rights or by reason of time being given to the said M/s _____ (Name of Vendor) which under law relating to the sureties would but for the provisions have the effect of releasing us.

Your right to recover the said sum of Rs. _____/- (Rupees _____ only) from us in manner aforesaid will not be affected/ or suspended by reason of the fact that any dispute or disputes have been raised by M/s _____ (Name of Vendor) and/ or that any dispute or disputes are pending before any officer, tribunal or court or Arbitrator.

The guarantee herein contained shall not be determined or affected by the liquidation or winding up, dissolution or change of constitution or insolvency of the said M/s _____ (Name of Vendor) but shall in all respects and for all purposes be binding and operative until payment of all dues to C-DAC in respect of such liability or liabilities.

Our liability under this guarantee is restricted to Rs._____/- (Rupees _____Only). Our guarantee shall remain in force until unless a suit action to enforce a claim under guarantee is filed against us within one month from the date of expiry of guarantee, all your rights under the said guarantee shall be forfeited and we shall be relieved and discharged from all liabilities there under.

We have power to issue this guarantee in your favour under Memorandum and Articles of Association of our Bank and the undersigned has full power to do under the power of Attorney dated.

Notwithstanding anything contained herein:

A. Our liability under this guarantee shall not exceed Rs_____ (in words)
B. This bank guarantee shall be valid up to (36 months from date of installation) & unless a suit for action to enforce a claim under guarantee is filed against us within one month from the date of expiry of guarantee, all your rights under the said guarantee shall be forfeited and we shall be relieved and discharged from all liabilities there after i.e. after one month from the date of expiry of this Bank guarantee
C. We are liable to pay the guaranteed amount or any parts thereof under this bank guarantee only and only if you serve upon us a written claim or demand or before _____
D. The Bank guarantee will expire on _____

Granted by the Bank

Yours faithfully,

For (Name of Bank)
SEAL OF THE BANK
Authorised Signatory

ANNEXURE F – UNDERTAKING IN LIUE OF EMD

Date:

To:

The Director General,
Centre for Development of Advanced Computing (C-DAC)
Innovation Park, Panchavati, Pashan Road,
Pune – 411008 Maharashtra, INDIA

Subject: Undertaking as per GFR – 2017, Rule 170(iii)

Dear Sir,

We, the undersigned, offer to carry out the `Turn-key' project including Construction, Supply, installation, commissioning etc. of Basic Infrastructures of Data Centre **etc.** as per tender at C-DAC, Bangalore, in response to your Tender No CDACP/NSM-20PF-DC/22-23/357. We are hereby submitting our proposal for same, which includes Technical bid and the Financial Bid through www.eprocure.gov.in. As a part of eligibility requirement stipulated in said tender document, we hereby submit a declaration in lieu of Earnest Money Deposit (EMD), as given below:

1. Our bid shall remain valid for 180 days from the date of submission and that we will not withdraw or modify our bid during the validity period,
2. In case, we are declared as successful bidder and an order is placed on us, we will submit the acceptance in writing within 7 days of placement of order on us.
3. In case, we are declared as successful bidder and an order is placed on us, we undertake, to submit a Security Deposit of 5 % of the order value, as per terms stipulated in the tender.
4. In case of failure on our part to comply with any of the above said requirements, we are aware that we shall be declared as un-eligible for said tender and /or debarred from any **future bidding process of C-DAC or any Government entity for a period of minimum one year.**
5. The undersigned is authorized to sign this undertaking.

Yours sincerely,

Authorized Signatory:

Name and Title of Signatory:
e-mail:
Mobile No:

ANNEXURE –G: DOCUMENTS CHECK –LIST

Sr. No.	Documents to be Submitted (IN THE FOLLOWING SEQUENCE ONLY).	Submitted (Yes / No) with page nos.
	e-Packet-1 (Section-I)	
1	Annexure-G duly filled and neatly arranged in the following sequence only. The bidder must submit all the documents as per Document Checklist – Annexure G, with appropriate page nos for the same. The flow of the submitted documents must be in the same order/sequence.	
2	Covering Letter as per Annexure – A.	
3	Authority Letter as per Annexure – B	
4	Demand Draft no /UTR no – (direct deposit) for Rs. 5000/- towards Tender fees (Non-exempted/non-refundable)	
5	The undertaking(s) from the Principal Manufacturer(s) (OEMs) of products/ items offered as per Annexure – C.	
6	Demand Draft / BG / Exemption documents or Annexure F towards EMD	
7	SLA as per Annexure – H	
8	Land Border Sharing/M.I.I. Declaration as per Annexure-I	
9	Format of Agreement for Consortium (if applicable) Annexure J:	
	e-Packet-1 (Section-II)	
10	A copy of Certificate of Incorporation, Partnership Deed / Memorandum and Articles of Association / any other equivalent document showing date and place of incorporation, as applicable.	
12	Copies of GST registration certificates.	

Sr. No.	Documents to be Submitted (IN THE FOLLOWING SEQUENCE ONLY).	Submitted (Yes / No) with page nos.
13	Copies of at least two purchase orders or contracts and installation reports in the name of bidder from the end client / end user – or for own use, during last Five years for Data Centre work.	
14	A photo copy of the commercial bid without prices (prices blocked) and copy of commercial terms & conditions (in detail) as included in the commercial bid. C-DAC reserves the right to reject the bid in case of any discrepancy observed in the un-priced commercial bid and the actual commercial bid.	
15	Undertaking to the effect that a Security Deposit of 5% of the order value will be submitted in case C- DAC decides to place the Purchase Order. (Annexure-A)	
16	Undertaking to the effect that the bidder is not black-listed or barred from participation in bidding process by any Central/ State Government, Government Department, Government Undertaking, Public Sector Unit (PSU) or autonomous institution, as on date of submission of bids. (Annexure-A)	
17	All the necessary documents in support of eligibility criteria stipulated in Eligibility Criteria.	
	E – Packet 1 (Section-III)	
18	The executive summary of the bid submitted (As per Section-V)	
19	Duly filled Technical Bid (covering the details of solution, detailed bill of material, technical specifications, makes and models of items, diagrams, layouts, all drawings etc.)	
20	The details of electrical power consumption, foot-print, ambient temp, temperature range targeted, discrimination curves, short circuit calculations, cable schedule along with voltage drop calculations, battery sizing and back up calculations etc.	

Sr. No.	Documents to be Submitted (IN THE FOLLOWING SEQUENCE ONLY).	Submitted (Yes / No) with page nos.
21	Details of diesel consumption & water consumption on various loading conditions.	
22	Design Basic Report along with annual average Power Usage Effectiveness (PUE) calculations for 25%, 50%, 75% and 100 % of IT load.	
23	Design basis and analysis of cooling solution at full and partial load conditions including complete details, assumptions made and the specific references/standards used for the same	
24	Point by point Compliance statement in table format for specifications of all the items	
25	Legal / statutory permissions required, if any.	
	e –packet 2 (FINANCIAL BID- B.O.Q.xls format)	
1	Price Bid as per format given in Section - V	

ANNEXURE H – SERVICE LEVEL AGREEMENT (SLA)

The successful bidder will be required to sign an SLA, at the time of issuing the works order for supply, installation and commissioning of Data Centres. The basic service requirements /conditions that would be covered in the SLA are as given below.

1. Scope of Work for Operation and Maintenance

Scope of this SLA covers the satisfactory Operations of DC, Maintenance, warranty and support, as stipulated in the Tender, Works Order, for a period of two years from the date of successful installation and commissioning of the Data Centre. One minimum 8 years experienced technician with experience in the field of O & M for Electrical and cooling equipment's per shift and one Diploma Engineer with minimum 10 year of technical + administration experience needs to be deployed.

2. Definitions

"**Uptime**" shall mean the time period for which the specified services / components with specified technical and service standards are available to the state and user departments. Uptime, in percentage, of any component (Non-IT) can be calculated as:

Uptime = {1- [(Downtime) / (Total Time – Scheduled Maintenance Time)]} * 100

"**Downtime**" shall mean the time period for which the specified services / components with specified technical and service standards are not available to the state and user departments and excludes the scheduled outages planned in advance, the link failures and reasons beyond Vendor Control.

"**Incident**" refers to any event / abnormalities in the functioning of the Data Centre Equipment / specified services that may lead to disruption in normal operations of the Data Centre services.

"**Resolution Time**" shall mean the time taken (after the incident has been reported at the helpdesk), in resolving (diagnosing, troubleshooting and fixing)

The following shall be the responsibilities of the successful bidder.

3. Uptime Requirements:

The bidder shall ensure the uptime requirements for various systems, equipment's, components as per details given in the following Table.

Sr No	List of Utilities	Criticality	Redundancy	Uptime	Resolution time
1	HVAC and Cooling (Including PAC/PAHU, Dry cooler/AHU, Pumps,)	High	N+1	98.5%	6-8 hours for minor complaints and 24-48 hours for major complaints.

Sr No	List of Utilities	Criticality	Redundancy	Uptime	Resolution time
2	UPS with batteries for IT as well as NON IT	High	N+1	98.5%	6-8 hours for minor complaints and 24-48 hours for major complaints.
3	Electrical Infrastructure	High	N+1	98.5%	6-8 hours for minor complaints and 24-48 hours for major complaints.
4	DG Sets	High	N+1	98.5%	6-8 hours for minor complaints and 24-48 hours for major complaints.
5	Fire detection and alarm systems, VESDA system, Fire suppression system,	High			Within 24 Hours
6	BMS and real-time measurements, CCTV system, Rodent control, Water leak detection system, Access control system	Medium			Within 48 Hours
7	Transformer	High	N+1	99%	6-8 hours for minor complaints and 24-48 hours for major complaints.
8	Chillers	High	N+N	99%	6-8 hours for minor complaints and 24-48 hours for major complaints.
9	In ROW s	High	N+1	99%	6-8 hours for minor complaints and 24-48 hours for major complaints.
10	RDHX	High		99%	6-8 hours for minor complaints and 24-48 hours for major

Sr No	List of Utilities	Criticality	Redundancy	Uptime	Resolution time
					complaints.

4. Reporting Methodology

Understand & analyzing the products covered in the Supply, installation and commissioning scope and performance on periodic basis.

Submission of daily, weekly and monthly service performance reports in the agreed format specified as per the requirement of the infrastructure facilities.

Measurement and Monitoring with recording of readings and checking parameters of different facility equipment's.

Analyzing the readings and escalating suitably for abnormalities observed, if any. Supervise installation and maintenance work, whenever new equipment or systems are to be / being installed.

Adequate stock of onsite and offsite spare parts and spare component must be maintained by the successful bidder.

Successful bidder to ensure the commitment towards uptime requirement of the DC.

To provide this service it is important for the M/S ……. selected bidder to have back to back arrangement with the OEMs. The selected bidder would be required to provide a copy of the service level agreement signed with the respective OEMs.

Component that is reported to be down on a given date should be either fully repaired within the stipulated time frame. If breakdown is major, bidder to arrange for standby component/equipment on temporary basis (of equivalent configuration) within the time frame. In case the selected bidder fails to meet the above standards of maintenance, there will be a penalty as per clause 9 of section III.

5. DAILY CHECKS:

Access Control System:

- 24x 7 checking of Access System for alert and alarms.
- Monitoring of Status.
- Abnormality of System / errors
- Access Card Activity
- Report of Access to Data Center
- Report of Forceful Access (Invalid Access)
- Generation of Logs / reports and submission to Host Institute for review and necessary action.

- Testing & checking of all Doors, Magnetic locks and Sensors.

CCTV:

- Daily Checking of DVR System & Cameras
- Suspicious Action Report
- Abnormality of System
- Generation of Logs / reports and submission to Host Institute for review and necessary action/s Maintenance of reports

Fire Alarm System, Novec 1230 Gas, VESDA, Water Leak Detection (WLD), Rodent Repelled:

- Daily Checking of FAS Panel
- Immediate Action to Alarm Generated
- Monitoring of MCP
- Generation of Logs / reports and submission to Client for review and necessary action/s Maintenance of reports, Report Generation through IBMS.

Precision AC, PAHU and Comfort AC:

- Monitoring of PAC's Temperature and Humidity every half an hour physically.
- Monitoring of Alarms & Immediate Action to it Comparison of Software readings with Actual Reading.

6. Fire Drill Test

Maintenance Activities will be carried for the System/Devices in Coordination with Host Institute Engineer & Technician

7. Daily Reports

1. Hourly basis monitoring of UPS & PAC & concern System
2. Reports of Energy meter reading of all meters.
3. Readings of main LT panel.
4. Fuel in DG fuel tank.
5. Immediate response to electrical complaints by any Working staff.
6. Following of effective power consumption chart provided by Customer.
7. Maintaining Critical Electrical parts.
8. Generation of Logs / reports and submission to Host Institute for review and necessary action's Maintenance of reports

8. Weekly Reports

1. All Electrical Systems Health Check Report
2. Vendor call tracking until closure

3. UPS & DG: On load Report.
4. Fire Alarm System: Reports of False Alarm.
5. Access System: Data Backup.
6. CCTV: Backup of DVR Status.
7. WLD: Test of Water Leak Detection Sensor Cable.
8. All System Health Report.
9. PAC, Chiller and comfort AC

9. Monthly Reports

1. Follow up of schedule regarding preventive maintenance.
2. Presentation of consumption of meter units by Pie diagram.
3. Vendor Performance Reports.
4. Report of pending calls/problems.
5. MIS Report Presentation for Each Month

10. Call Logging Process with OEM/Vendors

The onsite team will get alerts on any issue in the data center. The onsite team will identify the area of problem and define problem severity into minor or major call. Call severity will be decided on basis of unit under suspect and impact on functions inside data center like - electrical power in DB, racks, cooling efficiency. Based upon this on site team will either manage to close the problem in case of minor alerts/alarms or In case of major alarms the team will raise an alarm over phone and email to OEM/Vendor with information to C-DAC /Host Institute designated team and O&M in-charge. O&M team will follow the Escalation matrix. The site team / OEM will identify problem area and will work towards resolution of problem.

11. Scheduled Maintenance

Bidder to submit the scheduled maintenance time along with frequency for the components.

12. Bidder has to submit and present the detailed plan of execution for Operation and maintenance activities including manpower deployment along with qualification details of manpower deployed at site.

ANNEXURE I – DECLARATION/CERTIFICATE FROM BIDDER

To:
Executive Director,
Centre for Development of Advance Computing,
Pune – 411 008

Ref: Tender Ref. No: CDACP/NSM-20PF-DC/22-23/357

We hereby certify that the goods being offered by us vide our proposal, comply with the provisions of order No. Order No P-45021/2/2017-PP (BE-II), dated 4th June 2020 issued by Public Procurement Division, Department of Investment and Internal Trade, Ministry of Commerce, GoI, read with order number W-43/4/2019-IPHW- MeitY, dated 7th September, 2020 issued by IPWH division of MeitY, GoI.

We hereby certify the details pertaining to goods offered by us, as given below:

Sr. No	Item Description	Make & Model No.	Country of origin of OEM	Country of Manufacture of item	Country of Shipment	Percentage of Local contents, as per referred OM
1						
2						
3						
4						
x						

We also certify that, we are not from a country sharing land border with India as defined in order No. F/No/6/18/2019-PPD dated 23 July 2020 issued by public procurement Division, Dept. of Expenditure, Ministry of Finance, GoI and the goods offered by us comply with the provisions of said order.

For (Name of bidder)

Authorized Signatory
Name & Designation:
Mobile No:

Annexure J: Format of Agreement for Consortium

[On Non-judicial stamp paper of INR 1000 duly attested by notary public]

This Agreement executed into this day of [Date] [Month] [Year] at [Place]

M/s……..having registered office at…… acting through _____ (hereafter referred to as Consortium Member 1, which expression shall, unless repugnant to the context include its successors and permitted assigns) And M/s……having its registered office at……..acting through _____(hereafter referred to as Consortium member 2 which expression shall, unless repugnant to the context include its successors and permitted assigns) .

WHEREAS C-DAC, Pune, India has issued a Public Tender No: CDACP/..... Inviting Bids from interested Bidder for Selection of an agency for erection of Data Centre and for completion of allied building infrastructure under National Supercomputing Mission of GoI, as per terms and conditions stipulated in said tender.

AND WHEREAS we the Consortium members have had discussions and have decided for bidding for the above said Project and reached an understanding with respect to the Parties' rights and obligations towards each other and their working relationship.

Thus, on the basis of the mutual understanding the Consortium members inter se, we agree as follows:

A. M/s. (Name of Consortium Member 1) is nominated and authorised to act as the Principal Member for this bid

B. M/s. (Name of Consortium Member 1)) will submit the bid on behalf of both the consortium members.

C. In case of award of Contract, Ms. (Name of Consortium Member 1) will sign the Contract towards implementing and completing the activities pertaining to Data Centre and allied civil work, on the terms and conditions broadly stipulated in said tender document.

D. M/s. (Name of Consortium Member 1) shall be solely responsible and bound towards C-DAC for the performance of the works in accordance with the terms and conditions of the tender document and Contract. M/s (Name of Consortium Member 2) shall support M/s (Name of Consortium Member 1) in successful implementation of the objectives.

E. M/s. (Name of Consortium Member 1) shall act as the coordinator of the Consortium's combined activities and shall carry out the following functions: i. To ensure the Technical, Financial and administrative co-ordination of the Project work and the services to be rendered in relation thereto ii. To lead the contract negotiations of the Project work with C-DAC. iii. The Principal Member for this tender is authorized to receive instructions and incur liabilities for and on behalf of Consortium and all other Consortium Members. iv. In case of an award, act as channel of communication between C-DAC and the other members of Consortium v. Entire execution of the contract including coordination for payments shall be carried out exclusively through the principal Member. g. The Principal Member shall be responsible for the successful completion of the Contract / Agreement and C-DAC shall be

communicating with the Principal Member for all necessary actions. h. That we all the Consortium members shall carry out their responsibilities jointly and severally in terms of the Contract. i. That the broad roles and the responsibilities of each Party during implementation of Contract shall be as below:

Name of Consortium Member 1: _____

Name of Consortium Member 2: _____.

That the Consortium agreement shall be valid during the entire currency of the contract including the period of extension if any and the maintenance period after the work is completed.

We affirm that we will implement the Project in good faith and take all necessary steps to see the Project through expeditiously.

That no member of the Consortium shall have the right to assign or transfer the interest, right or liability in the contract without the written consent of the other members and C-DAC in respect of the said tender/contract.

Once the tender is submitted, the Consortium agreement shall not be modified /altered /terminated during the validity of the tender.

That this Agreement shall be governed in accordance with the laws of India and courts in..... shall have exclusive jurisdiction to adjudicate disputes arising from the breach of the same.

In witness thereof I on behalf of M/s (Name of Consortium Member 1) and M/s (Name of Consortium Member 2) have executed this Agreement on the date and year above mentioned.

Authorised Signatory of M/s (Name of Consortium Member 1)

Authorised Signatory of M/s (Name of Consortium Member 2)

Witness:

Witness

MANDATORY ANNEXURE (Declaration/Undertaking- As per below Notification)

F.No.6/18/2
019-PPD

Ministry of Finance
Department of
Expenditure Public
Procurement
Division

(Dt. 23 July 2020)

Restrictions under Rule 144(xi) of the General Financial Rules (GFRs) 2017

Annex I: Competent Authority and Procedure for Registration

A. The Competent Authority for the purpose of registration under this Order shall be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT)*.
B. The Registration Committee shall have the following members*:
   i. An officer, not below the rank of Joint Secretary, designated for this purpose by DPIIT, who shall be the Chairman;
   ii. Officers (ordinarily not below the rank of Joint Secretary) representing the Ministry of Home Affairs, Ministry of External Affairs, and of those Departments whose sectors are covered by applications under consideration;
   iii. Any other officer whose presence is deemed necessary by the Chairman of the Committee.
C. DPIIT shall lay down the method of application, format etc. for such bidders as stated in para 1 of this Order.
D. On receipt of an application seeking registration from a bidder from a country covered by para 1 of this Order, the Competent Authority shall first seek political and security clearances from the Ministry of External Affairs and Ministry of Home Affairs, as per guidelines issued from time to time. Registration shall not be given unless political and security clearance have both been received.
E. The Ministry of External Affairs and Ministry of Home Affairs may issue guidelines for internal use regarding the procedure for scrutiny of such applications by them.
F. The decision of the Competent Authority, to register such bidder may be for all kinds of tenders or for a specified type(s) of goods or services, and may be for a specified or unspecified duration of time, as deemed fit. The decision of the Competent Authority shall be final.
G. Registration shall not be granted unless the representatives of the Ministries of Home Affairs and External Affairs on the Committee concur*.
H. Registration granted by the Competent Authority of the Government of India shall be valid not only for procurement by Central Government and its

agencies/ public enterprises etc. but **also for procurement by State Governments and their agencies/ public enterprises etc. No fresh registration at the State level shall be required.**

I. The Competent Authority is empowered to cancel the registration already granted if it determines that there is sufficient cause. Such cancellation by itself, however, will not affect the execution of contracts already awarded. Pending cancellation, it may also suspend the registration of a bidder, and the bidder shall not be eligible to bid in any further tenders during the period of suspension.

J. For national security reasons, the Competent Authority shall not be required to give reasons for rejection / cancellation of registration of a bidder.

K. In transitional cases falling under para 3 of this Order, where it is felt that it will not be practicable to exclude bidders from a country which shares a land border with India, a reference seeking permission to consider such bidders shall be made by the procuring entity to the Competent Authority, giving full information and detailed reasons. The Competent Authority shall decide whether such bidders may be considered, and if so shall follow the procedure laid down in the above paras.

L. Periodic reports on the acceptance/ refusal of registration during the preceding period may be required to be sent to the Cabinet Secretariat. Details will be issued separately in due course by DPIIT.

* Note:

i. In respect of application of this Order to procurement by/ under State Governments, all functions assigned to DPIIT shall be carried out by the State Government concerned through a specific department or authority designated by it. The composition of the Registration Committee shall be as decided by the State Government and paragraph G above shall not apply. However, the requirement of **political and security clearance as per para D shall remain and no registration shall be granted without such clearance.**

ii. Registration granted by State Governments shall be valid only for procurement by the State Government and its agencies/ public enterprises etc. and shall not be valid for procurement in other states or by the Government of India and their agencies/ public enterprises etc.]

Annex III

Clause / Certificate to be inserted in tenders

Clauses for Tenders

I. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority.

II. "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in

any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.

III. "Bidder from a country which shares a land border with India" for the purpose of this Order means: -

a. An entity incorporated, established or registered in such a country; or
b. A subsidiary of an entity incorporated, established or registered in such a country; or
c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
d. An entity whose *beneficial owner* is situated in such a country; or
e. An Indian (or other) agent of such an entity; or
f. A natural person who is a citizen of such a country; or
g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above

IV. The beneficial owner for the purpose of (iii) above will be as under:

1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

   Explanation-

   a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent. of shares or capital or profits of the Company;

   b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;

2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;

4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;.

5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

V. An Agent is a person employed to do any act for another, or to represent another in dealings with third person.
1.

VI. [To be inserted in tenders for Works contracts, including Turnkey contracts] The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

Certificate for Tenders (for transitional cases as stated in the Order)

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I hereby certify that this bidder is not from such a country and is eligible to be considered."

Certificate for Tenders

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

Certificate for Tenders for Works involving possibility of sub-contracting

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

(End of Document)