Project: *Gopalpur Palm Resort –*

Swosti Group

Request for Proposal:

Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers and Allied Works - High Side HVAC System at Gopalpur Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam,

on

Item Rate Contract Basis

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INTRODUCTION

Background

Swosti Premium Ltd., a leading hospitality group in Odisha, the owner and developer of a hospitality project titled Gopalpur Palm Resort located at Gopalpur, Odisha(hereafter referred to as "The Client") is undertaking the development of a world-class hospitality destination under the brand **"Gopalpur Palm Resort"** at Gopalpur-on-Sea, District Ganjam, Odisha. The project envisions a premium coastal resort comprising a luxury hotel of B+G+9 storied building with 124+ keys, banquet and MICE facilities, restaurants, landscaped areas, spa & wellness, swimming pools, and associated amenities.

In pursuit of delivering a high-standard facility within a fixed timeframe, Swosti Premium Ltd. intends to select a reputed Original Equipment Manufacturer(OEM) for Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers and Allied Works - High Side HVAC System at Gopalpur Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam, on a **Item Rate Contract** Basis.-

Project Summary

Pkg. No.	Name of Work	Estimated Cost	Construction Period	Maintenance Period
01	Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers and Allied Works - High Side HVAC System at Gopalpur Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam,	₹225 Lakhs*	6(Six) Months	1 Year (DLP)+ 5 (Five) Years Paid

*Estimated Cost is exclusive of GST and based on current project planning and scope.

Scope of Work

The selected Bidder (hereafter referred to as the **"Contractor"**) shall be responsible for the following deliverables as per the terms of the Item Rate Basis contract:

- **Supply, Execution, Testing & Commissioning** based on issued GFC drawings
- **Procurement & Execution** of materials, manpower, equipment, and tools
- **MEP related facilitation with Civil Contractor in Coordination** with PMC as per client-appointed agencie's requirement.

PREAMBLE

1 The work shall be carried out strictly in compliance with this tender and design requirement. The onus of demonstrating satisfactory performance of entire system shall be sole responsibility of the contractor and supplied material shall be as per specifications and approved shop drawings. Relevant Indian Standards shall be adhered. It is to be understood that all liabilities and risks arising out of the stated conditions of contract shall be covered by contractor and Owner/Consultant shall be indemnified.

2 The unit rate for all items in the BOQ shall be quoted in Indian Rupees (INR) and include cost of equipment, wastage, accessories, tools, appliances, labour, installation, testing & commissioning upto satisfactory handover.

3 The contractor shall ensure that unit price of each item includes cost of Equipment, materials, fixing accessories, appliances, tools, plants, transport, labour and incidentals required in preparation for and in the full and entire execution, testing, balancing, commissioning and completion of work called for in the item and as per Specifications and Drawings.

4 The contractor to ensure that all waste and debris is collected and satisfactorily disposed off from site.

5 The contractor shall ensure that unit price of each item includes loading, transporting, unloading, handling/double handling, hoisting to all levels, setting, fixing in position and insurance upto satisfactory handover including security.

6 The specifications and drawings shall be read in conjunction to the Bill of Quantities. In case of conflict between Bill of Quantities and other documents including the specifications, the most stringent shall apply. The interpretation of the Architect / Consultant /Project Manager shall be final and binding

7 The quantities mentioned in the BOQ are for contractor guidance only.The actual procurement of material shall be done only after written approval of shop drawings & technical submittals. This shall also apply to the Contractor's requisition for Owner supplied materials. The contractor shall be solely responsible for material supplied at site.

9 The contractor shall ensure work is carried out in conformity with the approved shop drawings and taking cognizance of latest architectural and other displine drawings. The execution at site should be based on coordinated shop drawings or after obtaiing written approval of Project Manager/Architect/Consultant.

10 The progress of work shall be in accordance with approved pert chart which will be prepared by Contractor at the time of award of work and duly revised from time to time.

11 All shop drawings will be made on Autocad or Revit as per Project Manager requirement. Coloured prints shall be provided for site work. The shop drawings will clearly indicate requirement of hangars, supports, quantities and instructions for installation.

12 The information contained in this bid document, or any other information subsequently provided to Bidders—whether verbally, in documentary form, or by any other means—by or on behalf of the Client or any of its employees or advisers, is provided to the Bidders on the terms and conditions set out in this bid and such other terms and conditions subject to which such information is provided.

13 This bid document is not an agreement, nor is it an offer or invitation by the Client to any prospective Bidder or any other person. The purpose of this bid is to provide interested Bidders with information that may be useful in formulating their Proposals pursuant to this bid process.• This document includes statements that reflect various assumptions and assessments made by the Client in relation to the Services. Such assumptions, assessments, and statements do not purport to contain all the information that each Bidder may require. This bid may not be appropriate for all persons, and it is not possible for the Client, its employees, or advisers to consider the objectives, technical expertise, and particular needs of each party who reads or uses this bid.

14 The assumptions, assessments, statements, and information contained in this document may not be complete, accurate, adequate, or correct. Each Bidder should therefore conduct its own investigations, analysis, and due diligenG.M(B D),Swosti Premium Ltd and should check the accuracy, adequacy, correctness, reliability, and completeness of the information contained in this

bid and obtain independent advice from appropriate sources. Information provided in this bid to Bidders covers a wide range of matters, some of which depend on interpretations of law. The information provided is not an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The Client accepts no responsibility for the accuracy or otherwise of any interpretation or opinion on the law expressed herein.

15 The Client, its employees, and advisers make no representation or warranty and shall have no liability to any person, including any Bidder, under any law, statute, rule or regulation, or under the principles of tort, restitution, or unjust enrichment, for any loss, damage, cost, or expense which may arise from or be incurred or suffered on account of anything contained in this bid or otherwise, including the accuracy, adequacy, correctness, reliability, or completeness of this document, or any assumption, statement, or information contained in or deemed to form part of this bid, or arising in any way in this selection process.

16 The issuance of this bid document does not imply that the Client is bound to select any Bidder for the provision of the Services, and the Client reserves the right to reject all or any of the Proposals without assigning any reasons whatsoever. •The Client may, in its absolute discretion—but without being under any obligation to do so—update, amend, or supplement the information, assessment, or assumptions contained in this bid.

17 The Bidder shall bear all its costs associated with or relating to the preparation and submission of its Proposal, including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by the Client, or any other costs incurred in connection with or relating to its Proposal. All such costs and expenses shall remain with the Bidder, and the Client shall not be liable in any manner whatsoever for the same or for any other costs or expenses incurred by a Bidder in the preparation or submission of the Proposal, regardless of the conduct or outcome of the selection process.

Swosti Hotels
(A Unit of Swosti Premium Ltd.)
Corporate Office: Swosti Premium,
Jaydev Vihar, Bhubaneswar – 751013, Odisha
Email: info@swostihotels.com
Website: www.swostihotels.com

File No.: PMC/SPL/GPR/2025/01
Letter No.: 002 / Gopalpur, Date: 10th March 2026

LETTER OF INVITATION

Swosti Premium Ltd, on behalf of Gopalpur Palm Resort (A Unit of Swosti Premium Ltd), invites sealed bids for the Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers and Allied Works - High Side HVAC System at Gopalpur Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam, on a Item Rate Contract Basis for selection of a qualified agency to whom the project may be awarded.

The bid documents will be made available from 10.04.2026 10.00 am IST to 27.04.2026 5 pm IST at designated link or upon request physically from Swosti Corporate Office, Bhubaneswar or through official mail ID .Bid document can be downloaded from the website - https://www.swostihotels.com/tenders.html

The completed proposals shall be submitted in hard copy (physical submission) at the address specified in the bid document no later than 3:00 PM on 28.04.2026.

Three days before the scheduled Pre-Bid Meeting the intending bidders are requested to visit the site for accessing bid document and submit their queries in written form via their official mail ids or through registered postal service addressed to Swosti corporate office.

The Pre-Bid Meeting will be held on 17.04.2025 at 11.00 AM via Zoom/Physical mode. Meeting link/Venue shall be shared subsequently.

All received proposals will be opened at 4:00 PM on 28.04.2026 in the presence of authorized representatives of the bidders (not mandatory), at the venue communicated via email.

Swosti Premium Ltd reserves the right to reject any or all bids without assigning any reason thereto and shall not be liable for any costs incurred by bidders in the preparation or submission of proposals.

All subsequent corrigenda, clarifications, or updates (if any) will be circulated through official communication only via:

manoj@arkitechno.com

pmc.swosti@arkitechno.com

Gopalpur Palm Resort

(A Unit of Swosti Hotels)

gm.communications@swostihotels.com

Swosti Premium Ltd. Gopalpur Palm Resort Project,Gopalpur,Ganjam

DATED: 10.04.2026

DETAILED TENDER NOTICE

1. Last Date & Time of issue of tender documents from 10.04.2026 to 27.04.2026
2. Last Date & Time of receipt of tender 28.04.2026 upto 3.00 p.m.

G.M(B D),SWOSTI PREMIUM LTD Swosti Premium Ltd ,Bhubaneswar on behalf of Swosti Premium Ltd invites sealed item rate tenders from eligible contractors for similar works.

Name of work: **Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers and Allied Works - High Side HVAC System at Gopalpur Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam,**

Estimated cost of work put to tender : Rs. 225 Lacs
Time of completion : 6 Months

Earnest Money Deposit: **Rs. 2,25,000/- (Rupees Two Lacs Twenty Five Thousand only)** is to be submitted with tender document as earnest money. The above payment shall be made in the shape of deposit at pay order/demand draft of a scheduled bank issued in favour of **Swosti Premium Ltd payable** at New Delhi.

Works to be completed in coordination with the main Civil & MEP Interior works contractor. No extra for non-availability of fronts or coordination with main agency shall be payable on account of the same.

Tender documents can be downloaded from SWOSTI PREMIUM LTD website (www.Swosti Premium Ltd .ac.in) and submitted with non-refundable DD of **Rs. 11800/-** in favour of **Swosti Premium Ltd** as cost of tender.

1) The tenders shall be placed in sealed envelopes with a name of work and due date written on the envelope and addressed to the G.M(B D),SWOSTI PREMIUM LTD SWOSTI PREMIUM LTD. Complete tender documents shall be submitted by the approved contractors in **two envelopes**. **1st envelope** shall contain the earnest money in the shape of Demand Draft / Pay Order of a scheduled Bank requisite shape as per condition & eligibility criteria and cost of tender as stated above along with "Technical Bid " and supporting documents . The 2nd sealed envelop shall contain the "Financial Bid" . Both the sealed envelops shall be contained in another envelop , sealed and super scribed with the "Name of the Work", the name and detailed address of the bidder as well as contact phone number & e-mail id. This sealed envelop has to be submitted at designated place as indicated in the bid document.

2) The eligible contractors who have carried out similar works in Reputed Private Hotel Chain/Govt Deptts/PSU/Reputed Pvt sector /MNCs are to submit the experience certificates for the works and registration certificates with Govt. Depts. if any. The said certificates along with the EMD be

enclosed in Envelope-1.

3) Experience of having successfully completed similar works during last seven years ending on the 31.12.2025. **The Similar works shall mean works of Minimum 600 TR capacity Water/Air cooled screw chiller.** The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum calculated from date of completion to last date of receipt of tenders.

Three similar works not less than 40 % of est.cost	Rs 90.00 lacs each Or
Two similar works not less than 60 % of est cost	Rs 135.00 lacs each Or
One similar work not less than 90 % of est cost	Rs 202.50 lacs each

The work of similar nature should have been executed under Central/State/Autonomous/Central PSU/State PSU/local authority/Reputed Hotelier Group formed under any Act in Central/State .

4) **The bidder should be Original Equipment Manufacturer or authorized dealers of OEM and certificate/corroborative documentary evidences are required be submitted along with the bid.**

5) The applications not supported with requisite experience certificates, GST registration certificate and ITCC in Envelope-1 shall not be entertained

6) Solvency certificate for Rs. 90 lacs from any nationalized /scheduled bank. The applicant shall submit the solvency certificate, not older than six months prior to 30th September 2025, issued by any scheduled bank, in original.

7) Average Annual Turnover over HVAC works should be at least Rs 450 lacs during immediate last 3 consecutive financial years ending 31st Mar 2025.

8) Should not have incurred any loss in the more than two years in the last five years ending 31st Mar 2025.

9) Company should not have been barred / blacklisted for taking up similar work in any organization- A certification to this effect on the letter head of the bidder.

10) Performance certificates issued by past employers must be submitted by the

vendors for the works, in support of their experience.

11) Bidder shall furnish list of the supervisory persons and other technical persons he wishes to deploy in this job along with their experience details.

12) Letter of Authority for signing and negotiation of bid.

13) The 2**nd envelope** shall contain the financial bids including Priced Schedule of Quantities sealed,

14) The 1st envelop should contain Form of Tender, Conditions of Tender, Articles of Agreement, Brief Specifications, Condition of contract, Drawings

all duly signed by the authorized signatory of the firms.

1st and 2nd envelopes are to be put in a single envelope duly super-scribed the name of work, and addressed to G.M(B D),SWOSTI PREMIUM LTD and with their address. Incase the tenderer does not fulfill the laid down eligibility criteria or fails to deposit the earnest money in prescribed form, financial bid shall not be opened.

Tenderers shall seal the tender after affixing their initials and put stamp on each and every page of tender document before submission. The tender of the contractor, who submits in-complete tender document or submits more than one tender for one work, shall not be considered at all.

Tenders will be received by the **G.M(B D),SWOSTI PREMIUM LTD up to 3.00 P.M on 28.04.2026** and will be opened by him or his authorized representative in the office of Registrar, SWOSTI PREMIUM LTD on the same day at **4.00 P.M.**

First the Technical Bids will be opened and screened. The bids shall be examined whether the EMD is in order and the bidder meets the minimum eligibility criteria specified above. . Those bidders whose EMD is in order, meets the minimum eligibility criteria, has submitted all the required documents and meet the technical requirements shall be considered for opening of financial bid. Conditional tenders would not be accepted. Financial bids in respect of contractors who do not fulfill above criterion shall not be opened.

15) No Xerox / certified copies of tenders shall be accepted, if submitted these tenders shall be rejected.

16) **Pre- bid meeting** - A pre bid meeting will be held as on **17th April 2026** at 11.00 AM - Any doubts or queries of the potential bidders will be addressed during the hybrid meeting. Venue: Hotel SWOSTI PREMIUM LTD /Zoom Link.

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SECTION-1 INSTRUCTION TO BIDDERS (ITB)

1. The time allowed for carrying out the construction work will be 6 months from the 7th day after the date of written orders to commence the work.

2. The site for the work is available.

3. During execution of works, because of some unforeseen circumstances to enable him to complete the work as per terms of the contract, shall not relieve the contractor from any liability or obligations under the contract and he shall be responsible for the acts, defaults and neglects of any sub-contractor, his agents or workmen as fully as if they were the acts, defaults or neglects of the contractor, his agents or workmen.

4. The Contractor shall be required to deposit an amount equal to 3% of the tendered value of the work as performance guarantee in the form of an irrevocable bank guarantee bond of any scheduled bank or State Bank of India in accordance with the form prescribed or in the form of fixed deposit receipt etc. within 15 days of the issue of letter of acceptance. The performance guarantee shall have the validity up to 31st Jan 2027.

5. Tenderers are advised to inspect and examine the site and its surrounding at their own cost and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risk, contingencies and other circumstances which may influence or affect their tender. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed. The tenderer shall be responsible for arranging and maintaining at own cost all materials, tools and plants, water, electricity, access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contact documents. Submission of a tender by a tenderer implies that he has read this notice and all other contract documents and has made himself aware of the scope and specification of the work to be done, local condition and other factors having a bearing on the execution of the work.

6. The Accepting Authority -SWOSTI PREMIUM LTD does not bind himself to accept the lowest or any other tender and reserves to him/herself the authority to reject in whole or part, any or all of the tenders received without the assignment of any reason. All tenders in which any of the prescribed conditions are not fulfilled or for any condition including that of conditional rebate is put forth by the tenderer shall be summarily rejected.

7. Canvassing, whether directly or indirectly, in connection with tenders is strictly prohibited and the tenders submitted by the contractor who resort to canvassing will be liable to rejection.

8. The Accepting Authority reserves to himself the right of accepting the whole or any part of the tender and the tender shall be bound to perform the same at the rates quoted.

9. Tenders shall remain open for acceptance for a period of 60 days from the date of opening of the tenders. If any tenderer withdraws his tender before the said period for issue of letter of acceptance, whichever is earlier or makes any modification in the terms and condition of the tender which are not acceptable to the SWOSTI PREMIUM LTD , then SWOSTI PREMIUM LTD shall, without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely besides black listing of the tenderer.

10. The notice-inviting tender shall form a part of the contract document. The successful tenderer/contractor shall, sign the necessary contract documents consisting of the notice inviting tender, all the documents including additional conditions, specification and drawings, if any forming the tender as issued at the time of invitation of tender and acceptance thereof with any correspondence leading thereto within the time specified in the letter communicating the acceptance of the tender. In case of delay, the earnest money may be forfeited and the tender cancelled or the contract enforced as per the terms of the tender and the invitation to tender and the tenderer shall thus be bound by the condition of contract even though the formal agreement has not been executed and signed within the specified time by the tenderer.

11. The work shall be carried out as per general of conditions of contract (Tender Contract) and form part of the agreement/document.

12. Contract is liable to be terminated by the SWOSTI PREMIUM LTD without payment of any compensation, if subsequent to the acceptance of tender the contractor is black- listed by, or enters into partnership of any black listed contractor of the SWOSTI PREMIUM LTD or any other department, or Govt. or its, undertakings.

13. Cost of Bidding

    13.1 The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

14. Clarification of Bidding Documents

    14.1 A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing/mail at the Employer's address indicated in the invitation to bid not later than 7 days before the Date of Submission of Tenders. Email- **admin-project@Swosti Premium Ltd .ac.in**

15. Currencies of Bid and Payment

15.1 The unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees. All payments will be invariably made in Indian Currency (Indian Rupees.)

16. PROTECTION OF ENVIRONMENT AND OTHER LAWS:

The contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and other local Acts/ Laws/ rules made there under, regulations, notifications and bye-laws of local authorities or any other law, bye-laws, regulations that may be passed or notification that may be issued in this respect in future by the State/ Local authority.

17. Evaluation of Bids Received : Detailed at following section

For and on behalf of the
Swosti Group of Hotels, Resorts, Travels & Educations
GM Corporate Communications.
Cell- 9938244538
Email: gm.communications@swostihotels.com

Bid Data Sheet

Bid Identification No.: SWOSTI/GPR/TENDER/CCW/01/2026-27

The Swosti Premium Ltd., invites sealed, offline bids from reputed and experienced civil construction firms for the following work on lumpsum basis contract. Project details are as under:

Tender Summary

Sl. No.	Particulars	Details
1	Name of Work	**Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers- HVAC High Side and Allied Works at Gopalpur Palm Resort for Swosti Premium Ltd., Gopalpur, Ganjam, on a Item Rate Contract Basis**
2	Project Location	Plot No. 182/552/617 & 184/618, Khata No. 102 (AJA), Gopalpur-on-Sea, Ganjam District, Odisha
3	Nature of Contract	Item Rate Contract
4	Estimated Project Cost	₹225 Lalhs (Two Hundred Twenty Five Thousand Lakhs Only)
5	Time for Completion	06(Six) Calendar Months from date of LOA
6	Number of Packages	01 (One)
7	Eligibility	Reputed private sector entities having successfully completed similar scale works. **Relevant Project Experience must include**: •IT/Office Buildings •Commercial or Hospitality Projects
8	Cost of Tender Document	₹11,800/- (Including GST)(Non-refundable, to be paid via Demand Draft(DD) in favor of “Swosti Premium Ltd.”)- Including GST
9	Availability of Tender Documents	From 10.04.2025 to 27.04.2025 up to 5.00 PM –. a) From the Swosti Hotels website - https://www.swostihotels.com/tenders.html
10	Seeking Queries on RFP Document(Through email/Letter)	21.04.2025 upto 3:00 PM a) E-mail id. manoj@arkitechno.com b) Address : Swosti Hotels Corporate Office: Swosti Premium, Jaydev Vihar, Bhubaneswar – 751013, Odisha
11	Pre-Bid Meeting	17.04.2025 at 11:00 AM at Swosti Corporate Office, Bhubaneswar/Zoom Link in virtual mode
12	Last Date of Submission of Bids	28.04.2025 up to 3:00 PM (Sealed Envelopes at Swosti Corporate)

Sl. No.	Particulars	Details
13	Opening of Technical Bids	28.04.2025 at 4:00 PM in presence of PMC & Client
14	Technical Presentation (By technically qualified bidders)	Not Applicable
15	Opening of Financial Bids	Exact date and time shall be informed to qualified bidders atleast 48 hours of date of opening.
16	Mode of Tender	Offline, Physical Submission – Two Envelope System (Technical + Financial)
17	Bid Validity	90 Days from Last Date of Submission of Bids
18	Communication Email	manoj@arkitechno.com pmc.swosti@arkitechno.com

The bids must be submitted in hard copy (manual mode) in two separate sealed envelopes contained in another sealed envelope, marked clearly as “Technical Bid” and “Financial Bid”, mentioning the name and address of bidder, superscribed with title of work put to bids, along with all documents as prescribed in the bid document hereunder.

The client reserves the right to cancel the bidding process and/or reject any or all bids without assigning any reason there to. Corrigendum to bidding process/bid document if issued, subsequent to pre-bid meeting, shall be shared directly with bidders seeking clarification on or before pre-bid meeting/ participating in pre-bid meeting via email provided by them.

Authorized Signatory
Mr. Nihar Ranjan Sahoo, GM Corporate Communications.

Swosti Group of Hotels, Resorts, Travels & Educations

Cell- 9938244538

Email: gm.communications@swostihotels.com

Gopalpur Palm Resort Project
On behalf of Swosti Premium Ltd.

Evaluation Criteria

(Clause 1.1 of Instructions to Bidders – Gopalpur Palm Resort Project)

INTRODUCTION

- This Evaluation Criteria outlines the method by which bidders for the bids received will be evaluated based on their technical and financial qualifications, experience, project-specific understanding, organizational setup, and resource readiness.
- The evaluation will be conducted in accordance with the Instructions to Bidders (ITB) and is applicable to **Cover-I: Technical Bid**. Only those bidders who qualify under the technical evaluation will be considered for the opening and evaluation of their **Cover-II: Financial Bid**.

EVALUATION OF TECHNICAL BID (COVER-I)

The Technical Bid will be evaluated based on the following five main criteria:

Sl. No	Evaluation Criteria	Maximum Marks
a	Financial Strength	25
b	Experience in Similar Nature of Work	25
c	Working Methodology and execution of similar nature of work(DBR)	25
d	Key Personnel	25
	Total	**100**

Criteria/Sub-Criteria of TECHNICAL EVALUATION

Financial Strength – 25 Marks

Component	Max. Marks	Evaluation Basis
(i) Annual Financial Turnover (as per Bid Data Sheet)	20	70% marks for minimum eligibility criteria; 100% for twice the minimum. In between – on pro-rata basis.
(ii) Liquid Assets (as per Clause of Bid Data Sheet)	5	70% marks for minimum eligibility criteria; 100% for twice the minimum. In between – on pro-rata basis.

Experience in Similar Nature of Work – 25 Marks

Description	Max. Marks	Evaluation Basis
Completion of Similar Projects of Bid Data Sheet)	25	70% marks for minimum eligibility; 100% for twice the minimum. In between – on pro-rata

Description	Max. Marks	Evaluation Basis
		basis.

Methodology and Work Program – 25 Marks

Bidder shall submit a detailed Design Basis Report covering approach to execution of civil works.

Assessment will be based on content, specificity, and alignment to project needs.

Component	Marks
Technical Specifications for Materials & Workmanship	10
Project Execution Schedule / Work Programme	10
Approach & Methodology (project-specific)	5
Total	**25**

Key Personnel – 25 Marks

The following key personnel must be proposed and CVs submitted:

Position	Qualifications & Experience	Max. Marks	Evaluation Basis
Project Manager(1 No)	B.E./B.Tech Mech/Elect with 10+ years	15	Graduation (5), Experience (Exp. 10 yrs-7 , Higher - 10)
Site Engineer-HVAC (1 No)	B.E. with 3 yrs/Diploma with 7+ years in Mech	5	Graduation (2),Dip- (1), Experience (Exp. 7 yrs-2 , Higher - 3)
Site Engineer-Elect (1 No)	B.E. with 3 yrs/Diploma with 7+ years in Elect	5	Graduation (2),Dip- (1), Experience (Exp. 7 yrs-2 , Higher - 3)

GENERAL NOTES

- Bidders must furnish all necessary supporting documentation for substantiating the information.
- Only those bidders who score **70 marks or more (out of 100)** in Technical Evaluation shall be considered for opening of their “Financial Proposal”

Enhancement Factors for Past Financial Years (for Turnover/Experience Updating):

Year Before	Enhancement Factor
One	1.10
Two	1.21

Three	1.33
Four	1.46
Five	1.61

SECTION-2-FORMS & FORMATS

DOCUMENTS TO BE FURNISHED BY BIDDER

1. Documents as specified in Section 1, must be submitted by the Bidder in the Formats mentioned in Section 2 along with the BID.

2. Any other document, if asked by Employer for clarification during evaluation, shall be submitted by the bidder.

CHECKLIST OF DOCUMENTS TO BE SUBMITTED IN TECHNICAL BID

	Criteria	**Document to be submitted**	**Submitted (Yes/No)**
1	Cost Of Bid Document	DD/BC	
2	EMD/ Bid Security -	In the form of BG/Bid Security fee deposit details.	
3	Written power of attorney of the signatory of the Bid to commit the Bidder(If any)	Copy of power of attorney	
4	Whether Indian firms (Y/N)	Certificate of Incorporation	
5	OEM firms with proven track record of execution of similar HVAC Projects in IT buildings, commercial complexes, hospitality projects, or high-rise structures (G+9 or above).	Relevant Certificate	
6	Constitution or legal status of Bidder	Incorporation Certificate, Partnership Deed, Trade License, MoA, AoA	
7	Place of registration	Qualification Information	
8	Principal place of business	Qualification Information	
9	Major items of construction equipment proposed to carry out the Contract	Invoices of equipment / Lease agreement/Letter of Commitment	
10	Qualifications and experience of key site management and technical personnel proposed for the Contract	Detailed CV	
11	Reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past five financial years	CA Certificate along with Audited Financial report for the relevant Financial Years	
12	Evidence of adequacy of working capital for this contract [access to line (s) of credit and availability of other financial resources]; Liquid assets and / or availability of credit facilities	Banker's certificate	
13	Authority to seek references from the Bidder's bankers	Bankers Details	

14	Information regarding any litigation or arbitration resulting from contracts executed by the bidder in the last five years or currently under execution	List of Litigation, if any	
15	Methodology & Programme.	To be submitted	
16	Bids from Joint venture - Bids from Joint ventures / Consortiums / Association of Parties are not acceptable	NA	
17	Annual minimum turnover	Turnover from HVAC Construction works certified by chartered Accountant	
18	The Firm should demonstrate making profit	CA/ Statutory auditor certificate	
19	Should have valid PAN and GSTIN	Scan copy of valid PAN and GSTIN	
20	Experience of successful completion of works / substantial completion of works (90% of the value of the contract to be considered as substantial completion) as referred in Bid Data Sheet C l.2.3).	Completion Certificate from Competent Authority mentioning all the details as per Bid Data Sheet/TDS Certificate for Pvt Sector Project	
21	Bid Validity Undertaking	Undertaking	
22	Affidavit	Affidavit by the bidder duly signed by the Notary Public and as specified in Section 2,	
23	Design Basis Report	NA	
24	Certificate of No Relationships	As per format given in Section-2 of the tender document	
25	Information Regarding Any Conflicting Activities and Declaration Thereof	As per format given in Section-2 of the tender document	
26	Proposal for Sub-Contract	To be mentioned	

Undertaking by Tenderer

I/We have read and examined and understood the notice inviting tender, schedules, Specifications applicable, drawings & Designs, General Rules and Directions, Conditions of Contract, clauses of contract, special conditions, & all other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I / We hereby tender for the execution of the work specified for the SWOSTI PREMIUM LTD within the time specified in schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in General Rules and Directions and Conditions of contract and with such materials as are provided for, by, and in respect in accordance with, such conditions so far as applicable.
We agree to keep the tender open for Ninety (90) days from the due date of its opening and not to make any modifications in its terms and condition.
A sum of Rs.....……Rupees…… ……..)
has been deposited in demand draft of a scheduled bank issued by a scheduled bank as earnest money. If I / we, fail to furnish the prescribed performance guarantee within prescribed period, l / we agree that the said G.M.(BD), SWOSTI PREMIUM LTD or his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if l / we fail to commence work as specified, I / we agree that Director, SWOSTI PREMIUM LTD or his successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered, up to maximum of the 25 percentage and those in excess of that limit at the rates to be determined in accordance with the terms of contract. Further, I / We agree that in case of forfeiture of earnest money or both Earnest Money & Performance Guarantee as aforesaid, I / We shall be debarred for participation in the re-tendering process of the work.

I / We hereby declare that I / we shall treat the tender documents drawings and other records connected with the work as secret / confidential documents and shall no communicate information / derived there from to any person other than a person to whom I / we am / are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Dated. . . . .
Witness: Signatures of Contractor
Address: Postal Address
Occupation:

LETTER OF SUBMISSION

The GM Corporate Communications.
Swosti Group of Hotels, Resorts, Travels & Educations
Cell- 9938244538
Email: gm.communications@swostihotels.com
Gopalpur Palm Resort Project
On behalf of Swosti Premium Ltd

Sir,

.I/We, the undersigned, have read and examined in detail, the HVAC specifications and all bidding documents and hereby declare that:

Price and Validity

1. All the rates quoted in our proposal are in accordance with the terms and conditions as specified in the bid document. All the prices and other terms and conditions of this proposal are valid for a period of 90 calendar days from the date of opening of bid.
2. We do hereby confirm that our bid prices include all taxes/levies. GST indicated separately.
3. We hereby declare that if any tax law is altered, we shall pay the same.
4. The quoted rates are inclusive of ESI , PF and Green Tax no extra on such heads would be payable on such account.

Earnest Money

We have enclosed EMD in the form of demand draft no…..... , dated……..favoring Swosti Premium Ltd. payable at Bhubaneswar issued / drawn on … Bank for Rs.__/- (Rupees ___Thousand only), as desired.

Deviations

We declare that all the works shall be performed strictly in accordance with the technical specifications and other tender conditions with no deviations.

Qualifying Data

We confirm that all information/data have been submitted as required in tender document.

We hereby declare that our proposal is made in good faith, without collusion for fraud and the information contained in the proposal is true and correct to the best of our knowledge and belief. I/We agree that in case any information is found to be incorrect the tender is liable to be rejected at any point of tendering process.

Bid submitted by us is properly sealed and prepared so as to prevent any subsequent alteration and replacement.

We understand that you are not bound to accept the lowest or any bid you may receive.

Thanking you,
Yours faithfully,
(Signature and seal of Tenderer with name, designation and contact no.)

NON-BLACK LISTING DECLARATION

FORMAT OF UNDERTAKING, TO BE FURNISHED ON COMPANY LETTER HEAD WITH REGARD TO BLACKLISTING/ NON- DEBARMENT, BY ORGANISATION

UNDERTAKING REGARDING BLACKLISTING / NON – DEBARMENT

To,
SWOSTI
PREMIUM LTD
Bhubaneswar

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

Signature of Contractor

With stamp

.

GENERAL INSTRUCTIONS FOR SITE *VISIT*

I, , aged years, son/daughter of , presently residing at and authorized by (name of tenderer) ("Tenderer") to solemn this affidavit on behalf of the Tenderer, solemnly affirm on oath as hereunder:

The Tenderer confirms that the Tenderer has duly undertaken the visit of the proposed project site of SWOSTI PREMIUM LTD located at Gopalpur ,Ganjam

The Tenderer has inspected and examined its surroundings and has satisfied itself about the site conditions and site logistics. The Tenderer confirms that it is aware of the ground conditions and nature of the site, means of access to the site and the accommodation area required for establishing the labour camp. The Tenderer agrees and confirms it shall be solely responsible for arranging and maintaining the afore- mentioned at its own cost including all materials, tools & plants, water, electricity, access, facilities for workers and all other services required for executing the Work unless otherwise specifically provided for in the contract documents.

The Tenderer confirms and agrees that the submission of the tender implies that the requisite site visit has already been undertaken and that the Tenderer has acquainted itself with the local conditions and other factors having a bearing on the execution of the Work.

DEPONENT VERIFICATION

I, , aged years, son/daughter of , presently residing at and authorized by Tenderer verify that the information mentioned above is true and correct to the best of my knowledge and belief.

DEPONE

LETTER OF ACCEPTANCE

(To be issued to the successful bidder on the letterhead of Swosti Premium Ltd.)

[Date: _____]

To,
[Name and Address of the Contractor]

Subject: Letter of Acceptance for Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers and Allied Works at Gopalpur Palm Resort for Swosti Premium Ltd., Gopalpur, Ganjam, on a Lump sum Contract Basis)

Dear Sir(s),

This is to notify you that your Bid dated _____ for execution of the following work on a Lumpsum basis:

"Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers and Allied Works at Gopalpur Palm Resort for Swosti Premium Ltd., Gopalpur, Ganjam, on a Lump sum Contract Basis)"

for the Contract Price of Rs. _____ (Rupees _____ only), as corrected and modified[1] in accordance with the Instructions to Bidders, is hereby accepted by Swosti Premium Ltd.

We note that as per your bid,
☐ You do not intend to subcontract any component of work
or
☐ You propose to employ [Insert Name of Sub-Contractor] as sub-contractor for executing [Insert Work Component]
(*Delete whichever is not applicable*)

You are hereby requested to furnish a detailed Work Programme along with milestone-wise activity chart and cash flow forecast (S-curve) as per the Bid Data Sheet within 14 (fourteen) days from the issue of this Letter of Acceptance (LoA).

Further, you are required to furnish the Performance Security as specified in the Bidding Documents for an amount of Rs. _____, in the form prescribed, within 21 (twenty-one) days of receipt of this Letter of Acceptance.

Failure to comply with the above conditions may result in actions as specified in Clause 23 and 24 of the Bid Data Sheet.

We look forward to the successful execution of the project.

Yours faithfully,

_____
Authorized Signatory
Swosti Premium Ltd.
Bhubaneswar

NOTICE TO PROCEED WITH THE WORK

(To be issued on Letterhead of Swosti Premium Ltd.)

[Date: _____]

To,
[Name and Address of the Contractor]

Subject: Notice to Proceed – Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers-HVAC High Side and Allied Works at Gopalpur Palm Resort for Swosti Premium Ltd., Gopalpur, Ganjam, on a Lump sum Contract Basis)

Dear Sir(s),

Pursuant to your furnishing of the required Performance Security in accordance with Clause of Bid Data Sheet, and the execution of the Contract Agreement for the work titled:

"Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers-HVAC High Side and Allied Works at Gopalpur Palm Resort for Swosti Premium Ltd., Gopalpur, Ganjam, on a Lump sum Contract Basis"

at a Bid Price of Rs. _____ (Rupees _____ only), you are hereby instructed to proceed with the execution of the said works effective immediately, in strict accordance with the terms and conditions of the contract documents.

We trust that you will mobilize your resources promptly and commence the work at site without delay as per the agreed programme and milestones.

Wishing you a successful execution.

Yours faithfully,

_____
Authorized Signatory
Swosti Premium Ltd.
Bhubaneswar

PERFORMANCE BANK GUARANTEE

To
_____[name of Client]
_____[address of Client]

WHEREAS_____[name and address of Contractor] (hereafter called "the Contractor") has undertaken, in pursuance of Contract No.___ dated _____to execute _____[name of Contract and brief description of Works] (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligation in accordance with the Contract;
AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee:
NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, up to a total of___ [amount of guarantee]*_____(in words), such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of_[amount of guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.
We hereby waive the necessity of your demanding the said debt from the contractor before presenting us with the demand.
We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between your and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.
This guarantee shall also be operatable at our Branch at Bhubaneswar, from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

The guarantor/bank hereby confirms that it is on the SFMS (Structural Finance Messaging System) platform & shall invariably send an advice of this Bank Guarantee to the designated bank of Odisha Bridge & Construction Corporation Ltd details of which is as under:

Sl No.	Particulars	Details
1	Name of Beneficiary	Swosti Premium Ltd
2	Name of Bank	Union Bank Of India
3	Account No	128713100000061
4	IFSC Code	UBIN0578827

This guarantee shall be valid until 28 days from the date of expiry of the Defect Liability Period. Signature and Seal of the guarantor
Name of Bank _____ Address_____ Date _____

* An amount shall be inserted by the Guarantor, representing the percentage the Contract Price specified in the Contract including additional security for unbalanced Bids, if any and denominated in Indian Rupees.

BID SECURITY– Cover-IV

Bid Security (EMD): 8,50,000.00 INR

Affidavit (on Non-Judicial Stamp, attested by Notary Public)

Declaring authenticity of all submitted information and non-involvement in any corrupt or fraudulent practice.

Authorized Signature: _____
Name & Title: _____
Name of the Bidder: _____
Company Stamp/Seal

BANK CERTIFICATE

(To be issued by the Bidder's Bank on official letterhead and submitted by the Bidder in Cover-IV)

TO WHOMSOEVER IT MAY CONCERN

This is to certify that M/s. [Insert Name of Bidder] is a reputed company with good financial standing and banking conduct.

If the contract for the work, namely:

"Construction of Gopalpur Palm Resort – Core Civil Works (Lumpsum Package)"

is awarded to the above-mentioned firm, we confirm that we shall be in a position to provide overdraft / cash credit / fund-based credit facilities to the extent of:

₹ [Insert Amount in Figures and Words]

to meet their working capital requirements for executing the said contract.

Sl No.	Particulars	Details
1	Name of Beneficiary	Swosti Premium Ltd
2	Name of Bank	Union Bank Of India
3	Account No	128713100000061
4	IFSC Code	UBIN0578827

INFORMATION REGARDING ANY CONFLICTING ACTIVITIES AND DECLARATION THEREOF

(To be submitted on Bidder's Letterhead)

To,
The G M (B.D)

Swosti Premium Ltd.
Bhubaneswar

Subject: Declaration Regarding Conflicting Activities

Dear Sir,

I, the undersigned, hereby declare that our firm/company is not engaged in any activities that can be termed as conflicting in nature with respect to this tender for the project titled:

"Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers and Allied Works at Gopalpur Palm Resort for Swosti Premium Ltd., Gopalpur, Ganjam, on a Lump sum Contract Basis)"

I also acknowledge that in case of any misrepresentation or concealment of facts related to this declaration, our proposal and/or contract shall be liable for rejection/termination by the Client, and the decision shall be binding upon us without any claim whatsoever.

Authorized Signatory: _____
Name & Designation: _____
Name of the Bidder: _____
Stamp/Seal: _____
Date: _____
Communication Address: _____

Note:
Conflicting activities refer to any potential conflict of interest arising from prior, current, or proposed agreements, engagements, or affiliations with the Client that may impair the bidder's objectivity, integrity, or impartiality in the execution of the project.

AFFIDAVIT

[To be submitted by the bidder in a non-judicial stamp paper duly signed by the Notary Public]

1. I, the undersigned, do hereby certify that all the statements made in the required attachments are true and correct.

2. The undersigned also hereby certifies that neither our firm M/s…… … .....have abandoned any work on building in India nor any contract awarded to us by the State of Odisha for such works have been rescinded, during last five years prior to the date of this bid.

3. The undersigned hereby authorize(s) and request(s) any bank, person, firm or corporation to furnish pertinent information deemed necessary and requested by the Department to verify this statement or regarding my (our) competence and general reputation.

4. The undersigned understand and agrees that further qualifying information may be requested and agrees to furnish any such information at the request of the Department/ project implementing agency.

_____

Authorized Signature: Name & Title of Signatory:
Name of Bidder :

SECTION-3
BOQ,SPECIFICATIONS& TENDER DRAWINGS :

These Particular are to be read in conjunction with other documents issued along with tender. In case of any discrepancy between Design drawings, General conditions or Bill of quantity, Following order of preference shall be applicable.

- BOQ
- Specification
- Tender drawings

The contractor shall refer the tender drawings attached at end of this section.

The contractor shall refer the following annexure while bidding and will read them in conjunction with specifications as well as bill of quantity

Annexure - I : Design Criterion
Annexure -II : List of approved makes
Annexure -III : Codes and Standards
Annexure -IV : Technical Specifications
Annexure -V : Technical Data Sheets

ANNEXURE-I

DESIGN CRITERION

1.0 DESIGN CRITERION

Following shall be basis for developing the design:

Site Location	:	Gopalpur, Odisha
Geographical Data	:	20°15’ N, 85°49’ E
Altitude	:	46 m above the sea level

1.1 Outdoor Design Temperatures

The recommended outdoor design conditions for Bhubaneswar, (which is approximately 170 km from Gopalpur) mentioned in ISHRAE Weather Data Book-2022 has been selected

S. No.	Season	Outdoor Temperatures	
		DBT	WBT
1.	Summer	38.9 °C (102.02°F)	27.0 °C (80.6 °F)
2.	Monsoon	35.0 °C (95.0 °F)	30.1 °C (86.18 °F)
3.	Winter	14.1 °C (57.38 °F)	-

The outdoor temperatures are based on 0.4 % cumulative frequency of occurrence.

1.2 Envelope Details

Based on recommendations from ECBC for Warm-Humid zone, the minimum performance requirements are given below:

S No.	Description	Recommendation (Btu/Hr.Sqft °F)
1.	Exposed Masonry Wall	0.11
2.	Exposed Roof	0.05
3.	Window to Wall Ratio	As per design
4.	Glazing U-Value	0.50
5.	Glazing SHGC	0.27
6.	Spandrel	0.06

Annexure-II

(List of Approved Makes)

S. No	Equipment/Material	Approved Manufacturer Name
1.	Screw Water Chilling Unit with VFD	Daikin Carrier York Trane Kirloskar Climaveneta Dunham Bush Bluestar Kriscool
	With Automatic Tube Cleaning System	Energeo Ecomax
2.	Primary, Secondary chilled water pump & Condenser water Pumps	Xylem Armstrong Grundfos
3.	Pressurized Expansion Tank and Air Separator	Xylem Armstrong Grundfos Flamco
4.	Cooling Tower (CTI Certified)-Imported	Nihon Spindle Baltimore Evapco
5.	Ultrasonic BTU meter	Kamstrup Siemens Belimo
6.	BTU Meter	Omicron Kamstrup JCI

ELECTRICAL EQUIPMENT

S. No	Equipment/Material	Approved Manufacturer Name
1.	LT Panels	Adlec Control System Ambit Switchgear Pvt. Ltd. SPC Electrotech Neptunen Shivalik
2.	Air Circuit Breakers / Moulded Case Circuit Breaker	ABB Mitsubishi Siemens Schneider Electric L&T Legrand
3.	MCB/RCCB	Legrand Hager ABB Siemens

		Schneider Electric
4.	Motor Protection Circuit Breaker	ABB Mitsubishi Siemens Schneider Electric L&T Legrand
5.	Power/AUX Contractor	ABB Mitsubishi Siemens Schneider Electric L&T Legrand
6.	Control Transformer / Potential Transformers (Epoxy Cast Resin)	Automatic Electric Gilbert & Maxwell Matrix Kappa
7.	Indicating Lamps LED type	Schneider Electric Siemens ESBEE L&T
8.	Digital Meters	Schneider Electric L&T ABB Secure Neptune
9.	LT Cables	Polycab KEI Gemscab Grandlay CMI
10.	Termination kits	3M Raychem
11.	Double Compression Cable Glands with earthing links	Dowells Comet
12.	Bimetallic Cable Lugs	Cosmos Dowells Comet
13.	PVC Insulated Copper/Aluminium conductor wires and cables	RR Kabel KEI Finolex Batra Henlay Polycab
14	Protection Relay	ABB Siemens Schneider Electric L&T
15.	Overload Relays with built in Single Phase preventer	ABB Siemens Schneider Electric L&T
16.	Starter	ABB Siemens Schneider Electric L&T

ANNEXURE- III

PART LIST OF CODES & STANDARDS

The installation in entirety shall comply with latest codes/standards published by Bureau of Indian Standards (BIS) as well as local regulations from departments like Pollution Control Board, Electrical inspectorate, Fire Authorities, Airport Authority of India (AAI), High rise committee, Indian Electricity rules etc. Some of the standards are mentioned here below for reference:

ASHRAE Hand Books	Systems & Equipment 2024. Fundamentals 2023. Refrigeration 2022.
Application 2021.	
	ASHRAE Standard 62.1-2022. ASHRAE Standard 90.1-2022 ASHRAE Standard 55-2022 ASHRAE Standard 52.1 and 52.2
IEC	Energy Conservation Building code of India -2017 (BEE)
IS : 277 - 2003	Galvanized steel sheet (Plain & Corrugated) wire for fencing.
IS : 554 - 1985 (Reaffirmed 1999)	Dimensions for pipe threads where pressure tight joints are required on the threads.
IS : 659 – 1964 (Reaffirmed 2012)	Air conditioning (Safety Code)
IS : 660 – 1963 (Reaffirmed 2017)	Mechanical Refrigeration (Safety Code)
IS : 5133 - 1969 (Part-I) (Reaffirmed 1990)	Boxes for the enclosure of electrical accessories.
IS : 14772 - 2000	Guide for safety procedure and practices in electrical work.
IS : 5312 (Part-I) - 1984 (Reaffirmed 2004)	Swing - check type reflux Non return valves for water works
IS : 5578-1984 (R2016)	Marking and identification of conductors
IS : 11353-1985 (R2017)	Marking and identification of conductors
IS : 8623 Part 01 – 1993 (R2004)	Low voltage switchgear and control gear Assemblies (Requirement for type / partly type tested assemblies)
IS : 8828 – 1996 (R2006)	Circuit Breakers for over current protection For house hold and similar installation.
IS : 13947-1993 (Part-I)(R2004)	General rules for low voltage switch gears and control gears.

IS : 13947-1993 (Part-II) (R2004) IEC 947 - 2	Circuit Breakers
IS : 13947 - 1993 (Part-III) (R2004)	Switches, disconnector and fuse for low voltage switch gear and control gear.
IS : 13947 - 1993 (Part-IV) (R2004)	Low voltage switch gear and control gear for contactors and motor starters
IS : 13947 – 1993 (Part-V) (R2004)	Control Circuit Devices.

ANNEXURE-IV

TECHNICAL SPECIFICATIONS

1. WATER COOLED SCREW CHILLERS

The scope of work shall comprise of Supply, installation, testing & commissioning of water cooled screw chilling machines of the capacity indicated on drawings as well as Bill of Quantity. Each machine shall be fully assembled into a working refrigeration unit complete with all accessories including soft starter and supplied at site along with test certificates. The machine shall be commissioned at site during peak ambient conditions and prevailing peak loads in presence of manufacturer representative who will sign off the certificates. Factory witness test shall be required as detailed later in the specifications

1.1.1 Screw Compressor

Compressor may be hermetic or semi hermetic and single or twin rotary as per manufacturer specifications. The working pressure of compressor assembly shall be minimum 24 bar. The accessories shall include control valve with sliding mechanism, bearings, squirrel cage induction motor which is cooled through refrigerant gas, shut-off valves at suction & discharge, safeties not limited to high/low pressure cut-off as well as oil pressure alarm, check valve at compressor discharge, electronic expansion valve, muffler, temperature actuated 'off- cycle' heater, moisture indicator, over & under voltage protection and surge protection.

Both unit mounted electrical & control panels shall be housed in weather proof IP 54 protected enclosures. The machine shall be capable of operating in ambient temperatures ranging from 0°C to 50°C. Compressor shall start in unloaded condition.

1.1.2 Compressor Motor

The compressor motor shall be premium efficiency rated, two pole, squirrel cage induction type and capable of working on AC power supply of 415±10% volts, 3 phase, 50 hertz. In case of hermetic/semi hermetic machines, motors shall be cooled through suction gas. In open compressor machines, motors access shall be protected through a metal screen. The electrical terminal box shall be powder coated MS construction and capable of receiving suitably sized incoming aluminum cables. All terminal boxes shall be located at the same side of the motor and have terminal and cable glands suitable for the specified cables. In case of multiple compressors, distribution panel having one incoming and multiple outgoings (equal to number of compressors) along with cabling from panel to compressor motors shall be included.

The minimum required efficiency and power factor for machines at the specified power conditions is given below which is determined after taking into account losses such as independent excitation, motor-driven fans, lube-oil pumps etc.

Load	Efficiency	Power Factor
Full Load	96%	0.95
3/4	96%	0.95
1/2	96%	0.95

1.1.3 Starter

For constant speed chillers, the starter shall be unit mounted and either close transition star delta type or soft starter to ensure the starting current does not exceed twice the full load current at specified voltage and frequency. The maximum starting current shall be equal to full load current for VFD chillers. The starter shall be rated for 415 ± 10% volts, 50 hertz, 3 phase AC power supply.

1.1.4 Evaporator

The evaporator shell shall be constructed our of rolled carbon steel plate and welded to achieve uniform pressure rating. Water boxes shall be removable type to permit access for tube cleaning, service and replacement. Water boxes shall be designed for 150 psig working pressure and hydraulically tested at 1.5 times of working pressure. The tubes shall be copper with intermediate supports and as per manufacturer specification to achieve the specified capacity. An eliminator shall be provided to prevent liquid carry over to the compressor. The chiller shall be provided with a safety to prevent excess pressure build-up in the heat exchanger. In case of flooded evaporator, water velocity in tubes shall not exceed 12 fps. Evaporator shall be factory insulated with 38 mm thick nitrile rubber or cross linked poly- ethylene and permit operation of water boxes and removal of cover. Valves shall be included for drain & vent connections.

1.1.5 Water cooled Condenser (ASME)

The condenser shell shall be constructed our of rolled carbon steel plate and welded to achieve uniform pressure rating. Water boxes shall be removable type to permit access for tube cleaning, service and replacement. Water boxes shall be designed for 150 psig working pressure and hydraulically tested at 1.5 times of working pressure. The tubes shall be copper with intermediate supports and as per manufacturer specification to achieve the specified capacity. Valves shall be included for drain & vent connections.

1.1.6 Control Panel

Each machine shall be provided with LCD/LED screen with alphanumeric display in both SI & FPS units and English language. The display/control through the screen shall include (but not limited to) entering/leaving chilled water temperature, percent loading, start/stop, holiday/working schedule, remote reset, faults, cause of shutdown, sensor malfunction, low/high water temperature, low/high oil temperature, water flow interruption, power fault, evaporator/condenser refrigerant pressure, motor current, saturation temperatures; run hours, compressor starts etc. The screen shall be password protected. All reports including history shall be available in a printable form.

The control panel shall have both RS-232 and RS 485 port and interface with the Building Automation System (BAS). The control panel shall permit software integration and capable of providing Modbus/Lon Works/Bacnet protocol

1.1.7 Chillers with Variable Speed Drives

A variable speed drive shall be unit mounted and exactly same as per global catalogue. It shall vary the compressor motor speed by controlling the frequency and voltage of the electrical power to the motor. The adaptive capacity control logic shall automatically adjust motor speed and compressor pre-rotation vane position independently for maximum part-load efficiency by analyzing information fed to it by sensors located throughout the chiller.

Drive shall be PWM type utilizing IGBT's with a power factor of 0.95 or better at all loads and speeds. It must also employ harmonic filters to minimize current and voltage distortions. Harmonic filters shall be selected to provide THDi of 20% at drive terminal.

The variable speed drive shall be unit mounted in a NEMA-1 enclosure with all power and control wiring between the drive and chiller factory installed, including power to the chiller oil pump. Field power wiring shall be a single point connection and electrical lugs for incoming power wiring shall be provided.

The following features shall be provided : a door interlocked circuit breaker, capable of being padlocked; ground fault protection; over voltage and under voltage protection; 3 phase sensing motor overcurrent protection; single phase protection; insensitive to phase rotation; over temperature protection; digital readout at the chiller unit control panel of:

Output frequency
Output voltage
phase output current
Input kilowatts (KW) and Kilowatt-hours (KWH)

1.1.8 Performance

The chiller shall be capable of running satisfactorily upto 15% of full load and also receiving variable primary flow in the range of 100% - 40% atleast and must allow flow variation range of 30% per minute.

Parameters such as noise level, capacity and power consumption at different load conditions will be submitted for approval prior to supplying equipment at site and thereafter verified at the time of testing & commissioning. Capacity shall also be verified at site by manual measurement of chilled water flow rate and inlet/outlet water temperature. Power consumption shall be computed from measurements of incoming voltage & input current to the chilling machine.

Necessary testing equipment for demonstrating above parameters at site will be part of scope.

1.1.9 Factory Witness Test

Prior to shipment, one of the chilling machine shall be randomly subjected to factory performance test by Client/Consultant at AHRI certified test bed. Performance test shall be carried out as per procedure laid down by AHRI/Eurovent and as per actual design conditions specified in tender. Chilled water leaving temperature and condenser air entering temperature shall be kept constant to design value for partial load testing. Fouling factor shall be as per AHRI-550/590-2011 and compensation shall be provided as per Appendix-C of ARI- 550/590-2011.

There will be zero tolerance on design refrigeration capacity and guaranteed power consumption at these corrected set of conditions.

All expenses inclusive of business class airfare, boarding lodging etc. for two Client representatives relating to the witness test will be borne by the supplier.

1.2 Installation

The chilling machine shall be installed over a MS structure or cement-concrete foundation. Manufacturer shall include necessary vibration isolation mechanism to ensure there is no transmission of vibration to adjacent floors. Compressor and motor sole plates, anchor bolts and sleeves and necessary vibration isolation pads shall be included.

The machine shall be finished with final coat of spray paint. Paint that have scratched/damaged during shipment or erection shall be cleaned, wire brushed, spot primed and then coated with spray paint.

1.3 Automatic Tube Cleaning System

Automatic tube cleaning system shall consists of microprocessor controlled injection system (balls / stars, etc.). This system shall be part of chiller system and will not be separately indicated in SOQ.

Automatic tube cleaning system shall be designed for operation of 5 # chillers with single controller skid having 1 w pump and shall have individual ball trap and ball connector for each chiller. Control Panel having PLC Controller with Multi Colour Touch Screen HMI (Human Machine Interface) suitable for 415V, 50 Hz AC Supply. The control panel shall automatically generate ON/OFF signals as per the running status of chillers, controlling the electrically operated valves as per pre-determined program for periodic injection and collection of balls. Chiller ON status of chiller, alarm and faults in ATCS shall be monitored on the screen, with running description. HMI shall have complete ATCS graphics diagram on screen to readily check the status of ATCS operational stages at all times. Balls

injector nozzle at condenser inlet pipe of chiller.

ATCS having common Injection Cum Collection Pump. Pump/s shall be provided with Y strainer on the suction side and single on skid. All the pump motors must have following protections in control panel, a) Under Voltage, b) Over Voltage, c) Phase Loss and d) Phase Sequence.
The ball trap shall be mounted between two flanges - (BS Table 10 E) Grade B, 15 days 100 lbs. capacity, at the outlet line of the condenser. The casing shall be made from a MS material of IS2062 Grade B. The Ball trap shall have epoxy based finished paint. The screen inside is made from stainless steel SS304L perforated metal sheet.
Ball collector Hot dip Galvanized with SS304 Screen, removable sight glass, air vent and water drain connection with Ball Valve.
Sponge balls for circulation inside condenser tubes.
Automated electrically actuated motorized type control valve (Solenoid Valve shall not be used), actuators shall be protected against over loading. Incase Valve gets struck due to any reason, the actuator should make 5 attempts to open or close the valve, if valve is struck the actuator must trip without getting burned due to over loading., Each motorized valve shall be backed by a manual valve. manual ball valves and manual Butterfly Valves can be used wherever suitable.
Inter connecting piping including connection with the existing piping, interconnection pipes with welded joints including 2 coat of red oxide primer followed by 2 coats of painting, etc. complete, as required. (Note: If the number of chiller units in which Automatic Tube Cleaning System is to be provided are more than one, than ATCS suitable for maximum up to 5 chillers (connected to common condenser water supply and return headers), common Skid with common control panel for all such units shall be supplied.
Power failure: - Whenever power resumes the system will reset and will start operation from the first step, i.e. injection cycle of the first on chiller will be initiated irrespective of whatever may be the status of cycle before power failure.
Ideal Cycle:- During this cycle all the motorized valves shall automatically open and close once in every 24 hrs. to prevent deposition of scale inside those valves which are not in use for any reason for long time. During this cycle pump shall not operate.

1.4.ATCS shall have following features:
Fully automatic, no manual intervention required, with Manual Over ride facility. Chiller Bypass facility.
Cleaning is done on continuous basis online, according to the running status of chiller. Zero ball loss system, no balls can escape to cooling tower.
Ensures 100% clean tubes.

Automatically operate a cleaning cycle on the running chiller. Indicates number of cleaning cycles on individual chiller. Cleaning Sponge Balls would never come in contact with pump impeller. Also, should have IOT ready for compliant option for future scalability Manufactures features. Should have certificates like CE, RoHS, UL listed & ISO
Manufacturer should have pan India service setup to support spars & aftermarket supports for the product.

1.5 Chiller Plant Manager

Chiller plant manager has designed to sequence, optimize and controlling of chiller plant which includes chiller along with ancillary’s equipment such as pumps, cooling tower, etc.

Plant manager equipped with 10" Screen TFT colour display with 800*480; 65 k colours.
CPM has to control the Bypass modulating valve During Low delta T to ensure minimum water flow to the operating chiller.
CPM comprised of required inhibited input and output for controlling of the plant equipment's.
Through CPM chiller plant can be operated either auto or manual mode. In auto mode based on the designed logic chiller plant shall be operated. In manual mode user can command particular equipment's based on the requirements.
Each chiller have provision of Modbus RS-485/Bacnet/open protocol port output to providing system operating parameters for remotely monitoring/controlling via plant manager or BMS.

Individual chiller shall be assigned unique addressing among Modbus/Bacnet/open protocol network for providing communication interface to chiller plant manager. Chiller BTU meters are integrated with CPM by means of analog signals for monitoring.
Field motorized valves (chilled water, condenser water & Colling tower) are controlled by chiller itself.

Chiller Plant Manager / Sequencing Panel

Apart from unit mounted micro-computer / microprocessor control on each chiller unit, equipment sequencing / Plant manager panel shall be provided by EPC CONTRACTOR. Cabling from this panel to chilling unit panels shall be provided by EPC CONTRACTOR.

This panel shall carry out minimum, but not limited to, following functions.

Start and stop the plant in startup and shut down sequence for optimum plant performance
Sequence the operation of chillers, pumps and cooling towers (for water cooled system) so as to obtain.
Optimum Performance of each Chiller
Maximum Overall Life of the Plant
An Energy Efficient Plant Operation.
Load and Unload the Chillers to have optimum performance of Plant based on the return Chilled Water Temperature
Provide rotation of Chiller sequence by all modes viz.
An Operator Adjustable
Time & Date
External Input from BMS / PLC / DCS an Alarm shall be raised in case there is a problem in the current mode of rotation.
Give start and stop commands to the Chilled Water Primary Pumps as per Plant Operational requirements.
Give open and close commands to motorized valves (supplied and installed by CONTRACTOR) at outlet piping connections of chiller and condenser of individual chilling units.
Provide the operating status of the chilling plant, which shall include all points of individual chiller
Schedule the clock based operation of the chillers based on loading hours of plant
Vary the speed of the primary chilled water pumps based on the analog input signal received from remotely located differential pressure sensor cum transmitter.
Detect the failure of chiller, failure of reset
Communicate with the PLC / BMS / DCS panel of the client having required hardware protocol supplied by chilling unit EPC CONTRACTOR.

Communicate with individual micro-computer I microprocessor of each chilling unit
Record and contain the data of the plant operation, such that the history of plant operation could be retrieved through connected PLC / BMS / DCS to facilitate easy troubleshooting
Should have a facility of :
Programming all parameters that can be programmed in individual chilling unit.
Indicate all annunciations available in individual chilling unit.
Communicate all inputs to Building Automation System from individual chilling unit.
Chiller plant manager shall be responsible for control, operation and optimization of chiller & plant room equipment's. Vendor to present scheme with bid doc
Chiller plant manager shall be capable of handling variable primary feed system and shall include necessary accessories to run the system satisfactorily.
Chiller plant Manager shall be hooked up to BMS system by MODBUS RTU over RS 485 along with ON / OFF provision and shall be able to transfer all required data to BMS.

System Hardware: - The Chiller Plant Control System shall consist of the following hardware:

Chiller Gateway: - The BMS vendor should procure the gateway based on their protocol from chiller vendor.

Field - Mounted Microprocessor: - based chiller plant control panels MODBUS compatible Building Controller & PROGRAMMABLE CONTROL MODULES (Input/output controller). The Building controller shall reside on a BACNET / MODBUS RTU over RS 485. Each building controller shall perform routing to a network of Custom Application and Application Specific Controllers. The Building controller shall also be capable of residing on client's high speed network which supports Internet Protocol (IP). The Building Controller shall use the Read (Initiate) and Write (Execute) Services as defined in Clauses Motor and Cooler and Condenser, respectively, of ASHRAE Standard 135-95, to communicate with MODBUS objects. Objects supported shall include: Analog input, analogue output, binary input, binary output and device.

PC workstation as primary graphical operator interface for monitoring and control.

Operator Interface: - Work-stations shall be able to access all information available on the individual chiller microprocessor panel and all the points connected to the system. The work-stations shall reside on the same high speed network as the building controllers, and also be able to dial into the system.

System Applications: - Chiller control system shall provide following applications:

Chiller control system should provide control of system leaving water temperature by adding chillers as the building cooling load increases. It should also be able to calculate chilled water set point sent to each chiller. It should be able to optimize energy use by subtracting chillers when the cooling load does not require them to be enabled.

Provide runtime equalization and wear on each chiller by using different rotation schemes. Control System condenser and chilled water pumps and associated equipment attached to it. Add additional chiller based on:

System chilled water set point

System chilled water supply temperature.
The temperature subtract algorithm based on:

Actual System Delta T
System Design Delta T
Total Available Operating Capacity (tonnage)
The capacity available after next chiller is subtracted.

Allows operator to force an add or subtract request from the screen.

Specify chiller rotation type as:

Normal
Peak (last on - first off)
Base (first on - last off)
Swing (unevenly sized units)

Allow automatic rotation of sequence. Control soft loading when system supply temperature is far from set point.

Provide text description to assist the operator in understanding current chiller plant control operation and help to anticipate the next chiller plant control decision.

Alarm Processing: - Any object in the system shall be configurable to alarm in and out of normal state. The operator shall be able to configure the alarm limits, warning limits, states, and reactions for each object in the system.

Rend Logs: - The operator shall be able to define a custom trend log for any data in the system. This definition shall include interval, start-time, and stop-time. Trend intervals of 1, 5, 15, 30, and 60 minutes as well as once a shift (8 hours), once a day, once a week, and once a month shall be selectable.

Alarm and Event Log: - The operator shall be able to view all logged system alarms and events from any location in the system.

Reports and Logs: - Provide a reporting package that allows the operator to select, modify, or create reports. Each report shall be definable as to data content, format, interval, and date. Report data shall be archived on the hard disk for historical reporting. Provide the ability for the operator to obtain real time logs of designated lists of objects easily.

Custom Reports: - Provide the capability for the operator to easily define any system data into a daily, weekly, monthly, or annual report.

Standard Reports: - These reports shall be readily customized to the project by the owner.

ASHRAE Guideline 3 Report: - Provide a daily report that show the operating condition of each chiller as required by ASHRAE guideline 3.

Snapshot Reports: - When an equipment failure occurs, snapshot report should be triggered Showing operating conditions at five minutes intervals an hour before failure.

Chiller Status Report: - Provide an operating status report for each chiller. The report(s) shall provide the present status of all binary information and for analogue information present value, today' save rage, and the month to date average for the following information to provide the operator with critical chiller operating data.

Compressor On / Off Status.
Compressor Starts / Run Hours - Compressor A, B
Phase 1 / 2 / 3 Percent RLA - Compressor A, B
Passive Chiller Diagnostics or Alarms
Leaving Chilled Water Temperature
Entering Chilled Water Temperature
Water Heater Entering / Leaving Temperatures
Chilled Water Set point.
Condenser Fan Percent Airflow - Circuit 1, 2 (if Air Cooled)
Refrigerant Temperature Evaporator / Condenser - Circuit 1, 2
Operating Mode
Chiller Model and Serial Number
Percent RLA / Percent Current Limit
Outside Air Temperature
Zone Temperature (optional)

Diagnostics / Protection: - The BAS / BMS system shall be able to alarm from all sensed points and diagnostic alarms sensed by the chiller controller. Alarm limits shall be designated for all sensed points. Individual chiller diagnostic and alarm statuses shall include the following latching items for each chiller:

Leaving Evaporator Sensor Failure
Entering Evaporator Sensor Failure
Low Chilled Water Temperature`
Overload Trip - Compressor A, B, C, D
High Motor Temperature - Compressor A, B, C, D
Contactor Failure - Compressor A, B, C, D
High Oil Temperature - Compressor A, B, C, D
Oil Temperature Sensor Failure - Compressor A, B, C, D
Oil System Fault - Circuit 1, 2
Low Pressure Cut out - Circuit 1, 2
High Pressure cut-out - Circuit 1, 2
Solenoid Valve Failure - Circuit 1, 2
Phase Loss
External Interlock
Unit Controller

Individual Chiller Diagnostic & Alarm statuses shall include the following non-latching items for each chiller:

Entering Evaporator Sensor Failure
Outdoor Air Temperature Sensor Failure
Zone Temperature Sensor Failure
High Voltage
Low Voltage
Phase Reversal
Phase Imbalance.
Chiller Water Flow Interlock
Unit Communication Loss
Low Chilled Water Temperature (unit off)
Circuit 1 - Pump Down Timeout
Circuit 2 - Pump Down Timeout
Condenser Fan Variable Speed Drive Fault

Scheduling: - Provide the capability to schedule each object or group of objects in the system. Each schedule shall consist of the following :

Weekly Schedule Provide separate schedules for each day of the week.
Exception Schedules Provide the ability for the operator to designate any day of the year as an exception schedule.
Holiday Schedules Provide the capability for the operator to define up to [99] special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
Optimal Start / Stop The scheduling application outlined above shall support an optimal start/stop algorithm.

Remote Communications: - The system shall have the ability to dial out in the event of an alarm.

Maintenance Management: - The system shall monitor equipment status and generate maintenance messages based upon user designated run time, starts, and/or calendar date limits.

Chiller Sequencing: - Provide applications software to properly sequence the chiller plant to Minimize energy use.

Alarm Indications: - The chiller plant control status screens shall display chiller plant and individual chiller alarm messages.

PID Control: - A PID (proportional-integral-derivative) algorithm shall calculate a time-varying analogue value used

to position an output or stage a series of outputs.

Staggered Start: - This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started; along with the time delay between starts shall be user-selectable.

Anti-Short Cycling: - All binary output points shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.

Plant Manager / CSM should be with the following features
2.
No. of chiller units to be controlled : 3 Nos. each block
Management of hydronic units : Yes

User interface with display and commands : Yes
Touch screen, multi-language
Alarm Management: Yes
Management of stand-by, priority, rotation: Yes
Integration into BMS / BAS Systems: Yes
Compatibility with variable primary flow Systems: Yes

2.PUMPS

The scope of work shall comprise of Supply, installation, testing & commissioning of water application pumps of the capacity & type indicated on drawings as well as Bill of Quantity. The contractor shall submit Pump performance curves and power consumption with operating points clearly indicated in the technical submittal prior to supplying equipment to site.

Supply and install of Split Coupled (long coupled) Type Vertical In-Line Centrifugal pumping unit. The pumps shall be radially split, single stage centrifugal type with CI/GM casing with equal size suction and discharge flanges and having separate tapped flush line and pressure gauge connections, SS/ Bronze, Gunmetal Bronze (BS1400 LG2C) dynamically balanced impeller, stainless steel shaft, lower carbon throttle bushing, Outside Balanced type mechanical seal with Resin Bonded Carbon rotating face, Sintered Silicon Carbide stationary seat and Viton secondary seal.

The pump is to be fitted with a factory installed flush line. Supply in the flush line to the mechanical seal, a 50 micron cartridge filter (alternatively, a cyclone separator when pump differential pressure exceeds 30 PSIG) and floating ball type sight flow indicator suitable for the working pressure encountered. The mechanical contractor shall change the filters after the system has been flushed and on a regular basis until the pumps are turned over to the owner. The squirrel cage induction type motor, with TEFC enclosure and shall be connected to the pump through a high tensile aluminum, split type spacer coupling to permit Servicing of the mechanical seal without disturbing pump, motor or electrical wiring. Coupling shall be protected by a guard.

2.1 Variable Speed Pumping Package

The scope of work shall comprise of supply, installation, testing & commissioning of variable speed pumping package for water application pumps of the capacity & type indicated on drawings as well as Bill of Quantity. The contractor shall submit Pump performance curves and power consumption with variable speed curves as well as system curve duly indicating pump, motor & Variable Frequency Drive (VFD) efficiencies, project load profile, staging points, horse power and kilowatt/hour consumption. Sequence of operation shall also be indicated.

The pump manufacturer shall be ISO 9001 certified and listed by Underwriter's Laboratories (UL) as manufacturer of packaged pumping systems. The pump shall comply with specifications in earlier section of specifications. The variable speed pumping package shall comprise of Pump control panel, Pump controller, Variable Frequency Drive, Differential pressure transmitter (Min. 2 No. per zone), Software and associated power & control wiring. Low voltage wiring shall be included in the scope of the HVAC contractor.

The pumping package including pumps shall be sourced from the pump manufacturer who will be responsible for the complete package.

2.2 Pump Controller

The pump controller shall be responsible for controlling variable speed secondary chilled water pumps and specifically designed for this application. The controller shall safeguard against hydraulic conditions including flow surges, hunting, end of curve, system over pressure, motor overload etc. The controller shall receive analog inputs from various zone differential pressure transmitters and then control pump speed based on same. Each input signal shall be capable of maintaining a different set point value. Controller shall be capable of controlling all pumps installed in parallel. Additional analog input shall be available for a flow sensor which will serve as the criteria for the end of curve protection algorithm. The controller shall run on PID function and all messages shall be displayed in English language. An alpha-numeric LCD display with keypad shall be provided with indicating lights for faults.

The controller shall be integrated with BMS/Plant Manager on BACnet protocol with following minimum features:

Remote system start / stop non-powered digital input.
Failure of any component
Frequency
Output Current
Output power.
Individual Zone Set Points.
Individual Pump / VFD status.
Percent speed.

The controller shall be housed in IP 54 enclosure.

2.3 Differential Pressure Sensor/Transmitter

All sensors / transmitter inputs shall be individually wired to the pumps controller and necessary signal boosters shall be indicated in case of long length of cabling. All analog inputs shall be provided with current limit circuitry to provide short circuit protection and safeguard against incorrect wiring of sensors. Sensor shall have a corrosion resistant steel body with 1/8" NPT process connection with accuracy within 0.5% of full span.

2.4 Variable Frequency Drives

The VFD shall be microprocessor based, Pulse Width Modulation (PWM) type and UL tested. The VFD shall be housed in a IP 54 enclosure and capable of working in ambient temperature up to 50 Deg.C.

The VFD shall 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 lift. Power factor shall be near unity regardless of speed or load. The VFD shall have balanced DC link reactors to minimize power line harmonics. Input and output power circuit switching should be possible without interlocks or damage to the VFD. Manual operation of pump should also be possible though the keypad of VFD with following features:

i. Accel time.
ii. Decel time.
iii. Minimum Frequency.
iv. Maximum Frequency.

The VFD shall be capable of displaying the following information via an alphanumeric display:

i Reference % of control signal
ii. Frequency.

iii. Voltage
iv. Current
v. Kilowatts per hour
vi. Fault Identification.
vii. Percent Torque.
viii. Percent Power
ix. RPM
x. Fault indication

2.5 Sequence of Operation

The pumps shall start either in Auto or Manual mode as required. The pump controller shall continuously scan and compare each process variable to its individual set point and control to the least satisfied zone. If the set point cannot be satisfied by the designated lead pump, the pump controller shall initiate a timed sequence of operation to stage a lag pump. The lag pump shall accelerate resulting in the lead pump(s) decelerating until they equalize in speed. Further change in process variable shall cause the pumps to change speed together. When the set point criteria can be safely satisfied with fewer pumps, the pump controller shall initiate a timed de-stage sequence and continue variable speed operation. As the worst case zone deviates from set point, the pump controller shall send the appropriate analog signal to the VFD to speed up or slow down the pump / motor.

In the event of a VFD fault, the pump controller shall automatically initiate a timed sequence of events to start the redundant pump / VFD set in the variable speed mode. The redundant variable speed system shall be started through the pump controller.

In the event of the failure of a zone sensor / transmitter, its process variable signal shall be removed from the scan / compare program. Alternative zone sensor / transmitters, if available, shall remain in the scan / compare program for control.

In the event of failure to receive all zone process variable signals, a user selectable number of VFD shall maintain a user adjustable speed, reset shall be automatic upon correction of the zone failure.

2.6 Installation & Commissioning

All functions of the variable speed pump control system shall be tested at the factory prior to shipment. This test shall be conducted with motors connected to VFD output and it shall test all inputs, outputs and program execution specific to this application.

The system manufacturer through its trained representative shall provide commissioning support of the packaged pumping system. This shall include verification of proper installation, system initiation, adjustment and fine tuning. Commissioning shall not be considered complete until the sequence of operation, including all alarms, has been sufficiently demonstrated to the owner or owner's designated representative.

The contractor shall provide on-site training for owner's personnel. This shall also cover maintenance and operation training of all system components.

2.7 Suction Guide

Suction guides shall be provided and all the allied fittings shall be capable for PN-16 at 50 Deg C. suction guide and pump shall be sourced from same manufacturer for system better efficiency. The suction guide valve shall be angle for space savings.

Suction Guides (SGs) are installed on the suction side of pumps to protect against damage from debris and foreign matter, and optimize flow efficiency

The Suction Guide’s versatile 4-function design saves space and installation costs by incorporating 90 Elbow, Inline Strainer, reducing elbow & guide vane into a single solution. Following to comply :

Body : Carbon Steel

Strainer	:	SS, 3mm perforation
Start up strainer	:	Fine mesh GI
Guide vanes	:	Carbon steel
Cover Plate	:	Carbon Steel
Gasket	:	Synthetic Fibre
Max working pressure	:	PN 16
Max operating temp	:	300 Deg C

3. Expansion tank Pressurization Unit with Vacuum Degasser

Expansion, pressurization and Vacuum Degassing of the chilled water system to be provided by an integrated unit comprises of pressurized expansion tank, pressurization unit with stainless steel cylinder for effectively removing of dissolved gas by vacuum degassing function c/w state of the art digital controller, break tank all inside a compact cabinet.
The Expansion tank & pressurization unit shall be sized appropriate to the static height above the expansion tank (meters), total system volume, maximum ambient temperature, maximum allowable system pressure and safety relief valve settings and glycol content (%) if required.
The expansion tank shall be fitted with a replaceable high quality butyl rubber bladder/EPDM in accordance with DIN 4807-3, Nitrogen gas filling for longer maintenance of pre-pressure.
The pressurized expansion tank shall be cylindrical, In accordance with Pressure Equipment Directive 2014/68/EU. Tanks from (100 - 1000 liters): in accordance with EN13831 and from 1200 - 8000 liters: in accordance with AD2000.
Pressurization unit shall be manufactured and designed in accordance with European Pressure Equipment Directive PED 2014/68/EC and Machinery Directive 95/16/EC.
Expansion Tank shall have third party certificate (TUV / lloyds register).
The expansion tank shall have Red (RAL 3002) epoxy powder coating.
Tank shall be Suitable for addition of glycol-based anti-freeze up to 50%.
Tank shall be delivered with pressure gauge.
System pressure shall be regulated within ± 0.2 bar (2.9 psi) of the set pressure. High and low-pressure alarm setting shall be selectable by the user.
Maximum continual working temperature of the bladder shall be 70 °C (158 °F), and tank shall be Suitable for systems with a flow temperature of 120 °C.
The Pressurization unit shall have two pumps (Working+Standby) / duty standby housed in a steel cabinet with vacuum degassing cylinder of Stainless steel for removal of dissolved gas c/w WRAS Approved Polypropylene break tank, WRAS approved float valve, over flow connection, pressure sensor, solenoid valve, isolation Valve, NRV, Drain Valve.
The system shall have controller for pressurization as well as vacuum degassing function. The controller shall be IP54 rated, with bright LED display scrolling messages including pump operation and alarm mode, digital pressure setpoint with adjustable differential, and security password protection, High and low pressure alarm setting shall be selectable by the user. The Vacuum degassing function and pressurization function shall be programmable according to system requirement,
Pressure setting should be in 0.1 bar increments.
In case of any fault, controller shall display the fault code and generate the alarm
Auto resetting low water detection.
The unit shall be with MODBUS RTU Communication protocol.
The unit shall be with Pump pulse option, Flood Protection (Pump Runtime Limiter, Excessive Start Alarm). Event logging: Alarm activations, Pump Run counter (activations per pump), Cumulative run timer (hours per pump), Electrical interruption.
Volt free contacts should be available for Common Alarm, High Pressure Alarm, Low
Pressure Alarm, Sensor Health, Pump 1 Health, Pump 2 Health .
Factory should be conforming to ISO 14001:2015 and BREEAM. The product shall be installed according to the manufacturer's instructions using manufacturer's/distributors approved components.

3.1 Expansion tank with Pressurization unit and Top-up

Expansion & pressurization of the chilled water system to be provided by an integrated unit comprising of pressurized expansion tank, Pressurization unit, c/w Pump fittings and state of the art digital controller.
The Expansion tank shall be calculated according to the system expansion volume, static height above the expansion tank (meters), Glycol content (%) if required, maximum allowable system pressure and safety relief valve settings.
The expansion tank shall be fitted with a replaceable high-quality butyl rubber bladder in accordance with DIN 4807-3, Nitrogen gas filling for longer maintenance of pre-pressure.
Maximum continual working temperature of the bladder shall be 70 °C (158 °F); tank shall be suitable for system with a flow temperature of 120°C & addition of glycol-based anti-freeze up to 50%; Max. operating pressure shall be 6.0/10.0 bar.
Tank shall be delivered with pressure gauge (optional) and finish shall be with red epoxy powder coating.
Pressurization unit shall be manufactured and designed in accordance with Pressure Equipment Directive PED 2014/68/EU, and Electronic Components shall be tested and comply with the electromagnetic compatibility Directives EMC 2004/108/EC.
Pressurized expansion tank(s) shall be cylindrical, In accordance with Pressure Equipment directive 2014/68/EU. Vessels 100 - 1000 liters: in accordance with EN13831 and 1200 - 8000 liters: in accordance with EN13831/AD2000.
The Pressurization unit shall have one or two pumps enclosed in a mild steel cabinet c/w break tank of stainless steel having AB Air Gap Fluid Cat 5 Backflow protection utilizing a float valve, over flow connection, pressure Sensor, isolation Valve, NRV, Drain Valve, flood protection through pump run limit timer, MODBUS Communication output/and(or) BACnet communication protocol.
System pressure shall be regulated within ± 0.2 bar (2.9 psi) of the set pressure. High and low pressure alarm setting shall be selectable by the user.
System shall be digitally controlled comprises of IP54 rated controller, with bright LED display scrolling messages including pump operation and alarm mode, digital pressure setpoint with adjustable differential, and security password protection, flood limit or/shut down function in event of serious leak. In case of any fault controller shall display the fault code and generate the alarm
The unit shall be c/w solenoid valve as well as a safety relief valve for the tank protection.
Pressurization unit shall be factory assembled, shall be installed according to the manufacturer's instructions using manufacturer's approved components.

3.2 Expansion tank Pressurization Unit with Vacuum Degasser

Expansion, pressurization and Vacuum Degassing of the chilled water system to be provided by an integrated unit comprises of pressurized expansion tank, pressurization unit with stainless steel cylinder for effectively removing of dissolved gas by vacuum degassing function c/w state of the art digital controller, break tank all inside a compact cabinet.
The Expansion tank & pressurization unit shall be sized appropriate to the static height above the expansion tank (meters), total system volume, maximum ambient temperature, maximum allowable system pressure and safety relief valve settings and glycol content (%) if required.
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Drain Valve.
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Auto resetting low water detection.
The unit shall be with MODBUS RTU Communication protocol.
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Volt free contacts should be available for Common Alarm, High Pressure Alarm, Low
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Factory should be conforming to ISO 14001:2015 and BREEAM. The product shall be installed according to the manufacturer's instructions using manufacturer's/distributors approved components.

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The Pressurization unit shall have one or two pumps enclosed in a mild steel cabinet c/w break tank of stainless steel having AB Air Gap Fluid Cat 5 Backflow protection utilizing a float valve, over flow connection, pressure Sensor, isolation Valve, NRV, Drain Valve, flood protection through pump run limit timer, MODBUS Communication output/and(or) BACnet communication protocol.
System pressure shall be regulated within ± 0.2 bar (2.9 psi) of the set pressure. High and low pressure alarm setting shall be selectable by the user.
System shall be digitally controlled comprises of IP54 rated controller, with bright LED display scrolling messages including pump operation and alarm mode, digital pressure setpoint with adjustable differential, and security password protection, flood limit or/shut down function in event of serious leak. In case of any fault controller shall display the fault code and generate the alarm
The unit shall be c/w solenoid valve as well as a safety relief valve for the tank protection.
Pressurization unit shall be factory assembled, shall be installed according to the manufacturer's instructions using manufacturer's approved components.

repeated use. A washable aluminium mesh prefilter shall be provided at the inlet to trap all larger sized particles.

Filter cells shall be universal to allow for a single inventory of filters as spare parts.

4. COOLING TOWERS

Supply, erection, testing, performance assurance at the design conditions commissioning as per tender Drawing and

bill of quantities.

Type of Tower: Open circuit, Induced draft ,Counter flow.

Certification: For thermal performance CTI / JCI certification. The performance shall comply with CTI standard 201/ JCI- JIS B8609

Sound performance shall be in accordance with CTI ATC-128/ JIS-B8609

Heat rejection Performance shall be in accordance with ASHRAE 90.1- 2019

Seismic design requirements shall be in accordance with relevant provisions of IS Code/ National Building Code of India/ JCI.

The cooling towers shall have a design life of 15 years.

Constructional Feature of Cooling Tower

The induced draft cross flow FRP cooling tower shall be complete with FRP casing, fill, internal supporting structure, drift eliminators, fan, fan motor, hot water distribution system & cold water basin. All steel components including assembly hardware shall be hot dip galvanized (G-235 Grade). Suitable access shall be provided for the inspection & maintenance of fan. The design of louvers, fill & drift eliminators shall ensure minimum resistance to flow of air. The induced draft axial / propeller fan of the cooling tower shall be belt / direct driven by TEFC squirrel cage motor located inside/outside the moist air stream. The fill sheet includes both louvers and drift eliminators & the louvers should prevent water from escaping the fill sheets to assure proper & efficient heat transfer throughout wide variations in the airflow. Drift losses for the cooling tower should not be more than 0.005% of the circulated water. Suitable screens between the side of the cold-water basin & the base of the fill should be provided to prevent foreign materials in the circulating water flow & should be easily removable. The fan motor shall be suitable for 415 volts ±10%, 3 phases, 50 Hz ± 5%, AC supply conforming to IP 55.

Cold Water Basin

The cold-water basin shall be a deep fiber glass reinforced sump on which cooling tower structure shall be supported Basin fittings shall have the following.

Bottom Outlet.
Screened suction assembly fixed to the basin.
Drain at underside of suction, suction side sheet.
Overflow fixed to inside of casing side sheet.
Ball type automatic make-up water valve.
Equalizing connection & balancing valves for multiple CTs as required.
Quick Fill arrangements

Mechanical Equipment

The cooling tower shall be provided with low speed, low noise, and acoustically treated fans running at lower RPM through direct driven/ Belt driven motor. Fan shall be of the axial/propeller type lightweight rotor fitted with multiple aero foil blades. The entire fan assembly shall be statically and dynamically balanced. Fan shall be driven by TEAO motor suitable for 415 volts ±10%, 3 phases, 50 Hz ± 5%, AC supply conforming to IP 55. Fan motor shall be energy efficient motor weatherproof construction, designed and selected to operate in humid air stream. Fan guard shall be provided to prevent birds from nesting during idling periods. G.S.S canopy shall be provided over the fan motor for protection against rainwater. Care shall be taken that fan air is not restricted. Motor terminal box shall be made watertight.

VFD shall be provided for each motor if specified in BOQ.

Fillings:

The Fillings shall be made of corrosion proof and rigid film in cross fluted design and arranged in square / rectangular form and shall be elevated from the floor of the cold water basin to facilitate cleaning and easy replacement. They shall be arranged in such a manner to ensure negligible resistance to airflow and to eliminate backwater spots and prevent fouling trough scales that may form. In order to reduce carry-over losses through entrapment of water droplets in air stream, PVC drift eliminators shall be installed.

Distribution Header

Hot Water distribution system shall be open basin, flume and troughs, or a pipe system with nozzles spaced for even distribution of water over fill surface. System shall be self- draining and non-clogging. Spray nozzles, shall be cleanable stainless steel, bronze or high impact plastic, non-clog, removable type properly spaced for even distribution. Cover shall be provided for entire nozzle area or flume / trough area.

Cooling Tower Fill

Filling< Louvers & Drift eliminators shall be formed from self-extinguishing (per ASTM-568) PVC of 13 mil thickness having a flame spread rating of 5 per ASTM E84 and shall be impervious to rot, decay, fungus and biological attack and thermo vacuum formed with honeycomb design to facilitate for an even spread of water over fill heat transfer surface. The fill shall be suitable for entering water temperatures upto and including 130 deg F. Fill sheets shall either be suspended from tower deck structure under side & shall be elevated above the floor of the cold water basin to facilitate cleaning and easy replacement for cross flow towers or shall be bonded together in blocks for easy removal and replacement for counter flow towers. Fill shall be arranged in such a manner to ensure negligible resistance to air flow and eliminate water spots and prevent fouling through scales that may form.

Accessories

The cooling tower basin shall be provided with automatic float valve with a stop valve for continuous make up water flow, quick fill arrangement with stop valve, over-flow and drain connections with stop valves. A hot water bleed connection to the drain line through a stop valve shall be provided. It shall be connected to the drain line below the drain stop valve. Steel ladders & Hand rails shall be provided in such a manner and location as necessary to give safe and complete access to all parts of tower requiring inspection. Each ladder shall be made of iron sides and 16 mm straps and shall be bolted to the tower on the top and grouted in masonry at the bottom end. All Hardware used shall be of stainless steel. All pipe connections shall be hot dip galvanized and double flanged. Stell/ Painting Surface. All exposed steel surfaces shall be Galvanized steel in G235 grade & the color finish of cooling tower shall as per manufacturer standard requirement.

Performance Data:

The complete performance ratings and power consumption at varying outdoor wet bulb temperatures shall be submitted and verified at the time of testing and commissioning of the installation. The Capacity of the cooling tower shall be computed. The performance required for cooling tower is minimum 94 GPM/HP when tested according CTI ATC-105 procedure.

Testing:

Cooling tower being critical equipment for proper functioning of chillers, strict quality control is required. Capacity of the cooling tower shall be computed from the measurements of water flow, incoming/outgoing water temperatures and ambient air wet bulb temperature using accurately calibrated thermometers. Computed ratings shall conform to the specified capacities and quoted ratings. Power consumption for cooling towers shall be computed from measurements of incoming voltage and input current.

Drift Eliminator:

Drift losses to be less than 0.005% of the total water circulated.

Water Quality

Adequate quality to be maintained as per the respective manufacturer standard.

Fan

The tower shall be provided with low speed fan driven thru Multi grooved V belt/ Direct / Gear reducer to achieve sound noise level specified. Direct driven fan speed shall not exceed 700 rpm. The fan and drive should be corrosion resistant in 100% humidity climates. Fan shall be axial propeller type rotor fitted with blades of aluminum alloy / FRP construction for induced draft towers. Fan shaft bearing shall be self-aligning ,grease lubricated ball or roller bearings. Fan shall be protected by a fan guard of galvanized steel Construction to prevent birds from testing during idling period and shall be easily accessible for inspection and maintenance.

Motor

Fan shall be driven by 415±10% volts, 3 phase, 50 cycles, AC supply, energy efficient IE-3 (Design engineer can upgrade the efficiency of motors depending on the profile of the project) totally-enclosed, fan cooled (TEFC) with IP 55 / air over motor (TEAO) , The motors should be VFD compatible. The load applied to the motors shall not exceed 90% of their nameplate rating

Vibration cut off switch

Mechanical vibration cutout switch shall be provided..

Servicing

Internal walkway / Access door/ Ladder shall be provided.

Submittals

The contractors needs to submit the TECHNICAL DATA SHEET / GA DRAWING AND FOUNDATION DRAWING of the cooling tower before clearing the towers for production.

Performance Submittals

Manufacturer shall submit certificate from CTI / JCI validating capacity / performance / Noise levels of cooling tower at tender design conditions (entering and leaving condenser water temperature, entering air wet bulb temperature, water flow rate, fan kW).

Testing at Site

Capacity of the cooling tower shall be computed from the measurements of the water flow, incoming / outgoing water temperatures and ambient air wet bulb temperature using accurately calibrated mercury –in-glass thermometers. Computed ratings shall conform to the specified capacities and quoted ratings. Power consumptions for cooling towers shall be computed from measurements of incoming voltage and input current.
Essential requirements:-

S .No.	Description	Requirement
1.	TOWER CERTIFICATION	CTI / JCI
2.	MOTOR EFFICIENCY	EFF1 / VFD COMPATIBLE.
3.	HEAT REJECTION	AS QUANTIFIED IN THE BOQ.
4.	PERFORMANCE	AS PER SITE REQUIREMENT / CONDITIONS.

5. ELECTRICAL INSTALLATION

5.1 Scope

The scope of this section comprises of fabrication, supply, erection, testing and commissioning of Motor Control Centre (MCC), wiring and earthing of all air-conditioning equipment, components and accessories.

Note – Configuration of MCC panels shall be design to suit the requirement of system \ process. Necessary single line diagrams \ GA drawings shall be furnished by contractor for approval by consultant \ owner.

5.2 General

Work shall be carried out in accordance with the accompanying specifications and shall comply with the latest relevant Indian Standards and Electricity Rules and Regulations.

All motor control centers shall be suitable for operation on 3 Phase/single phase, 11,000/415/240 volts, 50 cycles, 4 wire system with neutral grounded at transformer. All MCCs be CPRI tested design and manufactured by a approved manufacturer. CPRI certificate be made available.

MCCs comply with the latest Relevant Indian Standards and Electricity Rules and Regulations and shall be as per IS-8623. MCCs / starter panels for outdoor equipment shall be suitable for outdoor duty application.

5.3 Constructional Features

The Motor Control Centre (MCC) shall be of 2 mm thick sheet steel cabinet and suitable for indoor installation, dead front, floor mounting/wall mounting type and shall be form 3b construction. The Distribution panels be totally enclosed, completely dust and vermin proof and be with hinged doors and folded covers, Neoprene gasket, padlocking arrangement and bolted back. All removable/ hinged doors and covers shall be grounded by flexible standard connectors. MCC shall be suitable for the climatic conditions as specified in Special Conditions. Steel sheets used in the construction of panels be 2 mm thick and be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all welding, slag shall be rounded off and welding pits wiped smooth with plumber metal. The general construction confirm to IS-8623-1977 (Part-1) for factory built assembled switchgear & control gear for voltage upto and including 1100 V AC.

All MCCs/panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned. Fixing screws enter into holes tapped into an adequate thickness of metal or provided with wing nuts. Self threading screws not be used in the construction of Distribution panels. A base channel of 75 mm x 40 mm x 5 mm thick shall be provided at the bottom for floor mounted panels. Minimum operating clearance of 275 mm be provided between the floor of panels and the lowest operating height.

The MCC shall be of adequate size with a provision of spare feeders. Feeders be arranged in multi-tier. Knockout holes of appropriate size and number shall be provided in the Motor Control Centre in conformity with the location of cable/conduit connections. Removable sheet steel plates shall be provided at the top to make holes for additional cable entry at site if required. Every cabinet shall be provided with Trifoliate or engraved metal name plates. All panels shall be provided with circuit diagram mounted on inside of door shutter protected with Hylam sheet. All live accessible connections shall be shrouded and minimum clearance between phase and earth be 20 mm and phase to phase be 25 mm.

Panels with ACB shall necessarily have front and rear access as per requirement whereas panels with all MCCB breaker shall be provided with front access with sufficient clearance.

5.4 Wiring System

All control wiring shall be carried out by using PVC insulated copper conductor wires in conduits. Minimum size of control wiring be 1.5 sq mm. Minimum size of conductor for power wiring shall be 4 sq. mm 1100 volts grade PVC insulated copper conductor wires in conduit. All conductors shall be stranded.

5.5 Circuit Compartment

All components for each feeder shall be housed in a separate compartment and have steel sheets on top and bottom of compartment. Sheet steel hinged lockable door be duly interlocked with the breaker in the "ON" position. Safety interlocks be provided to prevent the breaker from being drawn-out when the breaker is in 'ON' position. The door not form an integral part of the draw-out portion of the panel. Sheet steel barriers shall be provided between the tiers in a vertical section.

All MCCs shall be provided with feeders of appropriate capacity as per Single Line Diagram. All MCCs shall be completely factory wired, ready for connection. All the terminals shall be of proper current rating and sized to suit individual feeder requirements. Each circuit be clearly numbered from left to right to correspond with wiring diagram. All the switches and circuits be distinctly marked with a small description of the service installed.

Continuous earth bus sized for prospective fault current shall be provided with arrangement for connecting to station earth at two points. Hinged doors/ frames shall be connected to earth through adequately sized flexible braids.

5.6 Instrument Accommodation

Adequate space shall be provided for accommodating instruments, indicating lamps, control contactors and control MCBs. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker and bus bar `ON' lamps shall be provided on all outgoing feeders.

5.7 Bus Bar Connection

Bus bar and interconnections shall be of high conductivity electrolytic grade aluminium/copper complying with requirement of IS : 5082 – 1981 and of rectangular cross section suitable for carrying the rated full load current and short circuit current and shall be extendable on either side. Copper conductor shall be used for busbar of rating 1000A and above. Bus bars and interconnections shall be insulated with heat shrinkable sleeve of 1.1 KV grade and shall be colour coded. Bus bars shall be supported on glass fiber reinforced thermosetting plastic insulated supports at regular intervals to withstand the force arising from in case of short circuit in the system. All bus bars shall be provided in a separate chamber and all connections shall be done by bolting. Additional cross sectional area to be added to the bus bar to compensate for the holes. All connections between bus bars and breakers shall be through solid copper / aluminium strips of proper size to carry full rated current and insulated with insulating sleeves. Maximum current density for the busbars be 0.8 A/sq.mm for aluminium and 1.4 A/sq.mm for copper busbars.

Maximum allowable temperature for the Bus bar to be restricted to 85 deg C

5.8 Temperature _ Rise Limit

Unless otherwise specified, in the case of external surface of enclosures of bus bar compartment which shall be accessible but do not need to be touched during normal operation, an increase in the temperature rise limits of 25° C above ambient temperature be permissible for metal surface and of 15° C above ambient temperature for insulating surfaces as per IS 8623(Part-2) 1993.

5.9 Cable Compartments

Cable compartment of adequate size shall be provided in the panel for easy clamping of all incoming and outgoing cables entering from the top/bottom. Adequate supports be provided in cable compartment to support cables as per approved for construction shop drawing.

5.10 AIR CIRCUIT BREAKERS (ACB)

The ACB conform to the requirements of IEC 60947-2 / IS 13947-2 and shall be type tested & certified for compliance to standards from–CPRI, ERDA/ any accredited international lab. The circuit breaker shall be suitable for 415 V + 10%, 50 Hz supply system. Air Circuit Breakers be with moulded housing flush front, draw out type and shall be provided with a trip free manual operating mechanism or as indicated in drawings with mechanical "ON" "OFF" "TRIP" indications.

The ACB be 3/ 4 pole with modular construction, draw out, manually or electrically operated version as specified. The circuit breakers shall be for continuous rating and service short Circuit Breaking capacity (Ics) shall be as specified on the single line diagram and should be equal to the Ultimate breaking capacity(Icu) and short circuit withstand values(Icw) for 1 sec.

Circuit breakers shall be designed to 'close' and `trip' without opening the circuit breaker compartment door. The operating handle and the mechanical trip push button shall be at the front of the breakers panel. Inspection of main contacts should be possible without using any tools. The ACB shall be provided with a door interlock. i.e. door should not be open when circuit breaker is closed and breaker should not be closed when door is open.

All current carrying parts shall be silver plated and suitable arcing contacts with proper arc chutes shall be provided to protect the main contacts. The ACB have double insulation (Class-II) with moving and fixed contacts totally enclosed for enhanced safety and in accessibility to live parts. All electrical closing breaker be with electrical motor wound stored energy spring closing mechanism with mechanical indicator to provide ON/OFF status of the ACB.

The auxiliary contacts blocks shall be so located as to be accessible from the front. The auxiliary contacts in the trip circuits close before the main contacts have closed. All other contacts close simultaneously with the main contacts. The auxiliary contacts in the trip circuits open after the main contacts open. Minimum 4 NO and 4 NC auxiliary contacts be provided on each breaker.

Rated insulation voltage be 1000 volts AC.

5.10.1 Cradle

The cradle shall be so designed and constructed as to permit smooth withdrawal and insertion of the breaker into it. The movements be free from jerks, easy to operate and be on steel balls/rollers and not on flat surfaces.

There shall be 4 distinct and separate position of the circuit breaker on the cradle.
Racking Interlock in Connected/Test/Disconnected Position.

Service Position : Main Isolating contacts and control contacts of the breaker are engaged.

Test Position : Main Isolating contacts are isolated but control contacts re still engaged.

Isolated Position : Both main isolating and control contacts are isolated.

There shall be provision for locking the breaker in any or all of the first three positions.

The following safety features be incorporated :

Withdrawal or engagement of Circuit breaker not be possible unless it is in open condition.

Operation of Circuit breaker not be possible unless it is fully in service, test or drawn out position.

All modules shall be provided with safety shutters operated automatically by movement of the carriage to cover exposed live parts when the module is withdrawn.

All Switchgear module front covers have provision for locking.

Switchgear operating handles shall be provided with arrangement for locking in 'OFF' position.

5.10.2 Protections

The breaker should be equipped with micro-controller based , communicable type release with RS 485 port for communication to offer accurate and versatile protection with complete flexibility and offer complete over current protection to the electrical system in the following four zones :

Long time protection.
Short time protection with intentional delay.
Instantaneous protection.
Ground fault protection.

The protection release generally have following features and settings however for exact selection of protection releases shall be made based on project requirement,

a. True RMS Sensing

The release sample the current at the rate of 16 times per cycle to monitor the actual load current waveform flowing in the system and monitor the true RMS value of the load current. It take into account the effect of harmonics also.

b. Thermal Memory

When the breaker reclose after tripping on overload, then the thermal stresses caused by the overload if not dissipated completely, get stored in the memory of the release and this thermal memory ensure reduced tripping time in case of subsequent overloads. Realistic Hot/Cold curves take into account the integrated heating effects to offer closer protection to the system.

c. Defined time-current characteristics :

A variety of pick-up and time delay settings shall be available to define the current thresholds and the delays to be set independently for different protection zones thereby achieving a close-to-ideal protection curve.

d. Trip Indication

Individual fault indication for each type of fault should be provided by LEDs for faster fault diagnosis.

e. Self-powered

The release draw its power from the main breaker CTs and require no external power supply for its operation.

f. Zone Selective Interlocking

The release shall be suitable for communication between breakers to enable zone selective interlocking. This feature shall be provided for both short circuit and ground fault protection zones to offer intelligent discrimination between breakers. This feature enables faster clearance of fault conditions, thereby reducing the thermal and dynamic stresses produced during fault conditions and thus minimizes the damage to the system. To implement ZSI manufacturer should supply all related equipment like power supply, wiring etc.
On-Line change of settings should be possible. It should be possible to carry out testing of release without tripping the breaker.

g. The release meet the EMI / EMC requirements.

h. The setting range of release shall be generally as follows :

	SETTING RANGE OF RELEASE	
Type of Protection	PICK-UP CURRENT	TIME DELAY
Long Time	0.4 to 1.0 times In (Ir) Steps : 0.4, 0.5, 0.55, 0.60, 0.65, 0.70, 0.75, 0.80, 0.85, 0.90, 0.95, 1.00. Operating Limit : 1.05 to 1.2 times Ir	0.5 to 30 sec at 6 Ir Steps 0.5,1, 2,4, 6, 8,12,18,24 and 30 secs Tolerance : Corresponding to ±10% of current.
Short Time	2 to 10 times Ir Steps : 2,3,4,5,6,7,8,9 & 10 Tolerance : ±10%	20 ms to 600 ms Steps 20,60,100,160,200,260,300 400,500 and 600 ms Tolerance : ±10% or 20ms whichever is higher
Instantaneous	2 to 12 times In Steps : 2,3,4,6,8,10,12 Tolerance : ±10%	
Ground Fault	0.2 to 0.6 time In Steps : 0.2,0.3,0.4,0.5,0.6 Tolerance : ±10%	100 ms to 400 ms Steps : 100,200,300,400ms Tolerance : +10% or 20 ms whichever is higher.

Measurements
An ammeter with a digital display indicate the true rms values of the currents for each phase. Release acknowledge the current & time delay settings done by user on the LCD display.
A LED bar graph simultaneously display the load level on the three phases.
A maxi meter store in memory and display the maximum current value observed since the last reset. The data continue to be stored and displayed even after opening of the circuit breaker.

5.10.3 Safety Features

I. The safety shutter prevent inadvertent contact with isolating contacts when breaker is withdrawn from the Cradle.
II. It not be possible to interchange two circuit breakers of two different thermal ratings. For Draw-out breakers, an arrangement be provided to prevent rating mismatch between breaker and cradle.

III. There shall be provision of positive earth connection between fixed and moving portion of the ACB either thru connector plug or sliding solid earth mechanism. Earthing bolts shall be provided on the cradle or body of fixed ACB.
IV. The incoming panel accommodating ACB shall be provided with indicating lamps for ON-OFF positions, digital voltmeter and ammeter of size not less than 96 mm x 96 mm, selector switches, MCB for protection circuit and measuring instrument circuits.

It shall be possible to bolt the draw out frame not only in connected position but also in TEST and DISCONNECTED position to prevent dislocation due to vibration and shocks.

Draw out breakers should not close unless in distinct Service/Test/Isolated positions.

The insulation material used conform to Glow wire test as per IEC60695.

The ACB provide in built electrical and mechanical anti-pumping.

All EDO ACB`s have Ready to Close Contact to ensure that the ACB gets a command only when it is ready to close for applications of Remote Control, AMF, Synchronization and Auto Source Change Over Systems.

5.11 MOULDED CASE CIRCUIT BREAKER (MCCB)

The MCCB should be current limiting type with trip time of less than 10 m.sec under short circuit conditions. The MCCB should be either 3 or 4 poles. MCCB comply with the requirements of the relevant standards IS13947 – Part 2/IEC 60947-2 and should have test certificates for Breaking capacities from independent test authorities CPRI / ERDA or any accredited international lab.

MCCB comprise of Quick Make -break switching mechanism, arc extinguishing device and the tripping unit shall be contained in a compact, high strength, heat resistant, flame retardant, insulating molded case with high withstand capability against thermal and mechanical stresses

The breaking capacity of MCCB be as specified in the Drawings. The rated service breaking capacity (Ics) should be equal to rated ultimate breaking capacities (Icu). MCCBs for motor application should be selected in line with Type-2 Co-ordination as per IEC-60947-2, 1989/IS 13947-2. The breaker as supplied to meet IP54 degree of protection.

5.11.1 Current Limiting & Coordination

The MCCB employ maintenance free minimum let-through energies and capable of achieving discrimination up to the full short circuit capacity of the downstream MCCB. The manufacturer provide both the discrimination tables and let-through energy curves for all.

Protection Functions

MCCBs with ratings less than 100 A shall be equipped with Thermal-magnetic (adjustable thermal for overload and fixed magnetic for short-circuit protection) trip units
Microprocessor MCCBs with ratings 100A and above shall be equipped with microprocessor based trip units.
Microprocessor and thermal-magnetic trip units shall be adjustable and it shall be possible to fit lead seals to prevent unauthorized access to the settings
Microprocessor trip units comply with appendix F of IEC 60947-2 standard (measurement of RMS current values, electromagnetic compatibility, etc.)
Protection settings apply to all poles of circuit breaker.
All Microprocessor components withstand temperatures up to 125 °C

5.11.2 Testing

a) Original test certificate of the MCCB as per IEC 60947-1 &2 or IS13947 be furnished.

Pre-commissioning tests on the switch board panel incorporating the MCCB shall be done as per standard specifications.

5.11.3 Interlocking

Molded, case circuit breakers be provided with the following interlocking devices for interlocking the door of a switch board.

a) Handle interlock to prevent unnecessary manipulations of the breaker.

b)Door interlock to prevent the door being opened when the breaker is in ON position.

c) Defeat-interlocking device to open the door even if the breaker is in ON position.

The MCCB shall be current limiting type and comprise of quick make – Break switching mechanism. MCCBs shall be capable of defined variable overload adjustment. All MCCBs rated 100 Amps and above have adjustable over load & short circuit pick-up .

All MCCB with microprocessor based release unit, the protection be adjustable Overload, Short circuit and earth fault protection with time delay.

The trip command override all other commands.

5.12 MOTOR PROTECTION CIRCUIT BREAKER (MPCB)

Motor circuit breakers conform to the general recommendations of standard IEC 947 -1,2 and 4 (VDE 660, 0113 NF EN 60 947-1-2-4, BS 4752) and to standards UL 508 and CSA C22-2 N°14.

The devices shall be in utilization category A, conforming to IEC 947-2 and AC3 conforming to IEC 947-4.MPCB have a rated operational and insulation voltage of 690V AC (50 Hz) and MPCB shall be suitable for isolation conforming to standard IEC 60947-2 and have a rated impulse withstand voltage (Uimp) of 6 kV. The motor circuit breakers shall be designed to be mounted vertically or horizontally without de-rating. Power supply be from the top or from the bottom. In order to ensure maximum safety, the contacts shall be isolated from other functions such as the operating mechanism, casing, releases, auxiliaries, etc, by high performance thermoplastic chambers. The operating mechanism of the motor circuit breakers must have snap action opening and closing with free tripping of the control devices. All the poles close, open, and trip simultaneously. The motor circuit breakers accept a padlocking device in the "isolated" position.

The motor circuit breakers shall be equipped with a "PUSH TO TRIP" device on the front enabling the correct operation of the mechanism and poles opening to be checked. The auxiliary contacts shall be front or side mounting, and both arrangements be possible. The front-mounting attachments not change the breaker surface area. Depending on its mounting direction the single pole contact block could be NO or NC. All the electrical auxiliaries and accessories shall be equipped with terminal blocks and shall be plug-in type. The motor circuit breakers have a combination with the downstream contactor enabling the provision of a perfectly co-ordinated motor-starter. This combination enable type 1 or type 2 co-ordination of the protective devices conforming to IEC 60947-4-1.Type 2 co-ordination be guaranteed by tables tested and certified by an official laboratory: LOVAG (or other official laboratory).The motor circuit breakers, depending on the type, could be equipped with a door-mounted operator which allow the device setting. The motor circuit breakers shall be equipped with releases comprising a thermal element assuring overload protection and a magnetic element for short-circuit protection. In order to ensure safety and avoid unwanted tripping, the magnetic trip threshold (fixed) be factory set to an average value of 12 Ir.
All the elements of the motor circuit breakers shall be designated to enable operation at an ambient temperature of 60°C without derating. The thermal trips shall be adjustable on the front by a rotary selector. The adjustment of the protection shall be simultaneous for all poles. Phase unbalance and phase loss detection shall be available. Temperature compensation (-20°C to +60°C)

5.13 MINIATURE CIRCUIT BREAKER (MCB)

Miniature Circuit Breaker comply with IS-8828-1996/IEC898-1995. Miniature circuit breakers shall be quick make and break type for 240/415 VAC 50 Hz application with magnetic thermal release for over current and short circuit protection. The breaking capacity not be less than 10 KA at 415 VAC. MCBs shall be DIN mounted. The MCB shall be Current Limiting type (Class-3). MCBs shall be classified (B,C,D ref IS standard) as per their Tripping Characteristic curves defined by the manufacturer. The MCB have the minimum power loss (Watts) per pole defined as per the IS/IEC and the manufacturer publish the values.MCB ensure complete electrical isolation & downstream circuit or equipment when the MCB is switched OFF.

The housing shall be heat resistant and having a high impact strength. The terminals shall be protected against finger

contact to IP20 Degree of protection. All DP, TP, TPN and 4 Pole miniature circuit breakers have a common trip bar independent to the external operating handle.

5.14 Painting

All sheet steel work undergo a process of degreasing, pickling in acid, cold rinsing, phosphating, passivaiting (seven tank processing) and then painted with electrostatic paint (Powder coating). The shade of colour of panel inside/outside shall be as indicated in datasheets & relevant BIS code.

5.15 Labels

Engraved PVC labels shall be provided on all incoming and outgoing feeder. Circuit diagram showing the arrangements of the circuit inside the control panel shall be pasted on inside of the panel door and covered with transparent plastic sheet.

5.16 Meters

i. All voltmeters and indicating lamps shall be through MCB's.

ii. Meters and indicating instruments be plug type.

iii. All CT's connection for meters shall be through Test Terminal Block (TTB).

iv. CT ratio and burdens shall be as specified on the Single line diagram.

5.17 Current Transformers

Current transformers be provided for Control panels carrying current in excess of 60 amps. All phase be provided with current transformers of suitable VA burden with 5 amps secondaries for operation of associated metering.

The CTs confirm to relevant Indian Standards. The design and construction shall be dry type, epoxy resin cast, robust to withstand thermal and dynamic stresses during short circuits. Metering CTs, have inbuilt busbar mounting arrangement. Secondary terminals of CTs be brought out suitable to a terminal block which be easily accessible for testing and terminal connections. The secondary terminal should be covered with insulation cap/cover so that there should not be any possibility of touching the live terminal. The protection CTs be of accuracy class 5P20 and measurement CTs be of accuracy class I.

5.18 Selector Switch

Where called for, selector switches of rated capacity be provided in control panels, to give the choice of operating equipment in selective mode.

5.19 Contractor

Contactor shall be built into a high strength thermoplastic body and shall be provided with an arc shield for quick arc extinguishing. Silver alloy tips shall be provided to ensure a high degree of reliability and endurance under continuous operation. The magnet system consist of laminated yoke and armature to ensure clean operation without hum or chatter.

Starters contactors have 3 main and 2 Nos. NO / NC auxiliary contacts and shall be air break type suitable for making and breaking contact at minimum power factor of 0.35. For design consideration of contactors the starting current of connected motor shall be assumed to be 6 times the full load current of the motor in case of direct-on-line starters and 3 times the full load current of the motor in case of Star Delta and Reduced Voltage Starters. The insulation for contactor coils be of Class "E".

Coil shall be tape wound vacuum impregnated and be housed in a thermostatic bobbin, suitable for tropical conditions and withstand voltage fluctuations. Coil be suitable for 220/415±10% volts AC, 50 cycles AC supply.

5.20 Thermal Overload Replay

Thermal over load relay have built in phase failure sensitive tripping mechanism to prevent against single phasing as well as on overloading. The relay operate on the differential system of protection to safeguard against three phase overload, single phasing and unbalanced voltage conditions.

Auto-manual conversion facility shall be provided to convert from auto-reset mode to manual-reset mode and vice-versa at site. Ambient temperature compensation shall be provided for variation in ambient temperature from -5° C to +55°C.

All overload relays shall be of three element, positive acting ambient temperature compensated time lagged thermal over load relays with adjustable setting. Relays shall be directly connected for motors upto 35 HP capacity. C.T.operated relays be provided for motors above 35 HP capacity. Heater circuit contactors may not be provided with overload relays.

5.21 Time Delay Relays

Time delay relays shall be adjustable type with time delay adjustment from 0-180 seconds and have one set of auxiliary contacts for indicating lamp connection.

5.22 Indicating Lamp& Metering

All meters and indicating lamps be in accordance with relevant IS standard specification. The meters shall be flush mounted type. The indicating lamp shall be of LED type . Each MCC and control panel be provided with voltmeter 0-500 volts with three way and off selector switch, CT operated ammeter of suitable range with three nos. CTS of suitable ratio with three way and off selector switch, phase indicating lamps, and other indicating lamps as called for. All indicating lamp be backed up with 5 amps MCB.

5.23 Toggle Switch

Toggle switches, where required, shall be in conformity with relevant IS Codes and be of 5 amps rating.

5.24 Push Button Stations

Push button stations shall be provided for manual starting and stopping of motors / equipment Green and Red colour push buttons shall be provided for 'Starting' and 'Stopping' operations. 'Start' or 'Stop' indicating flaps shall be provided for push buttons. Push Buttons shall be suitable for panel mounting and accessible from front without opening door, Lock lever be provided for 'Stop' push buttons. The push button contacts be suitable for 6 amps current capacity.

Starters

Each motor shall be provided with a starter of suitable rating. Starters be in accordance with relevant IS Codes. All Star Delta Starters be fully automatic. Motors up to 7.5 HP be provided by Direct On Line (DOL) starter, motors above 7.5 HP and up to 45 HP shall be provided by star/delta starter and motors above 45 HP shall be provided by soft starter. All starters be with Type II coordination for breaker, contactor and over load relay.

All the switches, contactors, push button stations, indicating lamps be distinctly marked with a small description of the service installed. The following capacity contactors and overload relays shall be provided for different capacity motors or as per manufacturer's recommendation.

TYPE OF STARTER CAPACITY	CONTACTOR CURRENT RANGE		OVERLOAD RELAY
5 HP Motors	D O L	16 amps	6-10 amps
7.5 HP motors	D O L	16 amps	9-15 amps
10 HP Motors	Automatic Star Delta	25 amps	9-15 amps
12.5 HP Motors	Automatic Star Delta	16 amps	9-15 amps
15 HP Motors	Automatic Star Delta	25 amps	9-15 amps
20 HP Motors	Automatic Star Delta	32 amps	14-23 amps
25 HP Motors	Automatic Star Delta	32 amps	14-23 amps
30 HP Motors	Automatic Star Delta	40 amps	20-33 amps
35 HP Motors	Automatic Star Delta	40 amps	20-33 amps
40 HP Motors	Automatic Star Delta	40 amps	30-50 amps
50 HP Motors	VFD	70 amps	30-50 amps
60 HP Motors	VFD	110 amps	30-50 amps
75 HP Motors	VFD	110 amps	90-150 amps
100 HP Motors	VFD	200 amps	CT operated relay
125 HP Motors	VFD	200 amps	CT operated relay
150 HP Motors	VFD	200 amps	CT operated relay
150 HP Motors	VFD	300 amps	CT operated Relay.
200 HP Motors	VFD	300 amps	CT operated Relay.
250 HP Motors	VFD	400 amps	CT operated Relay.
300 HP Motors	VFD	400 amps	CT operated Relay.
400 HP Motors	VFD	600 amps	CT operated Relay.
600 HP Motors	VFD	900 amps	CT operated Relay.

Two speed motors when specified, be provided with DOL starter irrespective of it rating.

6 ELECTRIC CONTROL CABINET

The electric control cabinet shall be made as detailed in electrical panels and mounted directly on main frame. All controls and terminals shall be factory wired and tested. The control cabinet shall consist of following major controls of rated capacities:

a. Incoming MCCB.

b. ON-OFF toggle switch for individual banks.

c. Contactors with HRC fuses for individual heaters.

d. Indicating lights for ON status for individual banks.

e. Fault indicating lights.

f. Alarm with manual reset.

g. Thermostats and Master thermostat.

h. Cabling and control wiring.

i. Three phase ammeter and voltmeter with selector switches.

j. Control cabinet shall be BMS compatible

The panel shall be openable only after switching off the incoming power supply.

6.2 PAINTING

The external surface of the shell shall be cleaned, derusted and applied with three coats of primer.

The hot water generator shall be factory finished with durable epoxy paint on outside. Shop coats of paints that have become marred during shipment / erection shall be cleaned off with mineral spirits, then coated with enamel paint to match the finish over the adjoining shop painted surface.

The electrical panel shall be provided with powder coated paint finish of matching colour with hot water generator.

7. CLOSED TYPE PRESSURIZED EXPANSION TANK

Expansion, pressurization and de-aeration of the chilled water system to be provided by an integrated unit comprising of Pressure-less expansion tank , Twin pump Pressurization with digital controller.

Vessel volume shall be calculated according to the system expansion volume. Every vessel in the unit shall have the same size. Condensate drain cock shall be installed within the base of the vessel. Efficiency of the vessel volume shall be minimum 80%. The system shall be capable of removing dissolved gases and air bubbles via an automatic air vent installed on the top of the vessel. The expansion vessel(s) shall be fitted with a replaceable butyl rubber bladder in accordance with DIN 4807-3. Maximum continual working temperature of the bladder shall be 70 °C (158 °F). A weight sensor shall be fitted to the vessel to provide vessel content information. Finish shall be with epoxy coating.

The pressure-less expansion vessel(s) shall be cylindrical, welded and comply to EN 13831:2007.

Manufactured and designed in accordance with European Pressure Equipment Directive PED 2014/68/EC.

The pressurization unit shall be sized appropriate to the total system expansion volume and maximum operating pressure.

System pressure shall be regulated within ± 0.2 bar (2.9 psi) of the set pressure. High and low pressure alarm setting shall be selectable by the user.

Top-up function shall be programmed according to system requirements. The unit shall be fitted with an integral, adjustable flood limiter to shut down the system in the event of a serious leak. Water level in the expansion vessel(s) shall be maintained to a minimum value.

The de-aeration function and pressurization function shall be programmable according to system requirements.

The pressurization unit shall have two pumps (orientation vertical/horizontal) with non-return valve, flow restrictor valve and solenoid valve as well as a safety relief valve for the vessel and a “Y” strainer for system protection.

The controller shall display the vessel contents, system pressure and status of the main operating components in real time on the display. This acts as confirmation that pump(s) or valves are operating and responding as required, while also verifying the system setup.

The controller shall regulate the pump unit to provide duty/standby or parallel/backup operation and shall be selectable in dual pump units.

Controller shall display fault code and generate the alarm in case of any fault situation.

Pressurization unit shall be factory assembled. The product shall be installed according to the manufacturer's instructions using manufacturer's approved components.

8. QUALITY ASSURANCE,INSPECTION, TESTING AND COMMISSIONING

8.1 SCOPE

The following quality assurance, inspection, testing and commissioning procedures shall be required to be carried out upon award of work.

I. Provide quality assurance program (QAP), works quality assurance program (WQAP), field quality assurance program (FQAP) and quality plan.

II. Tests at manufacturer's works.

III. Perform site tests and commissioning.

8.2 SUBMITTALS

I. After award of work following information shall be submitted.

a. Quality Assurance Program (QAP)
b. Works Quality Assurance Programme (WQAP)
c. Field Quality Assurance Programme (FQAP)

II. For inspection and testing, submit inspection and testing procedures, Programme, record sheets applicable at each hold point.

III. After completion of testing, submit test records, packaging, transportation and storage instructions and methods.

IV. For site installation and commissioning, submit installation methods or procedures, notification and procedures for pre-commission and commissioning.

V. After commissioning, submit site test records, as-built drawings, manufacturer's operation maintenance manuals and list of recommended spares and tools.

8.3 QUALITY ASSURANCE CONCEPT AND CONTROL

I. Minimum requirements for establishing and implementing a quality assurance Programme shall be applied to all aspects of the work necessary for carrying out the contract. Quality assurance shall extend to material parts, components, systems and services as a means of obtaining and sustaining the reliability of critical items, operating performance, maintenance and safety.

II. Acceptance of the Contractor's quality assurance Programme does not relieve the Contractor's obligation to comply with the requirement of the contract document. If the Programme is found to be ineffective, then the Owner's site representative reserves the right to request for necessary revisions of the Programme.

III. The Contractor is required to produce readily identifiable documentary evidence covering the extent and details of both his own and his sub contractor's quality assurances system as follows :

a. Quality Assurance Program (QAP)
b. Works Quality Assurance Programme (WQAP)
c. Field Quality Assurance Programme (FQAP)
d. Quality Plan.

IV. These documents shall be prepared separately and submitted to the Owner's site representative at the time of starting the work.

V. Quality Plan and Manual shall be prepared by the Contractor for all items and services to be supplied, after the contract has been placed, but before commencement of fabrication, and shall be subject to evaluation and acceptance by the Owner's site representative before start of work.

8.4 QUALITY ASSURANCE MANUAL (QAM)

I. The QAM shall be a general comprehensive document outlining the Contractor's basic organization, policies and procedures. The information to be given in the QAM shall include but not limited to :

a. Quality Policy.

b. Quality Assurance Programme

c. Organisation Structure showing inter relationships.

d. Functional responsibilities and levels of authority.

e. Lines of communication.

f. Customer relations.

g. Laboratory Facilities.

8.5 WORKS QUALITY ASSURANCE PROGRAMME (WQAP)

I. The WQAP shall identify the Contractor's Quality Assurance Programme at works applicable throughout all phases of Contract performance, including design, procurement, manufacture, inspection and testing. It shall identify each of the Programme elements to be designed, developed, executed and maintained by the Contractor for the purpose of ensuring that all supplies and services comply with this specifications.

II. The information to be given under this Programme shall include but not limited to :

a. Organization and Responsibility.

b. Contract Review.

c. Design and Document Control.

d. Procurement Control.

e. Production Control.

f. Control on Sub-contractors.

g. In-process Quality Control and Traceability.

h. Inspection and Testing.

j. Control of Non-conformances.

k. Corrective Action.

l. Control of Inspection, Measuring and Test Equipment.

m. Handling, Storage, Packaging and Delivery.

n. Records.

p. Quality Audits.
q. After - Sales Servicing.

8.6 FIELD QUALITY ASSURANCE PROGRAMME (FQAP)

I. This Programme shall identify the Contractor's Quality Assurance Programme at site applicable throughout site construction, erection and commissioning. It is the underlying philosophy that the quality built into the product at works shall be maintained throughout the construction and commissioning stages.

II. While, in principle, the FQAP shall include the items discussed in WQAP, it shall, however, be approached differently to take into account site conditions.

III. The FQAP shall include, but not limited to the following information :

a. Organization and responsibility.

b. Control of Drawings and Documentation.

c. Product Checklist.

d. Control and Traceability of Purchased materials and services.

e. Receipt Inspection of materials at site.

f. Material Storage Control.

g. Inspection and Examination Procedures.

h. Control of Painting and Insulation Works.

j. Pre-commissioning.

k. Commissioning.

l. Control of Non-conformances.

m. Corrective Action.

n. Control of Inspection, Measuring and Test Equipment.

p. Records.

q. Complétion Documents.

r. List of recommended spares and tools.

s. Personal Training.

t. Servicing during Defects Liability Period.

8.7 QUALITY PLAN

I. The contractor shall be required to prepare manufacturing and construction/erection quality plans for all equipment items and services. The quality plan shall also define the involvement of Owner's site representative in the inspection and test programs.

II. The Quality Plan shall incorporate as appropriate :

a. Charts indicating flow of materials, parts and components through manufacturing quality control inspection and test to delivery and erection.

b. The charts shall indicate the location of hold points for quality control, inspection and test beyond which manufacture shall not continue until the action required by the hold point is met, and the documentation required is generated.

c. The control documents associated with each hold point, i.e. drawings, material, specification, Works Process Schedule (WPS), Process Quality Records (PQR), quality control methods and procedures and acceptance standards.

8.8 SITE QUALITY CONTROL SECTION

I. The Contractor's Quality Control (Q.C.) section shall be headed by an experienced Quality Control Engineer. He shall be assisted by other supervisors. The section shall be an independent one, reporting to the contractor's Site Manager only on administrative matters, but otherwise under full control by the Contractor's Corporate Quality System Management.

II. The Contractor's Q.C. Section shall liaise closely with the Owner's site representative in charge of Quality Assurance/Quality Control, and to whom it shall give fullest cooperation. It is the underlying principle of this contract document that while the Contractor's Q.C. Engineer implements the Contractor's Quality Programme, the adequacy and effectiveness of that implementation shall be audited by the Owner's site representative whose recommendations on improving or maintaining quality shall be acted upon promptly by the Contractor's Q.C. Section.

8.9 INSPECTION AND TESTING

I. All equipment and components supplied may be subjected to inspection and tests by the Consultant/ Owner's site representative during manufacture, erection/installation and after completion. The inspection and tests shall include but not be limited by the requirements of this contract document. Prior to inspection and testing, the equipment shall undergo pre-service cleaning and protection.

II. Tenderers shall state and guarantee the technical particulars listed in the Schedule of Technical Data. These guarantees and particulars shall be binding and shall not be varied without the written permission of the Owner's site representative.

III. No tolerances shall be allowed other than the tolerances specified or permitted in the relevant approved Standards, unless otherwise stated.

IV. If the guaranteed performance of any item of equipment is not met and / or if any item fails to comply with the specification requirement in any respect whatsoever at any stage of manufacture, test or erection, the Owner's site representative may reject the item, or defective component thereof, whichever he considers necessary; and after adjustment or modification as directed by the Owner's site representative, the contractor shall submit the item for further inspection and /or test.

V. The approval of the Owner's site representative of inspection and/or test results shall not prejudice the right of the Owner's site representative to reject an item of equipment if it does not comply with the contract document when

erected, does not or prove completely satisfactory in service.

VI. The Contractor shall be responsible for the timely transmission of the relevant and appropriate sections of the contract document to manufacturers and sub-contractors for the proper execution of all tests at their works as per contract specifications.

8.10 TESTS AT MANUFACTURER'S WORKS

I. All tests to be performed during manufacture, fabrication and inspection shall be agreed with the Consultant/ Owner's site representative prior to commencement of the work. The Contractor shall prepare the details of the schedule and submit these to the Consultant/ Owner's site representative for approval. It must be ensured that adequate relevant information on the design code/standard employed, the manufacture /fabrication/assembly procedure and the attendant quality control steps proposed are made available to the Consultant/Owner's site representative who will mark in the appropriate spaces his intention to attend or waive the invited tests, or inspections. Contractor shall arrange inspection and factory witness test for centrifugal, screw chiller and vapor absorption chiller.

II. A minimum of twenty-one days' notice of the readiness of equipment for test or inspection shall be provided to the Owner's site representative by the Contractor (whether the tests be held at the Contractor's of Sub-contractor's works). The subject items should remain available for Owner's site representative inspection and test up to a minimum 10 days beyond the agreed date of witnessing the test. Every facility in respect of access, drawings, instruments and manpower shall be provided by the Contractor and sub-contractor to enable the Owner's site representative to carry out the necessary inspection and testing of the Plant.

III. No plant shall be packed, prepared for shipment, or dismantled for the purpose of packing for shipment, unless it has been satisfactorily inspected, all tests called for have been successfully carried out in the presence of the Owner's site representative or approved for shipment, or alternatively inspection has been waived.

IV. Functional electrical, mechanical and hydraulic tests shall be carried out on completed assemblies in the works. The extent of these tests and method of recording the results shall be submitted to, and agreed by, the Owner's site representative in sufficient time to enable the tests to be satisfactorily witnesses, or if necessary for any changes required to the proposed Programme of tests to be agreed.

V. The Consultant/Owner's site representative reserves the right to visit the Manufacturer's works at any reasonable time during fabrication of equipment and to familiarize himself with the progress made and the quantity of the work to date.

VI. Within 30 days of completion of any tests, triplicate sets of all principal test records, test certificates and correction and performance curves shall be supplied to the Owner's site representative.

VII. These test records, certificates and performance curves shall be supplied for all tests, whether or not they have been witnessed by the Owner's site representative or not. The information given on such test certificates and curves shall be sufficient to identify the material or equipment to which the certificate refers and should also bear the Contract reference title.

VIII. When all equipment has been tested, the test certificates from all works and site tests shall be compiled by the Contractor into volumes and bound in an approved from complete with index and four copies of each volume shall be supplied to Consultant/ Owner's site representative.

IX. Stage wise inspection of equipment in factory in waived.

8.11 PERFORMANCE TESTS AT MANUFACTURER'S WOKS

I. All equipment may be subjected to routine performance tests at the Manufacturer's Works in accordance with the relevant ANSI, ASME, ASTM, BIS standard including operating tests of complete assemblies to ensure correct operation of apparatus and components.

II. Pumps, fans, compressor, and other rotating equipment shall be given full load tests, and run to 15% over speed for 5 minutes to check vibration. Main and auxiliary gear boxes shall be subjected to shock load tests and a six-hour endurance run at rated speed and maximum torque.

III. The Contractor shall submit single line diagrams including the layout of the Plant together with the location of test instrumentation and the principal dimensions of the layout. All calculations to derive performance data shall be made strictly in accordance with format given in the approved standards. Any alterations or deviations from the approved standard test layout or formulae shall be subjected to the prior approval of the Owner's Site Representative.

IV. The performance test shall be conducted over the full operating range of the pump to a closed valve condition and a minimum of five measurement points covering the full range shall be taken. Curves indicating Quality vs. Head, Quantity vs. Power absorbed, and Quantity vs. Pump efficiency shall be provided. In addition a curve of the NPSH required vs. Quantity shall be provided except when the suction conditions do not require this test. Any proposal for the omission of this test shall be to the approval of the Consultant/ Owner's site representative.

V. On completion of the tests the Contractor shall submit a report showing the test results obtained together with the curves corrected to the site operating conditions.

9. TESTING, ADJUSTING AND BALANCING

9.1 SCOPE

a. Testing, adjusting and balancing of heating, ventilating and air-conditioning systems at site.
b. Testing, adjusting and balancing of HVAC Hydronic system at site.
c. Testing, adjusting and balancing of exhaust system at site.

Comply with current editions of all applicable practices, codes, methods of standards prepared by technical societies and associations including :

ASHRAE : 2011 HVAC Application.

SMACNA : Manual for the Balancing and Adjustment of air distribution system.

9.2 PERFORMANCE

a. Verify design conformity.

Establish fluid flow rates, volumes and operating pressures.

Take electrical power readings for each motor.

Establish operating sound and vibration levels.

Adjust and balance to design parameters.

Record and report results as per the formats specified.

9.3 DEFINITIONS

Test :To determine quantitative performance of equipment.

Adjust :To regulate for specified fluid flow rates and air patterns at terminal equipment (e.g. reduce fan speed, throttling etc.)

Balance : To proportion within distribution system (submains, branches and terminals) in accordance

with
design quantities.

9.5 DESCRIPTION OF SYSTEM AND REQUIREMENTS

I.Adjust and balance the following system to provide most energy efficient operation compatible with selected operating conditions.

II. All chilled water systems.
All cooling tower (condenser) water systems.
Emergency purge systems.

9.6 The Preparatory Work

To conduct the above test, following preparatory works are required to be carried out including the availability of approved for construction shop drawings and submittals :

All outside air intake, return air and exhaust air dampers are in proper position.
All system volume dampers and fire dampers are in full open position.

All access doors are installed & are air tight.

Grilles are installed & dampers are fully open.

Provision and accessibility of usage of TAB instruments for traverse measurements are available.

All windows, doors are in position.

Duct system are of proper construction and are equipped with turning vanes and joints are sealed.

Test holes and plugs for ducting.

9.7 HYDRONIC SYSTEM BALANCING

I. The Hydronic system shall involve the checking and balancing of all water pumps, piping network (main & branches), the heat exchange equipment like cooling and heating coils, condensers and chillers and cooling towers in order to provide design water flows.

II. The essential preparation work, must be done by the HVAC contractor prior to actual testing, adjusting and balancing of HVAC system and ensure following :

Availability of coordinated drawings and approved submittals and system sketch with design water flows specified thereon.
Hydronic system is free of leaks, is hydrostatically tested and is thoroughly cleaned, flushed and refilled.
Hydronic system is vented.

III. The contractor shall confirm completion of the basic procedures and prepare check lists for readiness of system balance.

Check pumps operation for proper rotation and motor current drawn etc.

Confirm that provisions for TAB measurements (Temperature, pressure and flow measurements) have been made.

Open all shut-off valves and automatic control valves to provide full flow through coils. Set all balancing valves in the preset position, if these values are known. If not, shut all riser balancing valves except the one intended to be balanced

first.

Balancing work for both Chilled Water System and Condenser Water System shall be carried out in a professional manner and test reports in the specified format shall be prepared and presented to the PMC/Consultants for approval.

IV. Vibration and Noise Levels

Vibration and alignment field measurements shall be taken for each circulating water pump, water chilling unit, air handling unit and fan driven by a motor over 10 HP. Readings shall include shaft alignment, equipment vibration, bearing housing vibration, and other test as directed by the PMC.

Sound level readings shall be taken at ten (10) locations in the building as selected by the PMC. The readings shall be taken on an Octave Band nalyzer in a manner acceptable to him. The contractor shall submit test equipment data and reporting forms for review. In order to reduce the ambient noise level the readings shall be taken at night. All test shall be performed in the presence of PMC/Consultant.

b) Piping					5. Refrigeration Equipment			
Correct flow					Crankcase heaters energized			
Correct connections					Operating controls and devices.			
Leakage					Safety controls and devices.			
Valves open or set					Valves open			
Strainer clean					Piping connections and flow			
Air vented					Flexible connectors			
Flexible connectors					Oil level and lubrication			
Provisions made for TAB measurements					Alignment and drives.			
c) Bases					Guards in place.			
Vibration isolation.					Vibration isolation.			
Grouting					Starters, contactors and disconnect switches.			
Leveling.					Electrical connectors.			
					Nameplate data.			
4. Hydronic equipment.								
a) Heat Exchangers/HW coil					6. Hydronic Piping systems.			
Correct flow and connections					Leak tested.			
Valves open or set					Fluid levels and make-up			
Airvents or steam traps					Relief or safety valves.			
Leakage					Compression tanks and air vents.			
Provisions made for TAB measurements					Steam traps and connections.			
Nameplate data.					Strainers clean			
b) Cooling towers					valves open or set			
Correct flow and connections.					Provisions made for TAB measurements.			
Valves open or set					Systems installed as per plans.			
Leakage								
Provisions made for TAB measurements					7. Controls System			

Sump water level.					Data centers.			
Spray nozzles.					Outdoor return air reset			
Fan/pump rotation.					Economizer			
Motor/fan lubrication.					Static pressure			
Drives and alignment					Room controls.			
Guards in place.					8. Other Checks.			
					a) Other trades or personnel notified of TAB work requirements.			
					b) Preliminary data complete			
					c) Test report forms prepared.			

INSTRUMENT CALIBRATION REPORT

PROJECT _____

INSTRUMENT / SERIAL NO.	APPLICATION	DATES OF USE	CALIBRATION TEST DATE.

REMARKS.

TEST DATE _____ READINGS BY _____

CHILLER TEST REPORT
(TO BE FURNISHED BY INSTALLER)
PROJET _____ UNIT_____

LOCATION_____

MANUF._____ MODEL _____ SERIAL NO. _____

CAPACITY _____ REFRIG _____ STARTER_____ HEATER SIZE _____

COMPRESSOR	DESIGN	ACTUAL		MOTOR STARTER	DESIGN	ACTUAL
Make / Model				Make / Model		
Serial No.				Type		
Type (Reciprocating, Centrifugal Sealedd, Semi Sealed, Screw Rotart)				Voltas		
Piping Material				Amps		
Suction Pr / Tem.				O/L Release Range		
Discharge Pr/Temp						
Refrigerant				EVAPORATOR	DESIGN	ACTUAL
Oil Pump Type				Make / Model		
Oil Pressure				No. of Passes		
Oil Failure Switch Pressure				Ref : Level		
Unload Arrangement				Ref : Pressure / Temperature		
Unload Set Points				Ent. Water Temp/Pressure		
Drive				Leaving Water Temp/Pressure		
Compressor Speed				Temperature Difference		
Oil Level				Pressure Difference		
Oil Temperature				Water Quantity CPM		
L P Setting				Relief Valve Setting		
H P Setting				IKW / Ton		
Anti Freeze Setting						
Purge Unit Type						
Purge Operation Checked				CONDENSER	DESIGN	ACTUAL
				Make/Model		
				No. of Passes		
				Ref : Pressure / Temp		
COMPRESSOR MOTOR	DESIGN	ACTUAL		Ent. Water Temp / Pressure		
Make / Model				Leaving Water Temp/Pressure		
Type				Temperature Difference		
Voltage I1 Ie I2 I3 I3 I1				Pressure Difference		
Motor Rated Current				Water Quantity CPM		
Motor F L Current				Relief Valve Setting		

TEST DATE _____ READINGS BY _____

PUMP TEST REPORT
PROJECT _____

DATA	PUMP NO.	PUMP NO.	PUMP NO.	PUMP NO.	PUMP NO.
Location					
Service					
Manufacturer					
Model Number					
Serial Number					
GPM/Head					
Req. NPSH					
Pump RPM					
Impeller Diam.					
Motor Mfr. / Frame					
Motor HP/RPM					
Volts/Phase/Hertz					
F.L Amps					
Seal Type					
Pump Off-Press.					
Valve Shut Diff.					
Act.Impeller Diam.					
Valve Open diff.					
Valve Open GPM					
Final Dischg. Press.					
Final Suction Press.					
Final Ap					
Final GPM					
Voltage T1 T2 T2 T3 T3 T1					
Amperage T1 T2 T3					

REMARKS

TEST DATE _____ READINGS BY _____

COOLING TOWER TEST REPORT

PROJECT_____ SYSTEM_____

LOCATION_____

MANUF._____ MODEL_____ SERIAL NO._____

NOM. CAPACITY_____ WATER TREAT._____

COOLING TOWER / MOTOR / WATER DATA				AIR DATA	DESIGN	ACTUAL
Make / Model				Fan CFM		
Type				Outlet S.P.		
Tons				Avg. Ent. W.B.		
No. of Fan Motors				Avg. Lvg. W.B.		
Motor HP / RPM				Ambient W.B.		
Motor / Drive				Fan RPM		
Motor Speed				Voltage I1 Ie I2 I3 I3 I1		
Motor Rated Current				Amps T1 Te T21		
Motor FL Current						
O/L Release Setting						
CT Range						
CT Approach						
COOLING TOWER FAN / AIR DATA	DESIGN	ACTUAL		WATER DATA	DESIGN	ACTUAL
No. of Fans				Ent//Lvg./Water Pressure		
Type/ Drive of Fan				Ent//Lvg./Water Temperature		
Fan Dia				Water Temperature – T		
Fan Speed				GPM		
Air Inlet Temperature				Bleed GPM		
Air Outlet Temperature				Voltage I1 Ie I2 I3 I3 I1		
Fan Air Quantity				Amps T1 Te T21		
Water Bleed GPM						

REMARKS

TEST DATE _____ READINGS BY_____

9.8 INERTIA BASES FOR PUMPS.

The inertia base shall be an all welded mild steel channel frame the minimum depth of which shall be 1/12 of the longest span between isolator but not less than 150 mm. filled with concrete the density of which shall be 2300 kg/m3.

The inertia base shall be sufficiently large to provide support for all parts of the equipment, including any component which overhang the equipment base, such as suction and discharge elbows on centrifugal pumps.

The frame shall include pre-located equipment anchor bolts fixed into position and housed in a steel sleeve allowing minor bolt location adjustment.

Isolator support brackets shall be welded into the corners of the base and suitably re-enforced for the load of the equipment and base.

Additional reinforcing roads shall be provided at 200 mm. centres to ensure the concrete and frame is adequately stiffened against distortion.

9.9 FLEXIBLE CONNECTIONS

Flexible connections shall be provided on all duct work connections to fans, rotating plant and equipment isolated from structure and anti-vibration materials or mountings. Pipe work and duct work crossing building movement or construction joints shall be installed with flexible connections.

Flexible connections on duct work to fans etc., shall be a minimum / maximum free length of 100 mm. / 200 mm. respectively to minimise noise transmission and noise breakout. They shall be completely free from stress and shall not be required to accept any weight.

Thickness and strength of flexible connection materials shall be suitable to withstand the positive and negative fan pressures to which they will be subjected to and shall not allow perceptible leakage. The materials shall be durable, non flammable having food acoustical quality.

Flexible connections shall be fitted to all pump suction and discharge connections, chillers and other vibrating equipment and where anti-vibration mounts and inertia basis are fitted.

Flexible connections shall be fitted to all cooler coil chilled water pipe work connections.

Flexible connections shall allow freedom of movement of plant in all plans.

Making flanges to pipe work flexible connections shall be of the smooth faced weld-nick type.

Rubber Bellows shall be fitted as close to the source of vibration at practicable. The pipe at the other end of the bellows shall be a fixed point.

Rubber bellows shall be single convolution of multiply reinforced EPDM rubber with wire reinforced cuffs. Flanges shall be able to swivel and be removable. The date of manufacture shall be moulded on the bellows. For traceability membranes shall have an indelible identification showing manufacturer, country of origin, the type and a batch number.

Tie bars with rubber top hat washers shall be used on bellows.

For working temperatures up to 70o C the rubber bellows shall be high tensile synthetic fibre reinforced.

For working temperature between 70oC and 100oC the bellows carcase shall be steel wire mesh reinforced throughout. Steel reinforced bellows shall be manufactured and approved to the Standards.

For temperatures above 100oC bellow shall be multiply stainless steel with Van Stone ends swivel flanges. The overall length shall not exceed 130 mm.

Flexible connections with screwed connections shall be reinforced EPDM rubber hoses and shall have at least one full union to avoid torturing on installation.

Flexible pipe connections on chilled water systems shall be suitable for a working pressure of 10 bar and test pressure of 17 bar.

10. BTU METERS

Provide BTU meters as required per the specifications. All BTU meters in the main water plant consisting of Primary Chilled Water Systems, Condenser water System shall be Ultrasonic &, non-wearing type with EN/UL approval and shall provided with Optical interference protection as per EN 62056-21:2002 standard

Meter should be a tamper proof meter with Single button design. No tampering can be done on the meter through the keypad. Parameters of the meter can be changed through software only.

Meter should not have any moving part.

The electronic part of the meter should have split mounting arrangement for safety, manual reading and to avoid condensation

Meter should have an integrated flow calculator capable to display readings locally in case of network failure.

Meter should have Self-diagnosis and indication of values, parameters, malfunction and failure messages on the display

The meter Shall have M-bus/ Pulse / RS 485 module to network meters to central station. The flow meter should be pressure rated for minimum PN16.

The meter shall have measuring accuracy of Class 2 or 3 (EN 1434).

Meter shall have an integrated flow calculator capable to display readings locally in case of network failure The electronic part should have split mounting arrangement for safety, manual reading and to avoid condensation

The devices shall properly operate with the specified accuracy and shall not be affected by the media, or by the environment that includes but not limited to low temperatures (5 Deg C), temperature fluctuations and condensation. Control panel enclosures and electronics shall meet the aforementioned requirements or located strategically to ensure proper operation.

Provide insertion type flow meters designed to mount through a fully open, 1 inch full bore ball valve supplied by flow meter manufacturer. Meter flow range shall be 2-40 feet/second for liquid service. Meter linearity shall be +/-1% for a 10:1 range. Repeatability shall be.10%. All wetted parts shall be constructed of stainless steel, bearings shall be tungsten carbide, housing and flange shall be carbon steel.

All meters need to be wet calibrated(temperature sensor and flow meter need to be calibrated together) and calibration certificate to be provided for the BTU meters

Meters need to have an inbuilt battery backup – guaranteed for a minimum of 6 to 16 years. There is no requirement of external Power supply.
No reflector used for detection of flow. This ensure that meters are very robust and don’t have any problems even after years of operation. This ensures efficiency of meter and maintenance free years of operation.

The flow sensor needs to be a high capacity flow meter and can take velocities as high as 16 m/s.

One single model for line sizes ranging from 15mm to 700mm.

Meters need to be EN/UL certified and needs to have IP54 Protection

Meter should have the facility to be used as a hot meter as well as a cold meter without any modifications. The meter should have auto switching of Hot/ Cold meters

Accuracy Class : Class 2
Pressure Drop : ≤0.025MPa (Normal Flowrate)
Working Pressure : ≤1.6MPa
Ingress Protection : Protection IP68 (transducer) / IP 54 (Electronics)
Temp Range oC : -20 ～95
Output : Mbus or Pulse or RS485

Static current : <10uA
Battery type : Li, 3.6V/2.4Ah
Battery Life : greater than 6 years Guaranteed
Environmental Class : A
Enclosure Protection : IP54
Pt1000 cable length : 1.5m (longer cable available upon request)
Flow sensor cable length : 1.2m (longer cable available upon request)
BTU integrator : Remote with min 2 m cable

Provide supply and return temperature sensors for "Delta-T" calculation of BTU consumption. Monitor total accumulated BTUs, current BTUs, monthly total BTUs, and yearly total BTUs for each location specified or shown.

Provide isolation valve kit (by HVAC vendor) to allow removal and servicing of meter while system is operating.

ANNEXURE - V
Technical data Sheets

SCHEDULE OF TECHNICAL DATA

Contractor should furnish the detailed computerized performance sheet for chillers along with details listed below. In absence of the same, the bid shall be considered invalid.

Hi Side:-

1. SCREW WATER CHILLING MACHINE (Water Cooled)

1.1 COMPRESSOR

a. Manufacturer (Make)

b. Country of Origin

c. Model and type (Open / Semi-hermetic)

d. No. of compressors per chiller and compressor RPM

e. Refrigerant

f. Saturated evaporating temperature (0C)

g. Saturated condensing temperature (0C)

h. Discharge gas temperature (0C)

Cooling capacity at above condition (TR)

Compressor shell test pressure (Kg/cm2)

Method of oil cooling

Quantity of refrigerant in the chiller (Kg)

Chiller performance details to be provided at below parameters

Load	IkW/TR at tender design conditions & with ARI relief	IkW/TR at ARI 550/590 conditions	IkW/TR at tender design conditions & constant condenser water entering temp
100%			
90%			
80%			
75%			
70%			
60%			
50%			
40%			
30%			
25%			
20%			

15%			
Part load value	NPLV =	IPLV =	PLV =

Recommended range of capacity control without surging (%)

HP/LP/OP cutout set points (Kg/cm2)

Capacity variation step-less (Yes / No)

Type of bearings

Noise at 1 meter (as per AHRI 575)

Note: In case of machines containing multiple compressors, power consumption of each 6compressor shall be indicated.

1.2 COMPRESSOR MOTOR

a. Motor manufacturer

b. Type

c. K W Rating / Power factor

d. Electrical Characteristics (±10% voltage variation)

e. Motor RPM.

f. Insulation class.

g. Enclosure/protection class.

h. Efficiency.

i. Starter manufacturer & mode of start.

j. Starting current (Amps)

k. Full load current FLA (Amps)

l. Locked rotor current (Amps)

m. Type of vibration isolation for compressor and motor

1.3 CONDENSER

a. Manufacturer (Make) Model

b. Shell Material

c. Tube material / No. of tubes / Tube OD (mm)

d. Number of passes

e. Fouling factor (FPS)

f. Water Flow (USGPM)

g. Water velocity in tubes (m/s)

h. Water side pressure drop (Kg/cm2)

i. Water temperature In/Out (0F/0C)

j. ACTUAL capacity of condenser at above conditions(TR)

1.4 CHILLER

a. Manufacturer (Make) Model

b. Shell Material

c. Type (DX / Flooded)

d. Tube material / No of tubes / Tube OD

e. Fouling factor (FPS)

f. Number of circuits

g. Water Flow (USGPM)

h. Water velocity in tubes in case of flooded coolers (m/s)

i. Star rating (ISEER value):-

Pressure drop of chilled water (Kg/cm2)

Shell insulation at MFR works material & thickness (mm)

Water temperature, IN/OUT (0F/0C)

ACTUAL capacity of cooler at above conditions (TR)

1.5 MICROPROCESSOR CONTROL CENTRE

a. Indicate point wise display system, set points etc.

b. Interface with BAS (Confirm provided)

1.6 GENERAL

a. Original computer selection printout from manufacturer to be attached with the offer (confirm)

b. AHRI / Eurovent certification (Confirm)

c. Overall Dimension(M)

Length
Breadth
Height

d. Operating weight (kg) / shipping weight

e. Service clearance required (M) L x B x H

Low Side:-

1. Primary Chilled Water Pump :

1.1 Pump
a Make

b Type & Model

c Discharge in GPM

d Head (Meters of WC)

e Efficiency (%)

1.2 Skid Details
a Operating Weight

b Overall Dimension

c Mechanical Seal Detail

1.3 Material
a Body

b Impeller

c Shaft

1.4 Motor
a Make

b Model

c Power Requirement (HP/KW)

d R.P.M.

e Rating

f Class of Insulation

g Motor efficiency

h Type of coupling (Direct/Belt)

i Method of starting

j Recommended size and material of electrical cable for connections

2. Secondary Chilled Water Pump :

2.1 Pump
a Make

b Type & Model

c Discharge in GPM

d Head (Meters of WC)

e Efficiency (%)

2.2 Skid Details
a Operating Weight

b Overall Dimension

c Mechanical Seal Detail

2.3 Material
a Body

b Impeller

c Shaft

2.4 Motor
a Make

b Model

c Power Requirement (HP/KW)

d R.P.M.

e Rating

f Class of Insulation

g Motor efficiency

h Type of coupling (Direct/Belt)

i Method of starting

j Recommended size and material of electrical cable for connections

2.5 Variable Frequency Drive

a. Make / Country of Origin

b. Model No.

c. Rating

d. Interface with BAS.

e. Fault Indication.

f. Dimensions (mm)

g. No. of Steps

h. Operating Weight

2.6 Pump Controller

a. Make / Country of Origin

b. Model No.

c. Microprocessor

d. No. of Bits.

e. RAM Memory

14. ELECTRICAL TECHNICAL DATA SHEETS

For MCC (To be filled by the bidders)

S.No.	Description	Recommended Specification	Confirmation by the Bidders
1	Type of Panel	a. MCC non drawout type compartmentalized. b. AHU Panels non drawout type, non compartmentalized	
2	Type of Mounting	Free standing Floor Mounted	
3	Fault kA	50kA -1 Sec for MCC 25kA – 1 Sec for AHU Panels	
4 a b c d	Thickness of CRCA sheets Structural members Covers and doors Base channel Gland plate	 3mm 2mm MCC - ISMC 100 3mm	

5 a	Painting/ Process	Synthetic Enamel Paint As per seven tank process Oven baked.	
B	Paint shade; a. Inside b. Outside	 RAL – 7032 RAL - 7032	
6	Details of busbars	Electrolytic grade Copper of specified rating for details see constructional features mentioned in specifications	
7	Cable Entry	For MCC & AHU Panels Top or Bottom depending upon location of Panel.	
8	Enclosure Protection/ Ventilation	For MCC – IP -52 with louvers for Ventilation.	
9	Control Wiring/ Power Wiring	Insulated 660Volts Cu wire.	
a.	Voltage Circuit	1.5 sq mm	
b.	Current Circuit	2.5 sq mm	
c.	Minimum size of Power wiring CKt	16 sq mm	
10	Maximum Operating Height	2100	
11	Mounting height of Relays/Meters Control Switches	Range 350mm to 1900mm	

Constructional Features for MCC

S.No.	Description	Recommended Specification	Confirmation by the Bidders
1	MCC		
a.	Busbar Chamber	400mm ht	
b.	Metering Chamber	400mm ht	
c.	Incoming Compartment	1000mm vide Module Single Tier	
d.	Overall Height	2100 mm	
e.	Overall Depth	1300 & 900 mm	
f.	Overall Length	(To be indicated by the bidder)	
g.	Construction	IP-52 with louvers for ventilation	
h.	Current Density	1.25 Amp / Sq.mm	
i.	Main Bus	1.75 Amp / Sq.mm	
ii.	Branch Bus Rating	75% of aggregate Switches connected. 1.25 Amp / Sq.mm Density	
iii.	Neutral Bus	Half of the size of phase bus	
iv.	Earth Bus	Half of the size of phase bus	
j.	Incoming and outgoing feeders.	As per SLD	
2	AHU Panels		
a.	Accessibility	front accessible only	
b.	Overall Depth	300 mm	
c.	Overall Height	700 mm	
d.	Incoming compartment	Individually one module of 600mm wide with direct entry of incoming cables with cable bus bars for terminating multiple incoming cable. incoming metering units and outgoing cables as per SLD.	

DRAWINGS

The contractor shall refer the tender drawings attached in this section.

Sr. No.	Drawing Title (GFCs)	Drawing No.
1	LOWER GROUND FLOOR HVAC LAYOUT	AEON/AC/T-01
2	TERRACE FLOOR HVAC LAYOUT	AEON/AC/T-09

HVAC LEGEND:-		
S.NO.	SYMBOL	DESCRIPTION
01		(SEAD) SMOKE EXHAUST AIR DUCT
02		(SFAD) SMOKE FRESH AIR DUCT
03		(LLPAD) LIFT LOBBY PRESSURIZATION AIR DUCT
04		(PAD) PRESSURIZATION AIR DUCT
05		(TFAD) TREATED FRESH AIR DUCT
06		(TEAD/KEAD) TOILET/KITCHEN EXHAUST AIR DUCT
07		(FM DOAD) FLOOR MOUNT DOAS UNIT
08		AXIAL FLOW FAN
09		(CHW S/R) CHILLED WATER SUPPLY&RETURN PIPE
10		(VCD) VOLUME CONTROL DAMPER
11		MFD(NC) MOTORIZED FIR DAMPER NORMALLY CLOSED MFD(NO) MOTORIZED FIR DAMPER NORMALLY OPEN

NORTH DIRECTION

GENERAL TECHNICAL NOTES TO BE FOLLOWED AT SITE WHICH MAY NOT REFLECT IN THIS DRAWING

GENERAL NOTE

Terrace Floor Plan

WHOLE FLOOR 400mm FILLING IN LIGHT WEIGHT MATERIAL

ROOF FLOOR LAYOUT

NOTE:-

1) ALL MASONRY / FILLING IN AAC LIGHT WEIGHT BLOCK.
2) FILLING ON CANTILEVER SLAB IN MODIFOAM.
3) ALL ELEVATION WALLS IN AAC LIGHT WEIGHT BLOCK.

Terrace Floor plan

REV. NO.	DATE	REMARKS	BY
01	16-12-25	DWG REVISED AS PER COMMENTS	
00	14-08-25	DWG ISSUE FOR APPROVAL	

PRINCIPAL ARCHITECTS
NPAAE BANGKOK

PROJECT MANAGEMENT
ARKITECHNO

LANDSCAPE & INTERIOR DESIGN CONSULTANTS
CANDUSTUDIO

M E P F CONSULTANTS
AEON Integrated Building Design Consultants LLP
A-122, Sector 136, Noida - 201305, India

STRUCTURAL CONSULTANTS
SACPL
6th Floor, 106 B-Wing, Brij Bhoomi, Nehru Road, Above Canara Bank, Vile Parle (E), Mumbai, Maharashtra, 400057

ARCHITECTS
DENCITY
Architecture | Interiors | Turnkey
3rd Floor, Aryasamhati, Plot No. 751/3317, Behera Sahi Rd, Kalinga Stadium Sq, Bhubaneswar-751012
97775 78 111 | mail@dencity.co.in

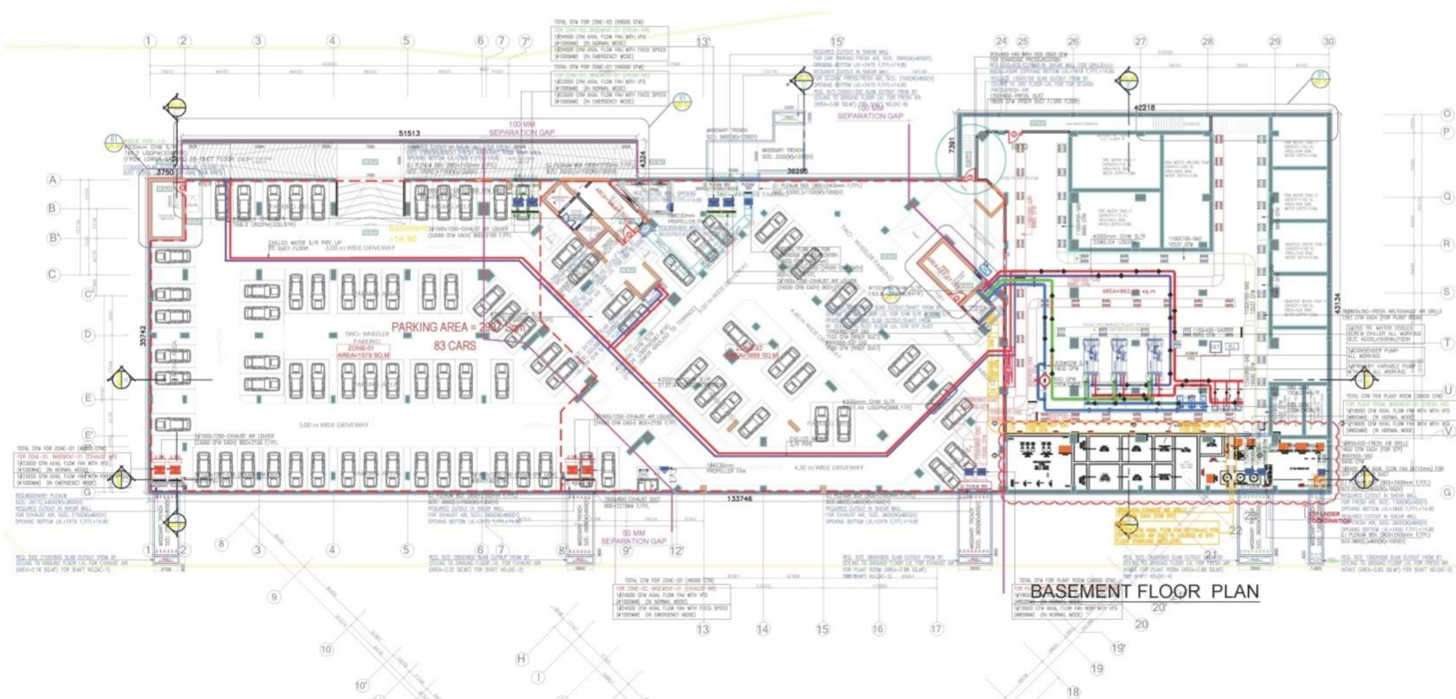
PROJECT GOPALPUR PALM RESORT Udayapur, Gopalpur-on-Sea, Ganjam, Odisha

OWNER / PROMOTER
SWOSTI PREMIUM LIMITED
P-1, JAYDEV VIHAR
BHUBANESWAR, ODISHA - 751013

DRAWING TITLE
TERRACE FLOOR
HVAC LAYOUT

DRAWING STATUS
FOR TENDER

PROJECT NO. - 24/C241	CHECKED BY: P.TOPPO
DATE OF FIRST ISSUE: 16-12-2025	
SCALE / REV.NO. R1 / PAPER ISO A1	DRAWN BY: A.E
DRG.NO. AEON/AC/T-09	



HVAC LEGEND	
SYMBOL	DESCRIPTION
A.T.C	AUTOMATIC TUBE CLEANING
C.E.T	CLOSE EXPANSION TANK
	AIR SEPARATOR
P.U.	PRESSURIZATION UNIT
	CONDENSER WATER SUPPLY/RETURN PIPE
	CHILLED WATER SUPPLY/RETURN PIPE

HVAC LEGEND	
	FRESH/SUPPLY AIR GRILL
	EXHAUST AIR GRILL
	FRESH AIR DUCT
	EXHAUST AIR DUCT
	PRESSURIZATION AIR DUCT
	STP EXHAUST AIR DUCT
	FRESH AIR/EXHAUST AIR AXIAL FLOW FAN
	HVAC SHAFT
	HVAC MASONARY TRENCH

NORTH DIRECTION

GENERAL TECHNICAL NOTES TO BE FOLLOWED AT SITE WHICH MAY NOT REFLECT IN THIS DRAWING

GENERAL NOTE

REV. NO.	DATE	REMARKS	BY
01	26.12.25	DWG REVISED AS PER NEW ARCHITECT LAYOUT	
00	14.08.25	DWG ISSUE FOR APPROVAL	

PRINCIPAL ARCHITECTS

NPAAE BANGKOK

NPAAE BANGKOK (THAILAND) CO. LTD.
79/38 Sukhumvit 46 Sukhumvit Rd. Phakanong, Klongtoey, Bangkok, Thailand

PROJECT MANAGEMENT

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Arkitechno Consultants India Pvt. Ltd.,
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LANDSCAPE & INTERIOR DESIGN CONSULTANTS

CANCUSTUDIO
9/168 & 25/2 Soi Paholyothin 9, Paholyothin Rd.,
Samsen Nai, Payathai, BKK 10400 TH

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AEON Integrated Building Design Consultants LLP
A-122, Sector 136, Noida - 201 305, India

STRUCTURAL CONSULTANTS

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ARCHITECTS

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Architecture | Interiors | Turnkey

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Behera Sahi Rd,
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PROJECT

GOPALPUR PALM RESORT
Udayapur, Gopalpur-on-Sea, Ganjam, Odisha

OWNER / PROMOTER

SWOSTI PREMIUM LIMITED
P-1, JAYDEV VIHAR
BHUBANESWAR, ODISHA – 751013

DRAWING TITLE

BASEMEN FLOOR PLAN
HVAC LAYOUT

DRAWING STATUS

TENDER DRAWING

PROJECT NO.-24/C241			DRG.NO. AEON/AC/T-01
DATE OF FIRST ISSUE- 26-DECEMBER-2025			
SCALE 1:250@A1	REV.NO. R1	PAPER ISO A1	
CHECKED BY T.A	DRAWN BY A.E		

SECTION-4

FINANCIAL PROPOSAL SUBMISSION FORM

(To be submitted in separate sealed Envelop)

(On company's Letterhead)
{Location, Date}

To

The General Manager (Communications)
Swosti Premium Ltd.
Gopalpur Palm Resort Project
Email: gm.communications@swostihotels.com ear Sirs:

We, the undersigned, offer to provide the construction services for "Supply, Installation, Testing & Commissioning of Water Cooled Screw Chillers-HVAC High Side and Allied Works at Gopalpur Palm Resort for Swosti Premium Ltd., Gopalpur, Ganjam, on a Item Rate Contract Basis", in accordance with your Request for Proposal dated and our Technical Proposal.

"We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery. We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely "Prevention of Corruption Act, 1988 (as updated from time to time)."

Our attached Financial Proposal is for the amount of {Indicate the corresponding to the amount(s) currency(ies)}{Insert amount(s) in words and figures}, *"excluding" of all indirect local taxes as in the Data Sheet.* The estimated amount of local indirect taxes is {Insert currency} {Insert amount in words and figures} which shall be confirmed or adjusted, if needed, during negotiations. {Please note that all amounts shall be the same as indicated above.

Our Financial Proposal shall be binding upon us subject to the modifications resulting from Contract negotiations, up to expiration of the validity period of the Proposal, i.e. before the date indicated in the Data Sheet.

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

We remain,

Yours sincerely,

Authorized Signature {In full and initials}: _____ Name and Title of Signatory: _____

In the capacity of: _____
Address: _____

E-mail:

BOQ FOR SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF HVAC-HIGH SIDE- 3 x 200 TR WATER COOLED SCREW CHILLERS AND ALLIED WORKS

S.No	Description of Items	Unit	Qty	Rate (INR)	Amount (INR)
A.	**HIGH SIDE EQUIPMENTS**				
1	Supplying, installing, testing and commissioning of single/multi compressor AHRI Certified Water Cooled Screw Water Chilling Machines (along with VFD) The delivered capacity of each machine shall be **200 TR** at the specified conditions under Basis of Design and comprise of machine mounted motor with closed transition star delta starter, water cooled condenser, refrigerant piping and control wiring, first charge of refrigerant & oil and accessories including safety controls mounted in central micro-processor based console panel, sockets, flow switches, sensors, cable termination adopter box with suitable rating of 4 pole MCCB/ACB. Refrigerant used as shall be Ozone friendly HFC. vibration isolators shall be provided for the chiller and included in price. Chiller plant Manager (CPM) shall be supplied with chiller units. Cost of same to be considered with the chiller units.				
	Evaporator shall be factory insulated with 25 mm Thick black cloth faced Nitrile Rubber/Elastomeric Foam as per OEM standard. Flow switch shall be provided at evaporator and condenser duly interlocked for safe operation of chiller.Condenser & Evaporator shell shall be constructed with ASME certifited rolled carbon steel.				
	Unit mounted/Floor mounted VFD to be provided. In case of floor mounted VFD, the cost of cabling & cable trays from VFD to chiller shall be included in the chiller price. Sound level should not be more than 75 dB(A) at 2 m distance from the unit.				
	Water marine boxes shall be provided at Condensers				
	Cable terminal box shall be suitable for receiving incoming Aluminium Cabling				
	Grooved coulping for chiller and condenser at inlet & outlet. BMS card shall be included in the price and vendor shall provide open protocol and suitable to connect with Modbus/ Lonwork/ Bacnet				
	Motor suitable for 415±10%, 50 cycles, 3 phase AC supply.				

	a) Testing point at site/design Condition are : 1)100 % Load 2) 50% Load 3) 25% Load 4) 100% Load (Design plus 5 Deg °F at condenser entering water temerature)				
	Chiller should also be capable to run at minimum 60° F. condenser inlet temp.				
	The Evaporator performance shall be as follows:				
	Chilled Water Temperature- Inlet	-	54 °F		
	Chilled Water Temperature- Outlet	-	44 °F		
	Fouling factor	-	0.0005 FPS		
	Chilled water flow	-	480 USGPM		
	Pressure drop	-	Max 10 ft		
	The Condenser performance shall be as follows:				
	Condenser Water Temperature- Inlet	-	89.96 °F		
	Condenser Water Temperature- Outlet	-	99.96 °F		
	Fouling factor	-	0.001 FPS		
	Condenser water flow	-	600 USGPM		
	Pressure drop	-	Max 15 ft		
	Chiller sequencing and operation should be designed in such a way that one chiller starts with minimum capacity initially and load to the maximum and enable the next chiller to start on demand through Building Management / CPM System.				
	Anti-freeze & communication card etc.				
	Micro-processor based controls with alpha-numeric display in English for all operating parameters such as supply voltage, frequency, load current, chilled water inlet, chilled water outlet, condenser inlet and outlet temperature parameters, operating pressures etc., It should be compatible to be be integrated with BMS / chiller plant manager of any make communicating on any one of the standard protocols such as BACNET / MODBUS. The required hardware and software with all accessories complete for communication.				
	Co-ordination with low side HVAC contractor for chiller commissioning, Power control termination, testing etc.				
	The bidder shall submit a computerized selection sheet of the chiller offered as obtained from the manufacturer along with their offer from the latest AHRI listed software version. Non-submittal of the computerized selection sheet shall be liable for bid rejection. The cooler and condenser shall have applicable pressure code vessel stamping on the nameplate as a standard, without which the machines will be rejected.				
	Clearing the goods including customs clearance				

	for all items as described under supply				
	Loading to the transport vehicle				
	Local transport by road including transit insurance.				
	Interaction and clearance at various local points				
	Unloading at site				
	Shifting of material to the point of installation including lifting using mechanical means to the designated area of Building				
	Note :				
	1. Vendor to study the methodology to lift/shift the chillers to Plant Room and only consultant/client approval approved methodology to be adopted.				
	2. Necessary permissions from authorities to be taken by the contractor before lifting / shifting the Chillers				
	3. Necessary Insurance for the workmen, material and third party liability.				
	Installation, leveling, testing and commissioning charges including all consumables, tools and equipment.				
	Any items and works not specifically mentioned above but as required for the works. (contractor to specify the nature of work / item)				
	Minimum COP at AHRI conditions shall be minimum 6.0 and IPLV 0.37				
	Maximum IkW/ TR at full load - 0.75 max, mini NPLV 0.39				
a	Water Chilling Machines as described above (2W+1SB)	No.	3		
b	4 testing point of Water Chilling Machine as described above (For one Chiller)	Set	1		
	Supplying, installation, testing and commissioning of Automatic Tube Cleaning System suitable for Chillers, capacity as mentioned above along with the following size of Condenser Nozzle connection and configuration of Chilling Unit(s).All above and as mentioned in Specifications.				
c	300 mm dia. for condenser	Set	1		
2	Supplying, installing, testing and commissioning of **Long coupled Vertical Inline Pumps** duly factory mounted on a base with electric motor. The pump motor shall be IE-3 efficiency (minimum 90%) and suitable for 415 +10% volts, 50 cycles, 3 phase power supply. Pumps will adhere to following performance characteristics :				
	The pump performance shall meet the criterion laid down under ASHRAE 90.1-2022 and with				

	minimum efficiency as specified.				
	Thermal insulation & cladding of the chilled water pumps will be included.				
	All pumps shall operate through variable frequency drives.				
	The rating of pumps shall be as follows:				
a)	Primary Variable Chilled Water Pumps-				
	Water flow rate	:	480 USGPM		
	Head	:	100 Ft. of water		
	Motor HP not to exceed	:	20 HP		
	Efficiency	:	75% or more		
	Primary Chilled Water pump as described above including 1 No. standby.	No.	3		
b)	Condenser Water Pumps-				
	Water flow rate	:	600USGPM		
	Head	:	100 Ft. of water		
	Motor HP not to exceed	:	20 HP		
	Efficiency	:	75% or more		
	Condenser Water pump as described above including 1 No. standby.	No.	3		
3	Supplying, installing, testing and commissioning of **Variable Speed Pumping System (Sensor based)** consisting of following:				
	Variable Frequency Drive suitable for Primary Variable Chilled Water Pumps & Condensor Water Pumps described above.				
	Pump controller (micrprocessor based) with licensed software capable of operating the system with Modbus/Lon Works/Bacnet protocol. Quoted price shall include control/power wiring for daisy chain linking of pumps and providing signals at one point within the room. Pump controller shall be capable of controlling numbers of PCHW pumps & CDW pumps.				
	Suitable No. Differential pressure sensor / transmitters control along with control cabling running in 25 mm dia MS conduit from sensor/transmitter to VFD Panel. Pressure sensing elements shall be installed at farthest end of zone circuit				
	Digital display shall be provided on Pump Controller which will display all critical parameters. All wiring to complete the installation shall be included as part of this item.				
i	Primary variable speed pumping system as described above	Set	1		

ii	Condenser variable speed pumping system as described above	Set	1		
4	Supplying, installing, testing and commissioning of FRP Induced draft **Cooling Towers with VFD** with built in PID controller, control panel(keypad and display) for air conditioning system. Each tower shall be complete with FRP basin, casing, distribution system, filling, louvers, HDG supporters, GI ladders, steel/masonary supporting structure, anti vibration mounting etc. (VFD is considered as a seperate item in the BOQ)				
	Cooling tower approach should not be more than 5 °C at lower WBT. Software generated curves to be submitted by manufacturer.				
	Motors shall be for outdoor application (IP55), suitable for 415±10% volt, 50 cycle's 3 phase power supply meeting criterion as per ASHRAE standard 90.1-2019 and high efficiency.				
	Isolators at cooling tower enclosed in weather proof panel shall also be included.				
	Performance required for cooling tower is minimum 50 gpm/hp when tested according CTI ATC-105 procedure. Foundation shall be under Civil Contractor's scope.				
	Cooling tower	-	225 TR Cooling capacity		
	Inlet Condenser Water Temperature	-	99.96 °F		
	Outlet Condenser Water Temperature	-	89.96 °F		
	Wet Bulb Temperture	-	86.18		
	Chilled Water Flow	-	600 USGPM		
	Motor HP	-	1 No. 10 HP		
	Cell Number	-	1 No.		
	Sound level	-	76 dB at 5 meter distance		
i	Cooling Tower as described above(2W+1Sb)	Set	3		
5	Supply, installation, testing and commissioning of Closed type pressurized chilled water expansion tank with PN-16 rating complete with necessary connection for piping, vent, valves and accessories. The requirement shall be as follows:				
	The total volume of water in chilled water pipes shall be worked out by HVAC contractor and contractor will work out the total volume. Below tank capacity are indicative for quotes, any change during the execution in Tank capacity. There will be no additional claim will be acceptable. Accessories like pumps in N+1 etc.shall be included in quoted price for satisfactory operation.				

	The tank shall be nitrogen precharged steel expansion tank with replaceable heavy duty butyl rubber bladder.				
	The tank shall have suitable sized inlet connection, drain alongwith valves for isolation/shutdown of system connection and drain and charging valve connection to facilitate the on site charging of the tank to meet system requirement.				
i	Chilled water Expansion tank of capacity- 1000 litres	Set	1		
6	Supply, installation, testing and commissioning of Centrifugal type Air Seperator complete with necessary connection for piping, vent, valves and accessories. The requirement shall be as follows:				
i	250 mm dia Air Seperator	Set	1		
ii	150 mm dia Air Seperator	Set		--	--
B	**ELECTRICAL INSTALLATION**				
1	**MOTOR CONTROL CENTRE :**				
	Design, manufacture, supply, installation, testing and commissioning of the following cubicle type 2 mm thick sheet steel enclosed separate compartment for each feeder, front operated, rear connections indoor type LT motor control panel, dust and vermin proof, drawout/hinged and lockable doors, complete with internal wiring, colour coding with ferrules, bonding to earth and painting. Quoted price for each panel & motor control centre shall include all associated control wiring and interlocking circuitary. Each MCC shall include cost of cable, cable trays,wiring, control wiring & inter locking between chillers, primary CHW pumps, condenser water pumps, motorized valves at chillers and condensers & flow switch installed in de-coupler by-pass line, in order to execute the required sequence of operation. A separate set of CTs to be provided for BAS and wiring from CT's and voltage transducers to be brought on to separate set of terminals.				
	All outgoing shall be provided with Stop/Manual/ Auto selector switch to facilitate operation through BAS. All starters shall be provided with potential free Contact for Connections to Building Automation System.				
	Motor Control Centre- Section 01 (415 V) bus section consisting of :				
1.1	2 No. Incoming each consisting of the following :				
	2 No. 400 amps 4 Pole MCCB, Motorized with microprocessor based complete with the following :				
	0 - 500 volts 96 x 96 sq mm digital voltmeter with selector switch. -1Set				

	0 - 500 amps 96 x 96 sq mm digital ammeter with 3 No. 500-/ 5 amps CT's and selector switch.-1Set				
	Phase indicating lamps.				
	TPN bus bars shall be of Aluminium and shall be sleeved. Phase bus bars shall be rated at 1250 amps and neutral bus bar shall be of 50% capacity.				
1.2	Bus Coupler 02-Set				
	2 No. 400 amps 4 Pole MCCB, Motorized with microprocessor based complete with the following :				
	Control MCB # 1No.				
	Outgoings 1				
1.3	3 No. 400 amps TPN MCCB with microprocessor based O/C, S/C protection release & ROM as outgoing to 3 No. 123 kW starter of chilling unit compressor motor. The MCCB compartment shall contain CT operated digital ammeter of 0-400 amps range with selector switch and an indicating lamp with MCB for 'ON' status of motor.				
	3 No. 63 amps MCCB Suitable rating MCCB Star Delta starter for 20 HP motor overloading relay with built in single phasing protection & outgoing feeder to Primary Chilled water pump motor. Each of these compartment shall contain CT operated digital ammeter of 0-100 amps range with selector switch and indicating lamp with MCB for 'ON / OFF' status of pump motors.				
	3 No. 63 amps MCCB with outgoing feeders to variable Frequency Drive (VFD) panel of 20 HP outgoing feeders to Variable Flow Condenser water pump. Each of these compartment shall contain CT operated digital ammeter of 0-100 amps range with selector switch and indicating lamp with MCB for 'ON / OFF' status of pump motors.				
	3 No. 32 amps MPCB with outgoing VFD feeders to 7.5 HP Cooling Tower Fan Moter. Each of these compartment shall contain CT operated digital ammeter of 0-63 amps range with selector switch and indicating lamp with MCB for 'ON / OFF' status of pump motors.VFD space provision shall be included				
	Necessary cable alleys, space for spare switches, internal wiring, control wiring / cabling and copper earthing of all equipment shall be included. All switches and other components shall be motor duty rating.				
	Spare feeder & space for following:				
	2 No. 20 HP Motor				
	1 No. 7.5 HP Motor				
	Only Space for provision, internal switchgear will be installed as per future requirement. Blank				

	space shall be provided.				
i	Motor Control Centre No. 1 as described above.	Set	1		
	Total of HIGH SIDE EQUIPMENTS				

SUMMARY OF COSTS

S. No.	Description of Item	Amount (INR)
A.	HIGH SIDE EQUIPMENTS	
	Grand Total	

OPERATION & MAINTENANCE

YEAR	OPERATION	ALL INCLUSIVE COMPREHENSIVE MAINTENANCE
DLP		**Part of DLP**
First Year after DLP		
Second Year after DLP		
Third Year after DLP		
Fourth Year after DLP		
Fifth Year after DLP		

Note:-

1. Above Prices will not be part of Tender Evaluation
2. It will not be binding on SWOSTI PREMIUM LTD for entering into above Comprehensive Annual Maintenance Contract
3. If SWOSTI PREMIUM LTD decides to enter into the above Comprehensive Annual Maintenance Contract, a separate Contract Agreement shall be made, which will not be part of this Contract
4. Tenderers are expected to quote Reasonable Prices.

PAYMENT TERMS:

Mobilization Advance:

- Contractor will be paid any mobilization advance as indicated in contract data.

PAYMENT SCHEDULE

The stage-wise payment to the Contractor shall be released based on the items of work executed as contained in the Bills of Quantities and rates agreed to thereto. Upon completion that item of work. Detail procedure are as below :

Preparation of R/A Bills :

- After satisfactory completion of each item of work, the bill shall be submitted with detailed measurements and invoice.
- Final bill along with no claim certificate should be submitted within 2 months from date of completion of work.
- Upon clearing the site of all debris, materials, temporary structures and machinery.
- Payments for supply/work done will be made in R/A bill based on monthly progress or work, verified with measurement by PMC/Authorised Engineer.
- R/A bills will be certified against final amounts as in contract.

Withholding of Payments:

- Payment may be withheld if contractor fails to meet contractual obligations.
- Failure to pay workers' wages or bills of contractor.

SECURED ADVANCE :

Any request for a secured advance may be requested for by Contractor along with invoice/ original shipping document copy of invoice and duly signed payment invoice. This may be considered by the Employer(Client) upon assessment by PMC/Engineer-in-Charge for items of non-perishable, non-fragile & non-consumable in nature and required for the work and in accordance with contract (Conditions & Technical Specifications), which have been brought to the site in connection with execution (having reference to an item of work in BOQ) and are adequately stored and/or protected against damage by weather or other causes and have not been incorporated in the work earlier. The amount of such advance shall be deducted from next/final payment. However, any secured advance for any material/equipment lying unutilized after 3 months/completion of work shall be recovered fully from the next/final bill.

Note:

Each payment shall be certified by the Engineer based on physical progress at site against the approved GFC drawings.

No advance payment shall be made unless specifically agreed in the contract data or special conditions.

All payments are subject to retention, tax deduction at source, and recoveries as per the contract.

. SECTION 5: CONTRACT DATA,CONTRACT FORM

&

CONDITIONS OF CONTRACT

CONTRACT DATA

Clause	Description
1. Name of Work	SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF HVAC-HIGH SIDE- 3 x 200 TR WATER COOLED SCREW CHILLERS AND ALLIED WORKS at Gopalpur Palm Resort – (Item Rate Contract)
2. Name of the Client	Swosti Group
3. Client's Representative	Project Management Consultant (PMC) – [Insert PMC Firm Name]
4. PMC Contact Details	Name: Designation: Project Manager – PMC Email: [Insert] Phone: [Insert]
5. Site Location	Gopalpur-on-Sea, Ganjam District, Odisha – 761002
6. Scope of Work	All HVAC-HIGH Side SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF HVAC HIGH SIDE-3 x 200 TR WATER COOLED SCREW CHILLERS AND ALLIED as per drawings and specifications.
7. Estimated Contract Value	₹ [Insert Amount] (Inclusive of all costs except GST)
8. Tender Type	Item Rate-Fixed Price Contract
9. Contract Type	Item Rate
10. Time for Completion	[Insert duration – e.g., 6 months] from the date of Letter of Acceptance (LoA)
11. Date of Commencement	Within 7 (seven) days from issuance of LoA or handing over of site, whichever is later
12. Defects Liability Period (DLP)	12 months from the date of issuance of Completion Certificate
13. Performance Security	2% of Contract Value in the form of Bank Guarantee to be submitted within 7 days of LoA
14. Retention Money	3% of Running Account Bills; to be released after successful completion of the Defects Liability Period
15. Mobilisation Advance	No
16. Schedule of Payments	Item-based payments linked to actual progress of works (Refer to Section – Payment Terms)
17. Liquidated Damages (LD)	0.2 % **per day** of the value of balance work delayed **beyond the stipulated date of completion**, subject to a **maximum of 10% of Contract Value**
18. Arbitration	In accordance with the Arbitration and Conciliation Act, 1996; sole arbitrator to be mutually appointed
19. Governing Law and Jurisdiction	Laws of India; jurisdiction: Bhubaneswar, Odisha
20. Insurance	Contractor to provide insurance for Works, Workmen Compensation, Equipment, and Third-Party Liability to indemnify the Client from damage/Claims arising out all such items including loss arising out of natural calamity.
21. Taxes and Duties	Quoted price is inclusive of all taxes and duties except GST; GST shall be paid extra as applicable

Clause	Description
22. Sub-contracting	Permitted only with prior written approval of the Client / PMC
23. Safety & Compliance	Contractor to comply with safety regulations, labor laws, and site protocols
24. Force Majeure	As per General Conditions of Contract
25. Advance Payment	10% of Contract Value, against submission of Bank Guarantee of 100% of amount; recoverable in equal instalments from running bills
26.Secured Advance	To be considered on request

AGREEMENT

AN AGREEMENT is made this----------BETWEEN the SWOSTI PREMIUM LTD ,Bhubaneswar, which expression shall include its successor, unless repugnant to or Excluded by the contract here of and assignees of and represented by its ……(the first party (hereinafter called the Authority) and by…… its sole proprietor/partners/Director and having registered office at (which expression shall be including his / its successor's heirs executors, representative and or assignees of the second party (hereinafter called the contractor}.

WHEREAS the Authority has, under tender Notification No. ----------

WHEREAS the contractor has submitted tender for carrying out the work as above as per the tender document page ---- to ----- and has represented that in conformity with his / its obligation contained in the tender as modified by the correction slips and corrigendum contained he / it shall carryout the same truly, faithfully and honestly.

THE SAME has been accepted by both the parties on the terms and conditions, corrections, corrigendum contained in the tender as modified as well as the letter of acceptance , at a total Contract Price of Rs. Crores (Rupees Crores) excluding GST (To be paid extra as applicable) as Issued party No.1 annexed here to as.

The same shall be binding on both the parties.

IN WITNESS WHEREOF, the parties have signed the deed of agreement on the date, month and year referred to above.

Date: At

New Delhi.

Signed by

Party No.1 Party No.2

WITNESS

1. Party No.1

2. Party No.2

Conditions of Contract

Conditions of Contract

Table of Contents

GENERAL

Terms,which are defined in the Contract Data and not defined in the Conditions of Contract shall keep their defined meanings. Capital initials are used to identify defined terms.

Bill of Quantities means the priced and completed Bill of Quantities;

Compensation Events are those defined in Document;

The **Completion Date** is the date of completion of the Works as certified by the Engineer.

The **Contract** is the contract between the Client and the Contractor to execute, complete and maintain the Works.

The **Contract Data** defines the documents and other information, which comprise the Contract;

The **Contractor** is a person or corporate body whose Bid to carry out the Works has been accepted by the Client [obligations of the Contractor mentioned in the Contract Data].;

The **Contractor's Bid** is the completed Bidding document submitted by the Contractor to the Client and includes Technical and Financial bids;

The **Contract Price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract;

Days are calendar days; months are calendar months;

A **Defect** is any part of the Works not completed in accordance with the Contract;

The **Defects Liability Period** is the period named in the Contract Data and calculated from the Completion Date;

The **Client** is the party who will employ the Contractor to carry out the Works; [As mentioned in the Contract Data].

The Engineer is the person named in the Contract Data (or any other competent person appointed and notified to the contractor to act in replacement of the Engineer) who is responsible for supervising the Contractor’s work, administering the Contract, certifying payments due to the Contractor, issuing and valuing Variations to the Contract, recommending extensions of time, and valuing the Compensation Events;

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works;

Initial Contract Price is the Contract Price listed in the Client's Letter of Acceptance;

Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Client by issuing an extension of time;

Materials are all supplies, including consumables, used by the contractor for incorporation in the Works;

Plant is any integral part of the Works, which is to have a mechanical, electrical, electronic or chemical or biological function;The **Site** is the area defined as such in the Contract Data;

Site Investigation Reports are those, which were included in the Bidding documents and are factual interpretative reports about the surface and sub-surface conditions at the site;

Specification means the Specification of the works included in the Contract and any modification or addition made or approved by the Client;

The **Start Date / Date of Commencement** is given in. the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates;

A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site;

Temporary Works are works designed, constructed, installed, and removed by the Contractor, which are needed for construction or installation of the Works;

A **Variation or Change in Scope** is an instruction given by the Client, which varies and change the scope of Works;

Works are what the Contract requires the Contractor to construct, install, and turn over to the Client, as defined in the Contract Data;

Year may be understood as financial year;

"Approved Make" means makes of items as specified in the "List of Approved Makes/Approved Manufacturers" in this RFP. However, a higher or equivalent make can be utilized after obtaining prior approval of "Engineer-In-Charge" in writing.

Interpretation

In interpreting the Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their general meaning under the language of the Contract unless specifically defined. The Client will provide instructions clarifying queries about the Conditions of Contract.

If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion date for the whole of the Works).

The documents forming the Contract shall be interpreted in the following order of priority:

(a) Agreement

(b) Letter of Acceptance, notice to proceed with the works

(c) Contractor's Bid

(d) Contract Data

(e) Conditions of Contract including Additional & Special Conditions of Contract

(f) Specifications

(g) Drawings

(h) Bill of quantities (optional) and

(i) Any other document listed in the Contract Data as forming part of the Contract.

Languages and Law

The language of the Contract and the law governing the Contract are stated in the Contract Data.

Engineer's Decisions:

Except where otherwise specifically stated, the Engineer will decide contractual matters between the Client and the Contractor in the role representing the Client as per the provision of the contract.

Delegation:

The Engineer may delegate any of his duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

Communications:

Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act).

Sub-contracting:

The Contractor may sub-contract any portion of work, up to a limit of 10% of contact value, with the approval of the Engineer but may not assign the Contract without the approval of the Client in writing. Sub-contracting does not alter the Contractor's obligations.

Other Contractors:

The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Client between the dates given in the Schedule of other Contractors. The Contractor shall as refer to in the Contract Data, also provide facilities and services for them as described in the Schedule. The Client may modify the schedule of other contractors and shall notify the contractor of any such modification.

Personnel:

The Contractor shall employ the key personnel named in the Schedule of Key Personnel as referred to in the Contract Data besides those as listed to carry out the functions stated in the Schedule or other personnel approved by the Engineer. The Engineer will approve any proposed replacement of key personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule.

If the Engineer asks the Contractor to remove a person who is a member of the Contractor's staff or his work force stating the reasons the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

Client's and Contractor's Risks:

The Client carries the risks which this Contract states are Client's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

Client's Risks:

The Client is responsible for the excepted risks which are in so far as they directly affect the execution of the Works in India, the risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Contractor's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive.

Contractor's Risks:

All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

Insurance:

The Contractor shall provide, in the joint names of the Client and the Contractor, insurance cover ***for the period as stated below against the events and*** in the amounts and deductibles stated in the Contract Data for the following events, which are due to the Contractor's risks:

A) From the starting date to the end of defect liability period:

(a) Loss of or damage to the works

B) From the start date till completion of the work as per agreement:

(a) Loss of or damage to plant, materials and equipment,

(b) Loss of or damage of property (except the works, plant, materials and equipment) in connection with the contract, and

(c) Personal injury or death.

If all the items as listed above can be combined / grouped under one insurance cover like Contractor's, All Risks (CAR) Policy **covering all-natural calamities as per local conditions.**

Prior to seven days before the start date, the Contractor shall furnish to the Engineer notarized true copies of the certificates of insurance, copies of insurance policies and premia payment receipts in respect of such insurance for the Client's approval. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

If the contractor does not provide any of the policies and certificates required, the Client may affect the insurance which the contractor should have provided and recover the premiums the Client has paid from payments otherwise due to the contractor or, if no payment is due, the payment of the premiums shall be a debt due.

Alterations to the terms of insurance shall not be made without the approval of the Client.

Both parties shall comply with any conditions of the insurance policies.

Site Investigation Reports:

The Contractor, in preparing the Bid, may rely on any site Investigation Reports referred to in the Contract Data, which are indicative and not exhaustive. The Client shall provide all available details to the Contractor (Bidder) for his information, if requested by him at least one week prior to the bid submission date. The bidder shall be responsible for interpreting all such data. After award of work, the Contractor shall carryout detail survey and investigation for preparation of detail designs as per the scope of work and time period stipulated.

To the extent which was practicable (taking account of cost and time), the Contractor (Bidder) shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Tender or Works. To the same extent, the Contractor (Bidder) shall be deemed to have inspected and examined the Site, its surroundings, the above data and other available information, and to have been satisfied before submitting the Tender as to all relevant matters, including (without limitation):

(a) the form and nature of the Site, including sub-surface conditions,

(b) the climatic conditions,

(c) the extent and nature of the work and Goods necessary for the execution and completion of the Works and the remedying of any defects,

(d) the Laws, procedures and labour practices of the Country, and

(e) the Contractor's requirements for access, accommodation, facilities, personnel, power, transport, water and other services.

(f) availability of required materials

Queries about the Contract Data:

The Client will clarify queries on the Contract Data if any during the Pre-bid references.

Contractor to Construct the Works:

The Contractor shall construct and install the Works in accordance with the approved specification and drawings. All designs, drawings and specifications to be furnished by the contractor shall be approved by the Client before execution.

The Works to be completed by the Intended Completion Date:

The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the programme submitted by the Contractor, as updated with the approval of the Engineer, and complete them by the Intended Completion Date.

Approval by the Engineer:

The Contractor shall be provided Specifications and Drawings showing the proposed Temporary Works by the Engineer.

The Contractor shall be responsible for design of Temporary Works.

The Engineer's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

The Contractor shall be provided approved design, drawings and specifications of all components of the building and all allied infrastructure works, except those for the temporary works.

Safety:

The Contractor shall be responsible for the safety of all activities on the Site.

Possession of the Site:

The Client shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the Contract Data the Client is deemed to have delayed the start of the relevant activities and this will be Compensation Event.

Access to the Site:

The Contractor shall allow the Client and any person authorized by the Client access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured / fabricated / assembled for the works.

Instructions:

The Contractor shall carry out all instructions of the Engineer pertaining to works, which comply with the applicable laws where the Site is located.

The Contractor shall permit the Client to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the Client, if so, required by the Client.

Disputes:

That for the purpose of jurisdiction in the event of disputes if any of the Contract would be deemed to have been entered in to within the State of Odisha and it is agreed that neither party to the Contract will be competent to bring a suit in regard to the matter by this Contract at any place outside the State of Odisha.

Procedure for Settlement of Disputes:

In case of Dispute or difference arising between the Client and the contractor relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled mutually.

TIME CONTROL

Programme:

Within **7 days of issue of letter of award**, the successful bidder shall submit to the Client detail work programme for approval showing the general methods, arrangements, order and timing for all the activities in the Works along with monthly cash flow forecast. The agreed work programme / milestones during such contract negotiation shall form part of the agreement.

An update of the Programme shall be a programme showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

The contractor shall submit to the Client, for approval, an updated Programme at intervals no longer than 15days. If the Contractor does not submit an updated Programme within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue programme has been submitted.

The Client's approval of the Programme shall not alter the Contractor's obligations. The Contractor may revise the Programme and submit it to the Client again at any time. A revised Programme is to show the effect of Variations and Compensation Events.

Extension of the Intended Completion Date:

The Client shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the intended Completion Date without the Contractor taking steps to accelerate the remaining work and which would cause the Contractor to incur additional cost.

The Client shall decide whether and by how much to extend the Intended Completion Date within 15 days of the Contractor asking the Engineer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

The Engineer shall within 7 days of receiving full justification from the contractor for extension of Intended Completion Date refer to the Client his recommendation. The Client shall in not more than 15 days communicate to the Engineer the Client's decision.

Delays Ordered by the Engineer:

The Client may instruct the Contractor to delay the start or progress of any activity within the Works.

Management Meetings:

Either the Engineer or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

The Engineer shall record the business of management meetings and is to provide copies of his record to those attending the meeting and to the Client. The responsibility of the parties for actions to be taken is to be decided by the Engineer either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

Early Warning:

The Contractor is to warn the Client/Engineer at the earliest opportunity of specific likely future events or circumstances that may adversely affect the work resulting delay in the execution. The Engineer may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Completion Date.

The Contractor shall cooperate with the Engineer in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer.

QUALITY CONTROL

Identifying Defects:

The Engineer shall check the Contractor's work regularly and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Engineer may instruct the Contractor to search for defects and to uncover and test any work that the Engineer considers may have a Defect

Tests:

If the Engineer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect the test shall be a Compensation Event.

Correction of Defects:

The Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

Every time notice of a Defect is given; the Contractor shall correct the notified Defect within the length of time specified by the Engineer's notice.

Uncorrected Defects:

If the Contractor has not corrected a Defect within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

COST CONTROL

Changes in the Quantities:(OPTIONAL)

Change of Scope (Variations) and Procedure for change of Scope:

The Client may, require the Contractor to make modifications/alterations to the works before the issue of the completion certificate either by giving an instruction or by requesting the contractor to submit a proposal for change of scope involving additional cost or reduction in cost. Any such change of scope shall be made and valued in accordance with the provisions of this contract and the contractor, in that event, will have no further claim on the ground that had it been known / disclosed earlier he would have made such charges in other connected work in their design, construction which would have saved him some cost and given him other consequential benefits.

Change in scope may include;

(a) Change in specifications of any item of works

(b) omission/ deletion of any item of work from the scope of work

(c) any additional work (such as addition of extra plinth area) which are not included in the scope of work including any additional test on completion

In the event of the Client determining that a change of scope is necessary, it shall issue notice to the contractor a notice specifying in reasonable detail the works contemplated there under (“Change in scope notice”)

Upon receipt of change in scope notice, the contractor shall with due diligence, provide to the Client through the Engineer within seven days time such information as is necessary together with documentation in support of;

(a) the impact, of any, which the change in scope is likely to have on the completion of the work

(b) the options for implementing the proposed change of scope and the effect, if any, each on the cost and time thereof including the following details;

i. break down of quantities, unit rates and cost for different items of work

ii. proposed design for the change of scope

iii. proposed modifications, if any, to the construction period with updated work programmes (all

Variations shall be included in updated programmes produced by the Contractor).

Any change in scope shall be calculated on the basis of the following priority:

The total value of all change of scope of work shall not exceed 10% of total contract price for the construction work.

Payments for Change of Scope (Variations):

The Client shall assess the change in scope proposal and Contractor's quotation at the time of bidding in financial form and upon reaching an agreement; the Client shall issue the Change of Scope Order requiring the contractor to proceed with the performance thereof.

If the Contractor's quotation is unreasonable, the Client may order the Variation and make a change to the Contract Price which shall be based on Client's own forecast of the effects of the Variation on the Contractor's costs.

If the Client decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event, subject to condition that such variation shall not exceed 10% of the total contract price for the contract work.

The Contractor shall not be entitled to additional payment for costs, which could have been avoided by giving early warning.

Payment Certificates:

The Contractor shall submit to the Engineer statements of the value of the work completed.

The Engineer shall check the Contractor's statement within 15 days and certify the amount to be paid to the Contractor as per contract payment schedule after taking into account any credit or - debit for the month in question in respect of materials for the works in the relevant amounts and under conditions set forth, including adjustment of advance.

The value of work executed shall be determined by the Engineer.

The value of work executed shall comprise the value of the quantities of the items as per the BoQ and work programme attached to the contract.

The value of work executed shall include the valuation of Change in Scope (Variation) and Compensation Events, if any.

The Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

Payments:

Payments shall be adjusted for deductions for retention, other recoveries in terms of the contract and taxes at source, as applicable under the law. The Engineer shall pay the Contractor the amounts as per the items of work executed and agreed rates thereto as well as payment schedule attached to the contract.

Tax:

The rates quoted by the Contractor shall be deemed to be exclusive of the GST and inclusive of Royalty, Income Tax, Labour CESS and all other statutory taxes that the Contractor will have to pay for the performance of this Contract. The Client will perform such duties in regard to the deduction of such taxes at source as per applicable law.

Currencies:

All payments shall be made-in Indian Rupees.

Retention:

The Client shall retain from each payment due to the Contractor the proportion stated in the Contract Data until Completion of the whole of the works or settlement of final payment.

On completion of the whole of the works and issue of the completion certificate the performance security shall be repaid to the contractor. The retention amount shall be paid after the Defects Liability Period has passed and the Engineer has certified that all defects notified by the Engineer to the contractor before the end of the period have been corrected.

Liquidated Damages:

The Contractor shall pay liquidated damages to the Client at the rate as stated in the Contract Data that the Completion Date is later than the Intended Completion Date (for the whole of the works or the milestone as stated in the contract data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Client may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not relieve the contractor from his / her / their obligation to complete the works or from any other duties, obligations or responsibilities which he / she / they may have under the contract.

If the Intended Completion Date is extended after liquidated damages have been paid, the Engineer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate.

Bonus Payment:

Deleted

Advance Payment:

The Client may make advance payment to the Contractor for mobilization and cash flow support of the amounts stated in the Contract Data by the date stated in the Contract Data, only against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a Bank acceptable to the Engineer in amounts and currencies equal to 110% of the advance payment.

The Advance Payment shall not be released until the camp setup, mobilisation of key personnel, equipment and labour at site.

The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. The contractor shall ensure that the Bank Guarantee remain enforceable until the advance payment has been fully repaid and accordingly renew it, from time to time, until the advance payment has been fully repaid.

If the terms of guarantee specify its expiry date, and the advance payment has not been re-paid by the date then 28 days prior to the expiry date, the contractor shall extend the validity of the guarantee until the advance payment has been fully repaid.

The advance payment shall be repaid through percentage deductions from the interim payments as follows:

Securities:

The Performance Security shall be provided to the Client no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and by a bank or surety acceptable to the Employee

The performance security shall be denominated in Indian Rupees. The Performance Security shall remain valid up to the period as defined in the Contract Data.

Cost of Repairs:

Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions including the situation as stipulated in the RFP.

FINISHING THE CONTRACT

Completion:

The Contractor shall request the Engineer to issue a Certificate of Completion of the Works and the Engineer will do so upon deciding that the Work is completed.

Taking Over:

The Client shall take over the Site and the Works within seven days of the Engineer issuing a certificate of Completion.

Final Account:

The Contractor shall supply to the Engineer a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Engineer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 30 days of receiving the Contractor's account if it is correct and complete. If it is not, the Engineer shall issue within 30 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Client shall decide on the amount payable to the Contractor and issue a payment certificate, within 30 days of receiving the Contractor's revised account.

Termination:

The Client may terminate the Contract if the other party causes a fundamental breach of the Contract.

Fundamental breaches of Contract include, but shall not be limited to the following:

(a) the Contractor stops work for 15 days when no stoppage of work is shown on the current Programme and the stoppage has not been authorized by the Engineer;

(b) the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(c) the Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer;

(d) the Contractor does not maintain a security which is required;

(e) the Contractor has delayed the completion of works by the number of days for which the maximum number of liquidated damages can be paid as defined in the Contract data; and

(f) if the Contractor, in the judgment of the Client has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this paragraph: "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition."

When either party to the Contract gives notice of a breach of contract to the Engineer for a cause other than those listed under Sub Clause 54.2 above, the Engineer shall decide whether the breach is fundamental or not.

Notwithstanding the above, the Client may terminate the Contract for convenience.

If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site, as soon as reasonably possible.

Payment upon Termination:

If the-Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue a certificate for the value of the work done fewer advance payments received up to the date of the issue of the certificate, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Client exceeds any payment due to the Contractor, the difference shall be a debt payable to the Client.

If the Contract is terminated at the Client's convenience, the Engineer shall issue a certificate for the value of the work done, less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract and less taxes due to be deducted at source as per applicable law. No extra cost will be paid by the Client for expenditure towards removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works and the Contractor's costs of protecting and securing the Works.

Property:

All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Client, if the Contract is terminated because of a contractor's default.

Release from Performance:

If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Client or the Contractor, the Engineer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

ADDITIONAL CONDITIONS OF CONTRACT

1.WORK DESCRIPTION

The work shall be strictly carried out as per the scope listed in this document and in accordance with the specifications. The equipment & material supplied at site will also be selected out of the list of approved makes. Bill of quantity provided with the document is for contractor guidance. It is expected that after award of work, contractor shall prepare shop drawings for approval by the Consultant & Client representative and also submit Technical documentation duly identifying shortlisted make of material/equipment along with its data sheets. Actual ordering shall be based on approved shop drawings & documents.

The work at site shall comply with the approved shop drawings and will meet the satisfaction of Client representative. The contractor shall be required to demonstrate satisfactory operation of entire system (including client supplied equipment installed by contractor) and furnish the required labour, material & tools to install & commission the system.

The broad scope of work for proposed HVAC system covered under this contract shall include supply, installation, testing & commissioning of the following:

Water cooled chiller (free supply)
Constant primary & Variable secondary Pumping system.
Smart Air handling units (AHU's).
FRP Cooling towers.
VFD's.
Dedicated outdoor air system including heat recovery wheel.
Mechanical ventilation systems.
Chilled, Condenser and Drain piping with associated fittings, valves etc.
Air distribution system.
Associated electrical works.
Kitchen ventilation.
Basement car parking ventilation.
Testing Adjusting & Balancing of the entire HVAC and mechanical ventilation installation.

Besides above, contractor shall also be required to undertake following:

Obtain fire approval from Local Authorities prior & post installation for operation of system by the land owner. Coordination for submission of required documents & demonstration of systems to obtain the Approval by the Contractor.
Minor civil works which include making openings in walls & slabs and making good of the same.
Commissioning of the plant including test reports to demonstrate satisfactory working prior to handing over.
Provide as-built drawings and handing over document comprising of list of recommended spares, catalogues and service schedule for each equipment/material.
Training of Client's staff.
Documents related LEED requirement

2.SITE MANAGEMENT

The Contractor shall be required to provide following staffing for the project:

Design Engineer who will work with Consultant for getting shop drawings, technical submittal and variation in quantity statement approved.

Procurement team.

Full time dedicated 1 manager (minimum 15 year experience) and Engineer (minimum 10 year experience) & one supervisor posted at site.

The contractor shall submit organization chart and CV prior to starting work at site.

The Contractor shall have required stores, tools & plant, security and facility to transport materials to place of installation for speedy execution of work.

3.REGULATIONS & PERMITS

Prior to starting work at site, the contractor shall obtain required permits/ licenses required for satisfactory execution and operation of the installation. All receipted amounts shall be reimbursed by Client on production of proof of payment by the contractor.

The executed work shall strictly confirm to applicable laws, regulations and Indian Standards which become applicable. In case the specifications and drawings contained in this document call for higher standard than those required by prevailing regulations, then these specifications & drawings shall become applicable. However, in case of any conflict or violation between the document/drawings and prevailing laws, then the applicable laws & regulations shall be governing & binding.

4.SHOP DRAWINGS

A set of design drawings listed in this document are available at Consultant office and may be issued with the tender document. These design drawings are for reference of the contractor and indicate proposed arrangement and the extent of work covered in the contract. The data given in the drawings and specifications is as exact as could be procured, but its accuracy is not guaranteed. The contractor cannot execute work or scale these drawings for reference.

Following shall be the procedure followed by contractor while preparation of shop drawings:

The contractor shall refer the design drawings for understanding the scope and proposed routes to be followed during execution.

Collate latest architectural backgrounds from the Client representative / Architect / Consultant.

Examine all related services drawings but not limited to structural, plumbing, electrical, HVAC, Interior, landscape and others including as-built works before starting the work. Any discrepancy must be report to the Client's site representative in writing and obtain approval for go-ahead.

Within one week of award of work, the Contractor shall prepare a list of shop drawing along with submission schedule for approval of Client representative/Consultant. The list of drawings must include layouts for Plant room, Pump room, Typical drawings showing exact location of supports, flanges, bends, tee connections, reducers, detailed piping drawings showing exact location and type of supports, valves, fittings etc; electrical panels inside/outside views, power and control wiring schematics, cable trays, supports and terminations.

Maximum headroom shall be maintained at all points and in case the same is inadequate, then written approval from Client representative must be obtained prior to execution at site.

These shop drawings shall depict information required to complete the Project as per specifications and as required by the Consultant/Client representative. These Drawings shall contain details of construction, size, arrangement, operating clearances, performance characteristics and capacity of all items of equipment, also the details of all related items of work by other contractors. Each shop drawing shall contain tabulation of all measurable items of equipment/materials/works and progressive cumulative totals from other related drawings to arrive at a variation-in-quantity statement at the completion of all shop drawings.

Where the work under this contract is proposed to be installed in close proximity or is interfering with other trades, then based on client representative/consultant directions, the contractor shall prepare all services coordinated working drawings and sections at a suitable scale (not less than 1:50), clearly showing proposed installed in relation to the work of other trades.

The contractor shall thereafter furnish 6 sets of detailed shop drawings to Client representative/Consultant for obtaining comments/approval. The Contractor will make unlimited number of re-submissions of shop drawings unless Client representative/Consultant/Architect approval is obtained.

The Contractor will thereafter submit 6 sets of final shop drawings to the Client representative for their exclusive use and all other agencies.

No material or equipment may be delivered or installed at the job site until the contractor has in his possession, the approved shop drawing for the particular material/equipment/installation.

In case installation is carried out without following above process or obtaining a waiver to follow the procedure from Client representative, the work shall be rejected and contractor shall rectify the same at their own cost.

Shop drawings shall be submitted for approval minimum four weeks in advance of planned

delivery and installation of any material to allow Client representative/Consultant ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved program.

Approval of shop drawings shall not be considered as a guarantee of measurements or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the contractor of the responsibility or requirement to furnish material and perform work as required by the contract.

5.TECHNICAL DOCUMENTATION

The contractor prior to supplying material at site, will submit the following documentation to Consultant/Client representative for approval:

Manufacturers drawings, catalogues, pamphlets and other documents in triplicate. Each item shall be properly labeled, indicating the specific services for which material or equipment is to be used, giving reference to the governing section and clause number and clearly identifying in ink the items and the operating characteristics. Data of general nature shall not be accepted.

Samples of all materials shall be submitted to the Client's site representative prior to procurement. These will be submitted in two sets for approval and retention by Client's representative and shall be kept in their site office for reference and verification till the completion of the Project. Wherever directed, a mockup or sample installation shall be carried out for approval before proceeding for further installation.

Where the contractor proposes to use an alternate make or model of equipment other than that specified, all new drawings and detailing required thereafter shall be prepared by the contractor at his own expense including any re-design required for other discipline/trade. Any delay on such account shall also be at the cost of and consequence of the Contractor.

Contractor to refer Annexure –II for list of approved makes & materials for this project.

6.VARIATION IN QUANTITY STATEMENT

After approval of major & relevant shop drawings, the contractor shall submit four copies of a comprehensive variation in quantity statement. This statement must be submitted prior to completing ordering of equipment and should identify imported/local materials in this contract as well as proposed spares/tools. The Consultant shall provide recommendation to Client representative for acceptance of anticipated variation in contract amounts and also advise Client to initiate action for procurement of spare parts and tools at the completion of project.

7. QUALITY ASSURANCE

The contractor to ensure that all materials and equipment supplied shall be new and of best available quality conforming to the relevant Indian Standard Specifications and to these specifications. Makes shall be strictly in conformity with list of approved manufacturers as per Annexure -II. Owners reserve the right to reject any item which in their assessment is second hand

Any deviations from above shall be clearly highlighted prior to supply and shall be brought to the notice of the Client representative/Consultant for further instructions in the matter.

Prior to starting execution work at site, the Contractor shall verify the sufficiency of the size of the shaft openings, clearances and ceiling spaces for proper installation. Failure to communicate insufficiency of any of the above, shall constitute Contractor acceptance of the same. The Contractor shall locate all equipment in fully accessible locations which can be easily serviced, operated or maintained. The exact location and size of access panels, required for each concealed, valve or other devices requiring attendance shall be finalized and communicated in sufficient time.

Failing this, the Contractor shall make all the necessary repairs and changes at own expense. Access panel shall be marked.

8. WORKS NOT COVERED UNDER THIS CONTRACT

Following works are excluded from the scope under this contract. These shall be executed by respective contractor in accordance with approved shop drawings where these details must be highlighted. However, contractor shall be responsible for providing details and thereafter supervision to ensure satisfactory & timely execution of these associated items as they have a bearing on this contract.

9. EXCLUDED FROM SCOPE OF WORK

ASSOCIATED CIVIL WORKS

Following civil works associated with HVAC installation are excluded from the scope of this contract. These shall be executed by other agencies in accordance with approved shop drawings of and under direct supervision of the air conditioning contractor.

i. RCC foundation for water chilling machine's pumps & centrifugal fans with angle iron frame work at the edges to protect these from damage.

ii. RCC basin & supports & MS Joists for cooling towers.

iii. PCC foundation blocks with angle iron frame work edging for all motor control center.

iv. PCC foundation for pot strainers.

v. PCC foundation blocks for all air handling units.

vi. Air-tight fire doors with minimum one hour fire rating for plant room, AHU rooms, fan rooms and other equipment rooms.

vii. Water proofing of floors of AHU rooms, air washer rooms and fan rooms.

viii. Masonry drain channels and sumps with CI gratings in AC plant room including provision for sump pump and disposal.

ix. Supply and fixing of G.I./wooden frame for mounting of grilles in masonary walls.

x. Supply and fixing of GSS frame for mounting of grilles / diffusers in false ceiling / boxing.

xi. Thermal insulation of terraces above air-conditioned areas exposed to sun.

xii. Making of trenches and back filling the same after laying / pressure testing etc. of pipes.

ELECTRICAL SERVICES WORKS

All associated ELECTRICAL WORKS listed below are excluded from the scope of this contract. These shall be installed by other agencies in accordance with approved shop drawings of, and under direct supervision of the air conditioning contractor.

Providing power supply with earthing at the incoming of control panel in A/C plant room.

ii. Providing power supply and earthing at the incoming MCCB in each air handling unit room.

iii. Providing power and earthing at the incoming MCCB in each centrifugal fan panel and pump panel at locations called for on air conditioning Contractor's shop drawings.

iv. Providing 15 amps power outlet within 2 meter reach of each fan coil unit and VAV boxes at locations called for on air conditioning Contractor's shop drawings.

v. Providing 15 amps power outlet within 2 meter reach of each single phase propeller fan/inline fan at locations called for on air conditioning contractor's shop drawings.

vi. Providing wiring and earthing for sump pumps in air conditioning plant room.

PLUMBING SERVICES WORKS

All associated PLUMBING WORKS listed below are excluded from the scope of this contract. These shall be installed by other agencies, in accordance with approved shop drawings of, and under direct supervision, of the air conditioning contractor.

Providing soft water (Commercial hardness 0 ppm and PH 7+1) at air washers, humidifiers and at chilled water expansion tank.

Providing make up water for cooling tower as per RO water quality

iii. Disposal of condensate drain from fan coil units / ceiling suspended units beyond the condensate drain riser.

Providing sump pumps and necessary piping for drainage of air conditioning plant room and other machine rooms located below ground level.

Providing floor drains in cooling tower area and in air handling unit rooms.

Note : Preparation of shop drawings defining the Foundation details to civil contractor will be under HVAC Contractor scope of work.

10. INTEGRATION WITH BUILDING AUTOMATION SYSTEM

The scope shall include providing following for the interface to Building Automation System.

Sockets /Nipples including shut-off valve for mounting sensors/transmitters on pipe lines.
Space in electrical panel for running of LV cables.
CT of 15 VA burden with potential free taps.
Auto/manual changeover switch with potential free contact at manual position.
Installation of motorized control valves with provision of counter flanges
Installation of current transformer & Transducer along with wiring between Current Transformer & Transducer up to the terminal block
Provision for mounting BAS sensors.
15 Amps. Power supply with MCB in all AHU panels and 32 Amps MCB on HVAC plant room panel for power supply to DDC Panel.

It is to be clearly understood that the final responsibility for the sufficiency, adequacy and conformity to the contract requirements lies solely with the contractor.

11. TESTING, ADJUSTING AND BALANCING

Air and water balancing shall be carried out by the contractor through a specialist team (different than erection team) as per Specifications and ASHRAE Guidelines. Performance test shall consist of three days of 10 hour each operation of system for each season. The results for each season shall be submitted to Client representative/Consultant. The submittal shall include operational parameters marked on performance curves for each equipment along with test certificates and safety/control settings.

The installation shall be tested again after removal of defects and shall be commissioned only after approval by the Client's site representative. All tests shall be carried out in the presence of the

representatives of the Construction Manager/Architect /Consultant and Client's site representative. After commissioning, the results shall be submitted for scrutiny in quadruplicate.

All equipment installation shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Client's site representative. In case of rotating machinery sound or vibration noticeable outside the room in which it is installed, or annoyingly noticeable inside its own room, shall be considered objectionable. Such conditions shall be corrected by the Contractor at his own expense. The contractor shall guarantee that the equipment installed shall maintain the specified Noise Control levels.

12. COMPLETION CERTIFICATE

On completion of the installation, a certificate shall be furnished by the contractor, counter signed by the licensed supervisor, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local authority engineer in-charge.

The contractor shall be responsible for getting the entire installation duly approved by the local authorities Engineer in Charge concerned, and shall bear expenses if any, in connection with the same.

13. AS-BUILT DRAWINGS

Contractor shall submit following as-built drawings as and when work is completed:
6 set of hard copies of all as-built drawings duly corrected and incorporating any modifications during execution.
Two set of pen drive containing the drawings.

The drawings shall provide plant room layouts, piping layouts, location of all concealed accessories/piping, wiring diagram, control diagram, Single line diagram, control schematic with detailed bill of materials, showing makes, types & description of all components & accessories and sequencing of automatic controls and other services.

14. MAINTENANCE MANUAL

Upon completion and commissioning of works, the contractor shall submit a draft copy of comprehensive operating instructions, maintenance schedule and log sheets for all systems and equipment included in this contract. This shall be supplementary to manufacturer's operating and maintenance manuals. Upon approval of the draft, the contractor shall submit four (4) complete bound sets of typewritten operating instructions and maintenance manuals; one each for retention by Consultant and Client's site representative and two for Clients Operating Personnel. These manuals shall also include basis of design, detailed technical data for each piece of equipment as installed, spare parts manual and recommended spares for 4 year period of maintenance of each equipment. The manuals shall include:

i. Description of the work carried out / installed.
ii. Operating instructions.
iii. Maintenance instructions including procedures for preventive maintenance.
iv. Manufacturers catalogues.
v. Spare parts list.
vi. Trouble shooting charts.
vii. Drawings
viii. Type and routine test certificates of major items.

Details of all the bought out item should be part of this maintenance manual.

15. ON SITE TRAINING

Upon completion of all work and all tests, the Contractor shall furnish necessary operators, labor

and helpers for operating the entire installation for such periods so as to enable the Client's staff to get acquainted with the operation of the system. During this period, the contractor shall train the Client's personnel in the operation, adjustment and maintenance of all equipment installed.

16. DEFECTS LIABILITY PERIOD

Complaints

The Contractor shall receive calls for any and all problems experienced in the operation of the system under this contract, attend to these within 10 hours of receiving the complaints and shall take steps to immediately correct any deficiencies that may exist.

Repairs

All equipment that requires repairing shall be immediately serviced and repaired. Since the period of Mechanical Maintenance runs concurrently with the defects liability period, all replacement parts and labour shall be supplied promptly free-of-charge to the Client.

17. UPTIME GUARANTEE

The contractor shall guarantee for the installed system an uptime of 98%. In case of shortfall in any month during the defects liability period, the Defects Liability period shall get extended by a month for every month having shortfall and no reimbursement shall be made for the extended period.

18. OPERATION & MAINTENACE CONTRACT

Contractor may be required to carry out the operation of the installation during and after the defects liability period. Further, it may also be required to carry out all-inclusive maintenance of the entire system for a period of four years beyond the defects liability period.

Operation Contract:

It will involve round the clock operation for 24 hours a day wherein work will include but not limited to operation of installation, maintaining log books, complain register and summary of operation.

The terms of payment shall be monthly at the end of each month on pro-rata basis.

All Inclusive Maintenance Contract:

The work will involve routine preventive maintenance with monthly status report. Entire installation shall be painted every two years. 98% uptime of all systems is expected under this contract wherein up time shall be assessed every month and in case of shortfall during any month the contract shall be extended by a month. No reimbursement shall be payable for the extended period.

Adequate number of persons to the satisfaction of the Client representative shall be provided including relievers wherein statutory compliances such as of EPF, ESIC and other applicable labour legislations shall be to contractor account. No overtime shall be payable. Routine shut downs shall be permitted with prior permission of the Owner.
Payment shall be Quarterly at the beginning of each quarter on pro-rata basis.

19 BIM Implementation

It is expected that Contractor, if required shall prepare all shop drawings in latest version of Revit

only and coordinate with other contractors to provide a clash free model. Thereafter, all shop drawings shall be provided in PDF, 2D CAD plans and critical sections in 3D. The drawings shall be submitted in hard copy in A0/A1 size at 1:100 scale including all annotations, heights, bottom of duct/pipe/tray etc complete in all respect as required.

20. GREEN BUILDING COMPLIANCE

Actions required by Contractor:

Contractor will provide full support in complying to Green Building requirements for the desired level of Green Building Rating in the project.
Contractor shall implement the recommendations provided by Green Building Consultant and provide support during the site inspections.
Contractor shall provide respective documentation including but not limited to specification sheets, manufacturer cutsheets, Test Certificates, Brochures, purchase records, manufacturer declarations, calculations, site photographs, commissioning reports.
Contractor is encouraged to designate an individual in their existing team who will be responsible for regular coordination with respective site people to ensure implementation of required green building measures and ultimately provide the required documentation for aspired Green Building Rating.
In case of any deviations in implementing recommended green building measures and/ or using specified material/ equipment/ system, contractor will have to inform Owners/ Services Consultant/ Green Building Consultant/ Architect as applicable for their formal approval.

In case of any additional requirement to comply with Green Building rating as identified during construction/ installation/ commissioning based on the actual site conditions/ construction activities, Contractor shall implement

21 PERFORMANCE GUARANTEE

The contractor shall carry out the work in accordance with the Approved shop drawings, Specifications, Schedule of Quantities and other documents forming part of the Contract. Contractor shall carry out heat load calculation, Ventilation calculation & Smoke calculation & submit the same for client / consultants approvals. The contractor shall be fully responsible for the performance of the selected equipment (installed by him) at the specified parameters and for the efficiency of the installation to deliver the required end result.

The contractor shall guarantee that the HVAC system as installed shall maintain the inside conditions in the air-conditioned spaces as described under “Basis of Design” in the specifications.

Complete set of architectural drawings is available in the Architect/Consultant’s office and reference may be made to same for any details or information. The contractor shall also guarantee that the performance of various equipment individually, shall not be less than the quoted capacity; also actual power consumption shall not exceed the quoted rating, during testing and commissioning, handing over and guarantee period.

LABOUR:

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

The Contractor shall, if required by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Engineer may require.

COMPLIANCE WITH LABOUR REGULATIONS:

During continuance of the contract, the Contractor and his sub-contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. Salient features of some of the major labour laws that are applicable to the construction industry are given below. The Contractor shall keep the Client indemnified in case any action is taken against the Client by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Client is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, the Engineer/Client shall have the right to deduct any money due to the Contractor including his amount of performance security. The Client/Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Client.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Client at any point of time.

SPECIAL CONDITIONs OF CONTRACT

SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK.

a) Workmen Compensation Act 1923: - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

b) Payment of Gratuity Act 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more or on death the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

c) Employees P.F. and Miscellaneous Provision Act 1952: - The Act Provides for monthly contributions by the Client plus workers @ 10% or 8.33%. The benefits payable under the Act are:

(i) Pension or family pension on retirement or death, as the case may be.

(ii) Deposit linked insurance on the death in harness of the worker.

(iii) Payment of P.F. accumulation on retirement/death etc.

d) Maternity Benefit Act 1951: -The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

e) Contract Labour (Regulation & Abolition) Act 1970: - The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the

Contractor fails to provide, the same are required to be provided, by the Principal Client by Law. The Principal Client is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Client if they employ 20 or more contract labour.

f) The Code on Wages, 2019: This code consolidates the Laws relating to Wages and Bonus and matters connected therewith or incidental thereto.

g) Industrial Disputes Act 1947: - The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

h) Industrial Employment (Standing Orders) Act 1946: - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Client on matters provided in the Act and get the same certified by the designated Authority.

i) Trade Unions Act 1926: - The Act lays down the procedure for registration of trade unions of workmen and Clients. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.

j) Child Labour (Prohibition & Regulation) Act 1986: - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.

k) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979: - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter- State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home up to the establishment and back, etc.

l) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996: - All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Client of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Client to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

m) Factories Act 1948: -The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

SPECIAL CONDITIONS

1.It must be understood that the work has to be completed as per the time provided in the contract and as such time is the essence of the contract.

2.The quantities furnished in the bills of quantities are only probable quantities liable to alternation by omission, deduction or addition, and it would be clearly understood that the contract is not a lump sum contract and the SWOSTI PREMIUM LTD do not, in any way, assure the tenderer or guarantee that the said probable quantities are correct or that the work would correspond thereto. Payments will be regulated on the actual quantities of work authorizedly done and measured at the accepted rates. No claims due to change in quantities (+ or -) will be entertained. The drawings, forming parts of complementary installations work specifications and the bills of quantities, of the contract, are explanatory of and are to one another, representing together the works / to be carried out. If neither the drawings nor the specifications nor the accepted bills of quantities include any part/parts the intention to include which is nevertheless clearly inferred and which are obviously necessary for the proper completion of the works/ installations, all such parts shall be supplied and executed by the contractor at no extra charge. Anything contained in one or another of (a) the drawings, (b) the specifications and (c) the accepted bills of quantities and not found in the others will be equally binding as if it were contained in each of them.

3.No alterations, that might have been made by the tenderer in the drawings, specifications, conditions or probable quantities accompanying this notice will be recognized and if any such alterations are made the tender, will be invalid. Conditional tenders will however be liable for rejection.

4.The tenderer must obtain for himself on his own responsibility and at his own expense all the information necessary, including risks, contingencies and other circumstances to enable him to make a proper tender and to enter into a contract with the SWOSTI PREMIUM LTD . He must examine the drawings, specifications, conditions and so on and must inspect the site of work, examine the nature of the ground and the subsoil (so far as is practicable) and acquaint himself with local conditions, means of access to the work, storage facilities or areas for staff colony, the nature of the work, in fact all matters pertaining thereto before he submits his tender.

5.The tender accepted shall not be entitled to make any claim for increase in the rates quoted and accepted excepting in pursuance of any specific provision in the contract.

6.Only approved agencies/ skilled workers shall be deployed to carry out requisite specialized items of work. The Officer/ Engineer in charge’s decision in consultation with Architect's/ in this regard shall be binding to all the parties concerned.

7. The rates shall be firm and not be subject to any variations in exchange rates, in taxes, duties etc. in railway freight and the like including labour conditions, etc. The rates are not subject to escalation.

8.It will be the sole responsibility of the contractor to procure all the equipments/ materials and other materials required for the work.

9.The SWOSTI PREMIUM LTD further reserves the right to delete or reduce at any time, any section of the bills of quantities with out assigning any reasons whatsoever there for and no claim will be entertained in this regard.

10.The tenderer whose tender is accepted is bound to execute formal agreement with the SWOSTI PREMIUM LTD within one week of the date of intimation of award of work in

accordance with the draft agreement which will include conditions of tender, form of tender (general conditions of contract & Special Condition of Contract), Articles of Agreement, Bills of quantities, Conditions of contract, Special conditions if any, the drawings and specifications, but his liability under the contract shall commence from the date of written order to commence work whether the formal agreement is drawn or not.

The Contractor shall bear all expenses in connection with the execution of the said agreement including fees for stamping and registration of documents as required.

11.The Security Deposit will bear no interest what so ever until the date of release.

12.

(a)The contractor, upon award of work, shall submit a memorandum of procedure giving the outline of his general scheme, programme and time table, in the form of a chart that shall be scrutinized and approved (with modifications as necessary), which shall become the approved programme for execution. The approved programme shall be the basis for assessment of comparative progress under the relevant conditions of contract.

(b). Over and above, the contractor has to supply programme chalked out showing important milestones to be achieved and the progress actually achieved compared with, the target of the same in the programme and shortfall, if any planned for being made up in the programme for next month.

13.The work in general shall conform to the Specifications provided.

(a)In case items not covered by the general specifications referred above, reference shall be made to the appropriate I.S. Code.

(b)Should there be any difference in the particular specifications of individual item of work and the description of item as given in the Schedule of quantity, the latter shall prevail, which will be as per the relevant drawing.

(c)In case of any work for which there is no specification in I.S. specifications or in the specifications forming part of tender documents or in case there is any variation, such work shall be carried out in all respects in accordance with the instructions to be issued by the Engineer in charge.

14.The work of any part of it shall not be transferred, assigned or sublet without the written consent of the SWOSTI PREMIUM LTD .

15.The Contractor shall be required to co-operate and work in co-ordination with and afford reasonable facilities for such other agencies / specialists / interior designers/ consultants as may be employed by the Architects / Project Management Consultant/ Officer in Charge on other works / sub-works in connection with the project/scheme of which this work forms a part.

16.The Contractor shall get the necessary insurance done for their personal employed/ Swosti Premium Ltd third party insurance in name of G.M(B D),Swosti Premium Ltd and for all other risk insurance or any other insurance as required.

17.The Contractor shall make arrangements of carrying water and electricity .

18.The Contractor is required to comply with all Acts of Government relating to labour, safety, environment and other Rules and Regulations made there under from time to time

and to submit at the proper times all particulars and statements required to be furnished to the appropriate Authorities.

19.Contractor shall not in any way interrupt or do any act, matter or thing to prevent or hinder such other Contractor or other person or persons employed for completing and finishing or using the materials and plant for the Work. When the Work shall be completed or as soon thereafter as convenient the Architect shall give a notice in writing to the Contractor to remove his surplus materials and plant, and should the Contractor fail to do so within a period of 14 days after receipt thereof by him, Owner shall sell the same, and shall give credit to the Contractor for the amount realized. The Architect shall thereafter ascertain and certify in writing what (if anything) shall be due or payable to or by the Owner for the value of the said plant and materials so taken possession of by the Owner and the expense or loss which the Owner shall have been put to in procuring the works to be completed, and the amount, if any, owing to the Contractor and the amount which shall be so certified shall thereupon be paid by the Owner to the Contractor or by the Contractor to the Owner, as the case may be, and the certificate of the Architect shall be final and conclusive between the parties.

20.If at any time after the commencement of the work the Owner shall for any reason whatsoever not require the whole thereof, as specified in the tender, to be carried out, but need to abridge the Contract, the Owner shall give notice in writing of the fact to the Contractor who shall have no claim to any payment or compensation which he might have derived from the execution of the work in full, but which he did not derive in consequence of the whole amount of the work not having been carried out. The Contractor shall in this case, however, be entitled to payment for the work already executed by him in accordance with the agreed rates. The Owner shall also take over all building materials as might have been ordered for the work, but orders for which cannot be canceled, if delivered within a reasonable time, and shall pay for them at cost price. The Contractor shall also be allowed to remove his tools and plants from the site.

Contractor Responsibility Matrix

Work Element / Activity	Contractor	Client (Swosti)	PMC (You)	Architect / Consultants
1. Mobilisation & Site Establishment	**R**	A	C	-
2. Setting Out and Site Survey	**R**	C	C	C
3. Site Safety & Housekeeping	**R**	C	C	-
4. Approvals from Local Authorities (as applicable)	**C**	A	R	C
5. Scaffolding, Centering, and Shuttering	**R**	I	C	-
6. Quality Control & Testing	**R**	I	C	C
7. Coordination with MEP teams	C	I	C	C
8. Materials Procurement (Cement, Steel, Bricks, etc.)	**R**	I	C	-
9. Submission of Progress Reports & MIS	**R**	I	A	-
10. Adherence to Timeline / Work Schedule	**R**	I	C	-
11. Rectification of Defects During DLP	**R**	A	C	-
11. Final Handover & Completion Report	**R**	A	C	-

Legend:

- **R = Responsible** – Main executor.
- **A = Accountable** – Final decision-maker or owner.
- **C = Consultative** – Provides input and coordination.
- **I = Informed** – Kept in the loop, but not involved in execution.

Management Meetings

- Either the Engineer or the Contractor may call for a management meeting.
- These meetings are held to review progress plans and handle issues flagged under the early warning system.
- The Engineer shall record meeting proceedings and circulate to attendees and the Client.
- Action items shall be assigned and communicated in writing.

Quality Control

- The Engineer shall regularly inspect the Contractor's work and identify any defects. Instructions may be issued to uncover or test work suspected to be defective.
- **Tests** If the Engineer instructs tests not specified in the specifications, and the work is found defective, the Contractor shall bear the cost of tests. If no defect is found, it will be treated as a Compensation Event.

Payments & Liquidated Damages Payments

- Payments shall be adjusted for deductions for retention, other recoveries in terms of the contract and taxes at source, as applicable under the law.
- The Engineer shall pay the Contractor the amounts as per the payment schedule attached to the contract.

Retention

- The performance security obtained at the time of signing of contract shall be retained till successful conclusion of project completion and issue of completion certificate.
- The Client shall retain from each payment due to the Contractor the proportion stated in the Contract Data until Completion of the whole of the works or settlement of final payment.
- On completion of the whole of the works half the total amount retained is repaid to the contractor and half when the Defects Liability Period has passed, and the Engineer has certified that all defects notified by the Engineer to the contractor before the end of the period have been corrected.

Milestone

Milestone No.	To be Achieved	Timeline
Milestone 1-	**60 % of value of contract**	**Upto 120 Days**
Milestone 2-	**100 % of value of contract**	**Upto 180 Days**

Liquidated Damages

- The Contractor shall pay liquidated damages to the Client at the rate 0.2%/day on the value of balance work beyond stipulated date of completion as per following milestones of execution subject to a maximum of 10% of contract value.
  a) Up to end of 120 days of signing of contract – 60 % of value of contract
  b) Up to end of 180 days of signing of contract –100 % of value of contract