Project: *Gopalpur Palm Resort –*

Swosti Group

Request for Proposal:

Supply, Installation, Testing & Commissioning of All External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services 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 Contracting Firms for Supply, Installation, Testing & Commissioning of External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services at Gopalpur Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam, on Item Rate Contract Basis.-

Project Summary

Sl. No.	Name of Work	Estimated Cost	Construction Period	Maintenance Period
1	Supply, Installation, Testing & Commissioning of External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services	₹670 Lakhs*	9 (Nine) 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 & Electrical 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 External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services 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 07.04.2026 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:

gm.communications@swostihotels.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: 07.04.2026

DETAILED TENDER NOTICE

1. Last Date & Time of issue of tender documents from 07.04.2026 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 External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services at Gopalpur Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam,**

Estimated cost of work put to tender : Rs. 670 Lacs
Time of completion : 9 Months

Earnest Money Deposit: **Rs. 6,70,000/- (Rupees Six Lacs Seventy 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 150.00 lacs each Or
Two similar works not less than 60 % of est cost	Rs 225.00 lacs each Or
One similar work not less than 90 % of est cost	Rs 350.00 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 experienced Electrical work executing Contracting Agency with essential demonstrated experience and certificate/corroborative documentary evidences are required be submitted along with the bid. The bidder should have a valid "H T Electrical " License issued by Electrical Inspector, Odisha /Equivalent authority of other States**

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. 180 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 600 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 2nd **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 External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services of Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam,on 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	₹370 Lakhs (Three Hundred Seventy Lakhs Only)
5	Time for Completion	09(Nine) Calendar Months from date of LOA
6	Number of Packages	01 (One)
7	Eligibility	Reputed private sector entities having successfully completed similar scale works having valid HT Licence. **Relevant Project Experience must include**: •Hotel/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 07.04.2025 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. gm.communications@swostihotels.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	gm.communications@swostihotels.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 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 Elect. with 10+ years	13	Graduation (5), Experience (Exp. 10 yrs-5 , Higher - 8)
Site Engineer-(1 No)	B.E. in Elect. with 5+ yrs relevant Experience	7	Graduation (2),Higher- (3), Experience (Exp. 7 yrs-3 , Higher - 4)
Site Engineer-Mech (1 No)	Diploma in Elect.with 7+ years in Elect	5	Dip- (1),Higher-(2) 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 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 External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services at Gopalpur Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam, on a Item Rate 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 External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services on a Item Rate 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 External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services at Gopalpur Palm Resort for Swosti Premium Ltd.,Gopalpur, Ganjam,, on a Item Rate 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 External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Servicesfor Swosti Premium Ltd.,Gopalpur, Ganjam, on a Item Rate 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

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 Electrical system covered under this contract shall include supply, installation, testing & commissioning of the following but not limited to :

- Installation of Substation equipment
- LT Panels, Distribution Boards & Final Distribution Boards
- HT/LT Cables & Cable trays
- Earthing & Lightning Protection System
- Conduiting, Wiring & Switch Sockets
- Internal Lighting Fixtures for BOH areas
- Installation of FOH lighting fixtures
- Infrastructure for Data, Voice & TV networking system
- Infrastructure for external lighting system
- UPS
- Testing & commissioning of the entire electrical installation.

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

- All Coordination for submission of required documents & demonstration of systems for Local Authorities shall be done by the contractor and approval will be taken by the land owner.
- 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.

2. SITE MANAGEMENT

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

a. Design Engineer who will work with Consultant for getting shop drawings, technical submittal and variation in quantity statement approved.
b. Procurement team.
c. Full time dedicated 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 Substation layout, DG layout, Electrical Panel rooms, lighting, power, cable, cable tray layouts, earthing, lightning protection, SLD, Typical drawings showing exact location of supports, bends, tee connections, reducers, detailed drawings showing exact location and type of supports, 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. Minimum 6 sets of drawings to be reviewed for max 6 copies shall be submitted after final approval along with CD.

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 – I 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 - I. 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.
Civil Works

- RCC/PCC Foundations for major equipment only.
- Construction of tanks & sumps including water proofing.

- Masonry drain channels and sumps in plant room.

HVAC Works

- Ventilation of Electrical room.

9. INTEGRATION WITH BUILDING AUTOMATION SYSTEM

The scope shall include providing following for the interface to Building Automation System.

- 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 current transformer & Transducer along with wiring between Current Transformer & Transducer up to the terminal block
- Provision for mounting BAS sensors.

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.

10. GREEN BUILDING COMPLIANCE

Actions required by Contractor:

1. Contractor will provide full support in complying to Green Building requirements for the desired level of Green Building Rating in the project.
2. Contractor shall implement the recommendations provided by Green Building Consultant and provide support during the site inspections.
3. 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.
4. 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.
5. 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.
6. 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 the same.

11. TESTING

Entire Electrical System testing shall be carried out by the contractor through a specialist team (different than erection team) as per Specifications and IS codes. 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. Cost of performance witness test of major equipment, etc. at factory with two personnel from OWNERs / Consultant shall be excluded. All inspections cost for visit shall be excluded as specified in the document.
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.

The 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.

The contractor shall be responsible for getting the entire installation duly approved by the local authorities 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:

- Six 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 all layouts with Cable layouts, earthing, cable trays, external/internal lighting, power points, location of all concealed accessories, 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 for24 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.

19. BIM Implementation

It is expected that Contractor 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. Smart Operation & Maintenance Implementation

Offline QR code shall be prepared and provided for following equipment and plant rooms and pasted on each MEP equipment / MEP room:

a. Substation layout & Schematic framed in the Main Panel Room
b. DG area layout & schematic framed in the Main Panel Room
c. SLD for AHU/Fans Panels laminated & pasted on top of respective Panel.
d. Floor Electrical Panel Schematics & DB Schedules laminated & pasted on top of respective Panel.
e. UPS room layout & schematic framed in the Main UPS Room

Each QR code shall provide offline 3D as-built drawing with equipment, piping, ducting, cable tray, lighting, sockets, fixture & fittings, detector schedules, DB schedule, Electrical Panel details etc. QR code shall also provide details like operation & maintenance instructions, SOPs, trouble shooting, OEM catalog etc.
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.

ANNEXURE – I
List of Approved Makes

S. No	Equipment/Material	Approved Manufacturer Name
1.	LT Panels/MCC Panels/DG synch panels	SPC Electrotech Tricolite Industries Ambit Switchgears Advance Panels Shivalic Controls
2.	Air Circuit Breakers / Moulded Case Circuit Breaker / MPCB / Contactors	ABB Mitsubishi Legrand Siemens Schneider Electric Lauritz Knudsen (Formerly L&T) C&S

3.	Sandwich Busduct / Rising Main	Schneider Legrand Lauritz Knudsen (Formerly L&T) C&S
4.	Final Distribution Boards / MCB/ RCCB (Type B)	Legrand Hager Mitsubishi ABB Lauritz Knudsen (Formerly L&T) Siemens Schneider Electric Panasonic
5.	Control Transformer / Potential Transformers (Epoxy Cast Resin)	Newtek Automatic Electric Gilbert & Maxwell Precise Pragati Matrix Kappa
6.	Indicating Lamps LED type and Push Button	Schneider Electric Siemens ESBEE ABB
7.	Digital Meters	Siemens Schneider Electric ABB Lauritz Knudsen (Formerly L&T) Secure Trinity
8.	HT / LT Cables	Polycab KEI Havells RR Kabel Agilon Bonton
9.	Termination kits	3M Raychem

10.	Double Compression Cable Glands with earthing links	Dowells Comet
11.	Bimetallic Cable Lugs	Dowells Comet Cosmos
12.	PVC Insulated Wires (Class 2)	RR Kabel Polycab KEI Batra Henlay Apar Anchor (Panasonic)
13.	Terminal Blocks	Connect well Elmex Wago Phoenix

14.	Industrial Socket outlets	Siemens Schneider Legrand Hager Cape Electric Mennekes C&S
15.	Cable Trays & Raceways	Profab MEM Indiana Gratings Advance Needex
16.	Accessories for Supporting system	Hilti Fisher Hira
17.	Fire Sealant & Paints	3M Hilti
18.	Insulating Mats	DL Miller & Co. Premier Polyfilm Ltd RMG Polyvinyl India Ltd
19.	Earthing & Lightning Protection System	Erico Dehn Obo Betterman Allied Power Cape
20.	Capacitors & APFC Relay	Epcos Schneider Electric Neptune Shreem
21.	Metal Conduit & Accessories	BEC AKG NIC
22.	PVC FRLS Conduit & Accessories	BEC AKG Polypack Precision Anchor
23.	Switch & Sockets (Range as per approved sample only)	Crabtree Northwest Schneider Honeywell Legrand ABB C&S Anchor
35.	Batteries SMF	Exide Amar Raja Global (Rocket) Panasonic
36.	Busbar	Hindalco

37.	Polycarbonate junction box	Hensel Clipsal
38.	Lighting Poles	Mayfair Bajaj Keselec
39.	Aviation Obstruction Light	Bajaj Binay Actos
40.	Energy Management System	Schneider Siemens Neptune ABB
41.	Battery Charger	Exide Nelco Logicstat Min Max Electrical Chhabi Electricals
42.	FS Cables	Polycab KEI Fusion Polymer Frtek AFW Batra Henlay
43.	Cat 6/6A cables (for BMS, Electrical ELV services only)	Amp Molex Panduit Schneider Anchor Fusion Polymer
44.	UPS	Schneider electric ABB Eaton Delta Riello
45.	Telephone cables	Delton Cables Finolex Polycab Bonton Fusion Polymer
46.	Aviation Obstruction Light	Bajaj Binay Actos
47.	Capacitors & APFC Relay	Epcos Schneider Electric Neptune Shreem P2P

ANNEXURE – II

PART LIST OF CODES & STANDARDS

The installation in entirety shall comply with latest codes/standards published by National Building Code of India, IEEE, 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:

IS 398 (part-1 7 2) Aluminium stranded conductors
IS 694 PVC insulated cables for working voltage up to 1100V
IS 732 Code of practice for electrical wiring installation
IS 1248 Electrical measuring meters : Part 1,2,3,4,5,6,7,8,9
IS 1293 Three pin plugs and socket outlets
IS 1554 (Part 1 & 2) Specification for PVC insulated (heavy duty) electric cables
IS 1646 Electrical installation fire safety of buildings (general) Code of practice
IS 1777 Industrial luminaire with metal reflectors
IS 1885 Glossary of items for electrical cables and conductors
IS 1913 General and safety requirements for fluorescent lamps luminaries Tubular
IS 1944 (Part 1 & 2) Code of practice for lighting of public through fares
IS 2071 (Part 1 to 3) Method of high voltage testing
IS 2147 Degree of protection provided by enclosures for low voltage switchgears and control gears
IS 2148 Specification for double compression cable glands
IEC-62305 (all parts) Protection of building and allied structure against lightning
IS 2544 Porcelain post insulators for systems with nominal voltages greater than 1000V
IS 2551 Danger Notice Boards
IS-2705(Parts 1 to 4) Specification for Current transformer
IS 3043 Code of practice for earthing
IS 3070 Lightning arrester for alternating current system
IS 3639 Fittings and accessories for power transformers
IS 3961 Current ratings for cables
IS 4004 Application guide for surge arrestors for AC system
IS 4012 & 4013 Specification for dust proof electric light fittings
IS 4146 Application guide for voltage transformers
IS 5133 Boxes for enclosure of electrical accessories Part-1 : Steel & cast iron boxes
IS 5077 Decorative lighting outfits
IS 5216 Recommendation on safety procedures and practices in electrical works
IS 5578 Marking and arrangement of bus bars
IS 5819 Recommended short circuit rating of high voltage PVC cables
IS 6616 Ballast for HP MV lamps
IS 7098 Cross-linked Polyethylene (XLPE) insulated PVC sheathed cables for working voltages from 1.1 KV up to and including 33KV
IEC-61439 Specification for Low voltage switchgear and control gear assemblies
IS/IEC 60947-1&2 'Low-voltage switchgear and controlgear-MCCB
IEC-60898 Circuit breakers for household applications – MCB
IS 10118 Code of practice for selection, installation and maintenance of switchgear and control gear
IS 10322 (latest edition) Specification for Luminares
IS 10810 Methods of test for cables
IS 12360 Voltage bands for electrical installation including preferred voltages and frequency
IS 12640/IEC 62423 Specification for RCCB
IS/IEC-60071-1 & IS/IEC 60529 Specification flame proof/weather proof double compression cable gland
IS 12943 Specification single compression cable gland
IS 13021/ IEC 60925

Electronic Ballasts
IS 13703 Specification for low voltage fuses upto 1000V
IS 15652 Specification for rubber mats for electrical purposes
IS 1651 & 1652 Stationary cells and batteries lead acid type
IS 398 (part-1 7 2) Aluminium stranded conductors
IEC 60598-1:2014/AMD1:2017 General requirements and tests
IEC 61032 Protection of persons and equipment by enclosures – Probes for verification
IEC 61347-1:2015/AMD1:2017 General and safety requirements
IEC 62471:2006 Photobiological safety of lamps and lamp systems
IEC 62504, Light emitting diode (LED) products and related equipment –
Terms and definitions
IEC TR 62778:2014, Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires
IS 1255 Code of practice for installation and maintenance of power cables up to 33 kV rating

TECHNICAL SPECIFICATIONS

1. 11 kV HT CABLE

General
Cables shall be aluminium conductor, XLPE insulated PVC inner sheathed, LSZH outer sheathed black colour construction and shall be supplied, inspected, laid, tested and commissioned in accordance with drawings, specifications, relevant Standard Specifications and cable manufacturer's instructions.

Material

a. Conductor

The Conductor shall be made from electrical purity aluminum stranded wires compacted together.

b. Insulation

High quality XLPE unfilled insulating compound of natural colour shall be used for insulation. Insulation shall be applied by extrusion process and shall be chemically cross linked in continuous vulcanization process.

c. Shielding
Cables shall be provided with conductor shielding as well as insulation shielding and shall consist of extruded semi-conducting compound, additionally insulation shield shall be provided with semi-conducting and metallic tape shield over the extruded insulation shield. XLPE insulation and outer core shielding shall be extruded in one operation.

d. Armouring

Armouring shall be applied over the inner sheath and shall comprise of flat steel wires (strips).
e. Outer Sheath

Tough outer sheath of heat resisting PVC compound shall be extruded over the armouring in case of armoured cables or over extruded over the armouring in case of armoured cables or over inner sheath in the case of unarmoured cables.

Tests

Cables shall be type tested and routine tested in accordance with IS:7098 (Part II).
a. Conductor resistance test.
b. Partial discharge test.
c. High Voltage test.

The following tests shall be carried out at site for insulation between phases and between phase and earth before and after cable laying.

a. Insulation Resistance Test.
b. Continuity test.
c. Sheathing continuity test.
d. Earth test.
e. High Voltage test.

Cables shall be laid with a clearance of at least 75 mm between two cables.

End Termination of HT Cable

Pre-moulded cable terminations for XLPE cable shall be used as per manufacturer's instructions. The steel cone of M-seal Push-On shall consist of highly track resistant insulating section vulcanised to a semi-conducting section. The pad material shall have cold-flow properties and shall be flame retardant.

Each end terminal shall undergo Hi Pot Test.

Laying of HT Cables DIRECT IN GROUND

The work shall involve digging of outdoor trench in the ground and laying cable(s) as indicated in specifications and Schedule of Quantities.

The depth of the trenches shall not be less than 900mm for 11 kV plus radius of cable, from the upper surface of ground. Where more than one multicore cable is laid in the same trench, a horizontal inter spacing of 250 mm shall be left in order ro reduce mutual heating and also to ensure that fault occuring on one cable will not damage the adjacent cable.

Cable shall be laid in cement pipes encased in concrete or hume pipes at all road crossing. Cables shall be laid in trenches over rollers placed inside the trenches. After the cable has been properly laid and straightened, it shall covered with 80 mm thick layer of sand. Cable shall then be lifted and placed over this sand cushion. Again, the cable shall be covered with a 80 mm layer of 80 mm layer of sand. Over this sand layer a course of cable protection tiles by overlapping cables by 50 mm on either side, shall be provided. Trenches shall then be back-filled with earth and consolidated. Suitable cable markers made of cast iron with aluminium paint indicating the voltage grade and direction of run of the cables shall be installed at regular intervals.

RCC/Masonry Trench

For laying of HT cable in RCC/Masonry trench refer detail on sub-station layout drawing and IS-1255-1983.

2. BUSWAYS & RISING MAINS

The specification covers design, manufacturing, supply, installation, testing and commissioning of Sandwich type bus bar trunking for use as feeder bus bars for interconnection between separate electrical equipment / load centers, and for use as plug in bus bar risers.

System details

The busduct shall be suitable for operation in a 600/1000V system, with frequency of 50 Hz having 100% neutral and internal earth. The bus duct shall be designed for an ambient of 40 deg C (35 deg C average over a period of 24 hours) as per IS 8623.

Standards

All busbar trunking products and fittings (straight length, elbow, tees, flanged ends, cable tap box and circuit breaker, etc.) shall be in accordance with IEC 61439 Part 6 (2012) or UL857 and from the same manufacturer as the busbar trunking system. The degree of protection of the busbar trunking system should be IP54/ for indoor and IP-65 for outdoor in accordance to IEC 60529.

Testing

The bus bars shall be type tested at a reputed international/national test laboratory (ASTA/ KEMA,ANLB) for short circuit withstand. The test shall be for a minimum duration of 1 second. Tests shall be performed over a range of

current ratings, covering the different frame sizes of the manufacturer.
Degree of ingress protection (IP rating) shall also be tested at any reputed independent laboratory. This test shall be for IP54 for indoor application and IP65 for outdoor application for sandwiched bus bars.
Manufacturer
The manufacturer must have an established track record in design and manufacture of sandwich and cast resin busbar trunking, and must have supplied bus bar systems for at least 5years. The busbar, of full range and each rating, should pass full type tests specified in IEC 61439 Part 6 (2012).The test report & certificate shall be issued by an international independent testing authority as per ISO/IEC 17025 (e.g. NABL, ASTA, KEMA, UL).

Design & Construction requirements

General: The bus bars shall be of sandwich construction, non-ventilated design. It shall be possible to mount the bus bar system in any orientation, without affecting the current rating.
The bus duct shall consist of three phases and neutral bus bar permanently positioned dust and vermin proof and the degree of enclosure protection shall be IP 54 for indoor installation and shall be IP-65 for outdoor installation as per schedule of quantities.

Bus bars: The bus bars shall of high conductivity Aluminum, as specified in the tender.
Unless otherwise specified, in the external surface of enclosures of bus bar compartment which shall be accessible but do not need to be touched during normal operation, maximum temperature rise limits of 40° C above ambient temperature shall be permissible for metal surface and of 50° C above ambient temperature for insulating surfaces as per IS 8623(Part-1) 1993.

Where an earth conductor is required, it shall be a separate, integral earth conductor, of the same high conductivity material as per clause 7.4.3.1.7 of IEC 60439. In addition to this, enclosure shall have fixing arrangement to install 2 nos. of external earth strip along the run of the bus duct.

Insulation
The bus bars shall be insulated throughout their length by Mylar. The insulation material used shall be of minimum Class B). The insulation must comply to UL 94 V-O. It shall be Halogen Free.
Housing
The housing shall be made of extruded Aluminum case duly enameled/ electro- galvanized sheet steel, with an epoxy powder coated paint finish. The housing shall be profiled, to provide higher strength and efficient heat dissipation. The width of the housing shall preferably be the same for all ratings of bus bars, in order to provide interchangeability of tap off boxes.

Joints
The busbar trunking joint shall be of the one-bolt type which utilizes a high strength steel bolt(s) and Belleville washers to maintain proper pressure over a large contact surface area.
The bolt shall be torque indicating and at earth potential.
The bolt shall be two-headed design to indicate when proper torque has been applied and require only a standard long handle wrench to be properly activated.

Access shall be required to only one side of the busbar trunking for tightening joint bolts.
It shall be possible to remove any joint connection assembly to allow electrical isolation or physical removal of a busbar trunking length without disturbing adjacent busbar trunking lengths.

Tap off units:

Where specified, tap off locations shall be provided for insertion of plug in tap off units. The tap off locations shall be covered by hinged plates.
Tap off units safety features:

When the door cover is open, it should not be possible to turn the MCCB on. This should be by means of mechanical safety locking system and not by the rotary handle of the MCCB.

The door shall be provided with a lock and keys.

When the lever is in ‘on’ position, even with the key unlocked, the operator should not be able to remove the box or open the tap off location cover.
During insertion, the earth conductor shall make contact first before the phase conductors. This should follow the sequence of first in last out concept.
The tap off unit handle shall be flexible in the sense that the ‘on/off’ handle can be attached to the left or right side of the box or in front, depending on the site situation.

When the box is open the live conductors shall be safe guarded by a transparent insulator plate which allows for visible inspection but does not allow touching of the live conductors.
In the event of a MCCB requiring maintenance or changing, the mechanical interlocking must allow easy access by removing only the front plate and not interrupting the adjacent linkages.

The tap off boxes will be suitable for accommodating MCCBs or other accessories, as required. The tap off units should allow the flexibility of accommodating different, reputed MCCB makes, to be mutually agreed depending on the tender requirements.

Tap off boxes shall be suitable for termination of AL cables.

Accessories: A full range of accessories like bends, end flanges, end feed units, and support brackets etc. shall be available

Installation
Bus ducts running along the wall shall be supported at intervals not exceeding 1.5 m. In case of branching, there shall be support on all branches at a distance of 300 mm from the point of branching, Support shall not be less than 40 x 40 x 6 mm MS angle secured in an approved manner. Supports may also be provided in the form of brackets fixed to walls where the duct runs along the wall. In case of ceiling suspended bus ducts, supports made out of 40x40x6 mm MS angle iron shall be provided. The horizontal distance between two such supports shall not be more than 1200 mm. The ducts supports shall be suspended from suitable approved suspension devices provided in the ceiling. Fire barrier shall be provided at each floor/wall crossing as per relevant IS code

Test at Site

The following tests shall be carried out at site and test results to be recorded:

a. Insulation resistance shall be tested with 1000 V megger and shall be not less than 100 mega ohms..

b. Earth continuity test.

3. LT DISTRIBUTION PANELS/BOARDS
Main LT Panel, Distribution Panels and Sub-Distribution Panels shall be covered under this section. Panels/Boards shall be suitable for operation on 3 Phase/single phase, 415/240 volts, 50 cycles, 4 wire system with neutral grounded at transformer. All Distribution panels shall be CPRI tested design and manufactured by approved manufacturer. ASTA/ KEMA,ANLB NABL/CPRI report shall be made available.

Construction Features

Distribution panels shall be 2 mm thick sheet steel cabinet for indoor installation, dead front, floor mounting/wall mounting type and shall be form 4B/3B/2B construction as mentioned in electrical SLD. The Distribution panels shall be totally enclosed, completely dust and vermin proof and shall 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. Distribution panel shall be suitable for the climatic conditions as specified in Special Conditions. Steel sheets used in the construction of Distribution panels shall be 2 mm thick and shall 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 shall confirm to IEC-61439 for factory built assembled switchgear & control gear for voltage up to and including 1.1kV AC.

All panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with wing nuts. Self-threading screws shall 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 shall be provided between the floor of Distribution panels and the lowest operating height.

Distribution panels shall be of adequate size with a provision of spare switchgear as indicated on the Single Line Diagram. Feeders shall be arranged in multi-tier. Knockout holes of appropriate size and number shall be provided in the Distribution panels 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 engraved on PVC sheet. All live accessible connections shall be shrouded and shall be finger touch proof and minimum clearance between phase and earth shall be 20 mm and phase to phase shall be 25 mm. Panels with ACB shall necessarily have front and rear access as per requirement whereas panels with all MCCB breaker may be provided with only front access with sufficient clearance.

The structure including doors and panels shall be suitable of withstanding stresses due to seismic conditions as specified in aforementioned site conditions.
The rating of equipment / component shall take full account of all heat sources and other de- rating factors, nonlinear loads within enclosures. All metallic non – current carrying parts of the switchgear shall be bonded together and connected to the switchgear earth busbar.

All doors shall be bonded to the main structure by means of a flexible copper connection arranged so that it cannot be trapped as the door is opened or closed.

Withdrawable parts (e.g. circuit breakers) shall be effectively earthed until they are completely withdrawn with all power and control connections disconnected.

Provision shall be made for earthing cable screen and armouring to the earth busbar, near the gland.
All control, instrument and communication cables, if any, shall be earthed suitably to prevent any electromagnetic interference and ensure electromagnetic compatibility. Each earthing point shall be marked with an E. Provision shall be made for an instrument clean earth.

Bus Bar Connections

Bus bar and interconnections shall be of high conductivity electrolytic grade aluminium / copper as indicated in the bill of quantities complying with requirement of IS : 5082 and of rectangular cross section suitable for carrying the rated full load current and short circuit current and shall be extendable on either side. 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 bus bars shall be 0.8 A/sq.mm for aluminium and 1.4A/sq.mm for copper bus bars.

Temperature Rise

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, maximum temperature rise limits of 25° C above ambient temperature shall be permissible for metal surface and of 15° C above ambient temperature for insulating surfaces. Maximum allowable temperature for the Bus bar to be restricted to 90 deg C for non-silver plated joints and 105 deg C for silver plated joints. Temperature rise must comply to IEC-61439.
All main distribution panels and sub distribution panels shall be provided with MCCB of appropriate capacity as per Single Line Diagram. All final Distribution boards shall be provided with Miniature Circuit Breakers. Final Single Phase Distribution boards shall be connected to the incoming supply through double pole MCB units & earth leakage circuit breakers. All wiring for final distribution boards shall be concealed behind 5 mm thick Bakelite sheet or MS sheet cover. All Distribution boards 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 shall be clearly numbered from left to right to correspond with wiring diagram. All the switches and circuits shall 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.

Cable Compartments

Cable compartment of adequate size shall be provided in the Distribution panels for easy clamping of all incoming and outgoing cables entering from the top/bottom. Adequate supports shall be provided in cable compartment to support cables.

Air Circuit Breakers (ACB)

The ACB shall conform to the requirements of IS/ IEC 60947-2 and shall be type tested & certified for compliance to standards from– ASTA/ KEMA,ANLB NABL/CPRI ERDA any accredited international/national lab. The circuit breaker shall be suitable for 415 V + 10%, 50 Hz supply system. Air Circuit Breakers shall 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 and bill of quantities with mechanical "ON" "OFF" “TRIP” indications.

The ACB shall 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.(Isc=Icu=Icw=100%)

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. 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 shall have double insulation (Class-II) with moving and fixed contacts totally enclosed for enhanced safety and in accessibility to live parts. All electrical closing breakers shall 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 shall close before the main contacts have closed. All other contacts shall close simultaneously with the main contacts. The auxiliary contacts in the trip circuits shall open after the main contacts open. Minimum 4 NO and 4 NC auxiliary contacts shall be provided on each breaker.

Rated insulation voltage shall be (Ui)1 kV and rated impulse insulation voltage shall be (Uimp) 12 kV A.
Cradle

The cradle shall be so designed and constructed as to permit smooth withdrawal and insertion of the breaker into it. The movements shall be free from jerks, easy to operate and shall 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 are 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 shall be incorporated:

a. Withdrawal or engagement of Circuit breaker shall not be possible unless it is in open condition.
b. Operation of Circuit breaker shall not be possible unless it is fully in service, test or drawn out position.

c. 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.

d. All Switchgear module front covers shall have provision for locking.
e. Switchgear operating handles shall be provided with arrangement for locking in 'OFF' position.
Protections

The breaker should be equipped with micro-controller based, communicable type release with RS 485 port for communication for metering data, fault history, data logger and maintenance related data to offer accurate and versatile protection with complete flexibility and shall 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 shall generally have following features and settings:

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

b. Thermal Memory
When the breaker shall reclose after tripping on overload, then the thermal stresses caused by the overload if not dissipated completely, shall get stored in the memory of the release and this thermal memory shall ensure reduced tripping time in case of subsequent overloads. Realistic Hot/Cold curves shall 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 shall draw its power from the main breaker CTs and shall require no external power supply for its operation.
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 shall meet the EMI / EMC requirements.

h. 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 minimises the damage to the system. To implement ZSI manufacturer should supply all related equipment like power supply, wiring etc. ZSI, wherever specified, shall be used for all incomer as well as outgoing ACBs.
On-Line change of settings should be possible. It should be possible to carry out testing of release without tripping the breaker.

I. The typical 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 In

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
Instantaneou s 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.

All incomer ACBs shall have following additional protections other than mentioned above.
- Under and over voltage
- Under and over frequency
- Restricted Earth Fault protection
- Trip Circuit supervision with PS class CT’s.

- Load shedding and reconnection thru programmable contacts.
- Release should display the Contact wear indication.

The release should provide local indication of actual %age loading at any instant. The release should be able to communicate on MODBUS RTU protocol using inbuilt RS485 port and shall be integral part of supply with trip unit. Parameters of the Protection Release should be changeable from Release as well as thru communication network. Release should have graphical LCD for display of power parameters. The release of incoming breakers should provide comprehensive metering with the following parameters

- Phase currents (running, average & max) – All parameters in single window.
- Release should be able to capture short circuit current on which ACB has tripped. The last 20 trips and alarms shall be stored in memory with the date & time stamping along with type of fault and alarm. The sensing CT Should be Rogowsky type with measurement precision of 2%.
- Release should be self-powered.
- Release should have facility to select different type of IDMTL protection DT, SIT, VIT, EIT, HVF) for better co-ordination with HT Breaker/Fuse.
- Phase voltages (running, average& max)
- Energy & power parameters (active, reactive and apparent)
- PF
- Frequency
- Maximum Demand (KVA & KW)

All O/G ACBs shall have following functions.

Protection

- The ACB control unit shall offer the following protection functions as standard:
- Long-time (LT) protection with an adjustable current setting and time delay;
- Short-time (ST) protection with an adjustable pick-up and time delay;
- Instantaneous (INST) protection with an adjustable pick-up and an OFF
- Position.
- Current and time delay setting shall be indicated in amperes and seconds respectively.
- Earth-fault protection with an adjustable pick-up and time delay shall be provided if indicated on the appended single-line diagram.

Measurements

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

Safety Features

i. The safety shutter shall prevent inadvertent contact with isolating contacts when breaker is withdrawn from the Cradle.

ii. It shall not be possible to interchange two circuit breakers of two different thermal ratings. For Draw-out breakers, an arrangement shall 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.

v. It shall be possible to connect the drawout frame not only in connected position but also in TEST and DISCONNECTED position to prevent dislocation due to vibration and shocks.

vi. Drawout breakers should not close unless in distinct Service/Test/Isolated positions.

vii. The insulation material used shall conform to Glow wire test as per IEC60695.
viii. The ACB shall provide in built electrical and mechanical anti-pumping.

All EDO ACB`s shall 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 and Auto Source Change Over Systems.
Moulded Case Circuit Breaker (MCCB)

The MCCB should be current limiting type with trip time of less than 10 msec under short circuit conditions. The MCCB should be either 3 or 4 poles as specified in BOQ. MCCB shall comply with the requirements of the relevant standards IS/IEC 60947-2 and should have test certificates for Breaking capacities from independent test authorities ASTA/ KEMA,ANLB NABL/CPRI /ERDA any accredited international/national lab.

MCCB shall 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 moulded case with high withstand capability against thermal and mechanical stresses.
The breaking capacity of MCCB shall be as specified in the schedule of quantities. The rated service breaking capacity (Ics) should be equal to rated ultimate breaking capacities (Icu) (Isc=Icu=100%). MCCBs for motor application should be selected in line with Type-2 Co-

ordination as per IS/IEC-60947-2. The breaker as supplied with ROM should meet IP54 degree of protection.
Rated insulation voltage shall be (Ui)1 kV and rated impulse insulation voltage shall be (Uimp) 8 kV A.

Current Limiting & Coordination

The MCCB shall be capable of achieving discrimination up to the full short circuit capacity of the downstream MCCB. The manufacturer shall provide and confirm Total Discrimination from Main Incomer ACB upto Final Distribution Boards and let-through energy curves for all switchgears provided as per SLD.

It shall be the responsibility of Panel board manufacturer to obtain the confirmation from supplier and provide the same as part of GA drawing submission.

Protection Functions

- MCCBs with ratings up to 200 A shall be equipped with Thermal-magnetic (adjustable thermal for overload and fixed magnetic for short-circuit protection) trip units
- MCCBs with ratings 250A 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 shall comply with appendix F of IS/IEC 60947-2 standard (measurement of rms current values, electromagnetic compatibility, etc.)
- Protection settings shall apply to all poles of circuit breaker.
- All Microprocessor components shall withstand temperatures up to 125 °C Testing

a) Original type test report & certificate of the MCCB as per IS/IEC 60947-1 &2 shall be furnished.
b) Pre-commissioning tests on the switch board panel incorporating the MCCB shall be done as per standard specifications.

Interlocking

Moulded case circuit breakers shall 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.

- All MCCB with microprocessor based release unit, the protection shall be adjustable Overload, Short circuit and earth fault protection with time delay.
- The trip command shall override all other commands.
- All MCCBs above 63A shall be provided with Silver Plated Copper Spreader Links for enhancing termination capacity

Miniature Circuit Breaker (MCB)

Miniature Circuit Breaker shall comply with IS/IEC 60898 and IEC 60947-2. 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 shall 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 shall have the minimum power loss (Watts) per pole defined as per the IS/IEC and the manufacturer shall publish the values. MCB shall 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 shall have a common trip bar independent to the external operating handle.

Rated insulation voltage shall be (Ui) 400 V and rated impulse insulation voltage shall be (Uimp) 6 kV A for three phase power supply circuit breakers.

Painting:
All sheet steel work shall undergo a process of degreasing, pickling in acid, cold rinsing, phosphating, passivating (min nine (9) tank processing) and then painted with electrostatic paint (Powder coating). The shade of colour of panel inside/outside shall be as per BOQ confirming to IS Code No.5.
Labels:
Engraved PVC labels shall be provided on all incoming and outgoing feeder. Circuit diagram showing the arrangements of the circuit inside the distribution panels shall be pasted on inside of the panel door and covered with transparent plastic sheet.

Meters
i. All voltmeters and indicating lamps shall be through MCB’s.
ii. Meters and indicating instruments shall be flush 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.

Current Transformers
Current transformers shall be provided for Distribution panels carrying current in excess of 60 amps or as per tender SLD. All phase shall be provided with current transformers of suitable VA burden with 5 amps secondary for operation of associated metering.

The CTs shall confirm to relevant Indian Standards. The design and construction shall be dry type, epoxy resin cast/ Flame Retardant resin filled Nylon type robust to withstand thermal and dynamic stresses during short circuits. Metering CTs, shall have inbuilt bus bar mounting arrangement. Secondary terminals of CTs shall be brought out suitable to a terminal block which shall 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 shall be of accuracy class 5P10 and measurement CTs shall be of accuracy class 1.

Potential Free Contacts

Potential free contacts shall be provided for connection to Building Automation System in panels indicated in Schedule of Quantities.

Indicating Panel

All meters and indicating instruments shall be in accordance with relevant Indian Standards. Meters shall be flush mounted type. Indicating lamps shall be of low burden, and shall be backed up with 2 amps MCB/MPCB as per relevant fault level and toggle switch.

Testing

Testing of panels shall be as per following codes:

- All type test and routing test for factory built assembled switchgear & control gear for voltage up to and including 1.1kV AC shall be performed and submitted according to IEC-61439
- All type test circuit breaker for voltage up to and including 1.1kV AC shall be performed and submitted according to IEC-60947-1&2
- IEC-60529 Degree of protection
- IS: 5578 & IS :11353, 1985 Arrangement of bus bars.

Wiring

In wiring a distribution panel it shall be insured that total load of various distribution panel and/or consuming devices is divided evenly between the phases and number of ways as per drawing and approval. All wiring shall be minimum FRLS.

Anti-Condensation Space Heaters

1 No. 100 W, 240 volts, single phase, 50 Hz AC Anti Condensation space heaters controlled by thermostat and protected by 6 amps MCB's or MPCB's as per fault level at the panel shall be provided in each vertical section of main LT panel and 1 No. 60 watt Anti Condensation space heater with thermostat shall be provided in each cable alley of main distribution boards and sub distribution boards.

Rubber Mat

Rubber mat shall be provided in front to cover the full length of all panels. Where back space is provided for working from the rear of the panel, rubber mat shall also be provided at the back of the panel also to cover the full length of panel on the rear also. Rubber mats provided shall be as per IS 15652-2006.

4. Power Factor Correction System With Detuned Filter

Scope

Design, manufacture, supply, erection, testing and commissioning of Indoor type power correction capacitor banks for power factor improvement as per specification given below :

Standard

Unless otherwise stated below, the APFC system shall comply with the following standards (and their latest amendments) :

IS 13340-1993, IS 13341-1992, IEC 60831-1+2 : Capacitors with self-healing features IS 12672 : Capacitors with over pressure disconnectors

IS 13703 : HRC cartridge fuse and links up to 600V

IS 13947 : Circuit breakers & switch gear components Rating

10 to 50 KVAR (or less) capacitor units as specified in the BOQ shall be used to form a bank of capacitors of desired

capacity.
Enclosure

The panel shall be indoor type, free standing, and floor mounting with IP42 degree of protection. It shall be completely made of CRCA sheet steel. The enclosure shall have sturdy support structure with angle supports as necessary and shall be finished with powder coating in the approved colour shade/s to match the colour of the other panels. The thickness of powder coating should be minimum 60-80 microns.
Suitable provisions shall be made in the panel for proper heat dissipation. Air aspiration louvers for heat dissipation shall be provided as a necessary.

The front portion shall house the switchgear and the rear portion shall house capacitors and series reactors. The enclosure is to be suitably sized to accommodate all the components, providing necessary air clearance between live and non-live parts, providing necessary working clearance.

APFC Relay / Controller
Microprocessor based APFC relay (Intelligent VAr controller) shall have dual sensing so that on generator supply it can suitably switch to desired power factor and automatically switch ON / OFF the capacitor unit or stage to achieve the preset target PF. The controller shall have the following features :

- Controller shall provide solid state output of 8/12/16 stage suitable for fast switching of capacitor bank controlled by thyristors.

- Controller shall sense three phase three wire voltage and shall have 3 current feedback CT sensing for measurement.

- Digital settings of parameters like PF, Switching time delay, Step limit etc.
- LCD Display displaying PF/V/I/KVA/KW/KVAR temp./Harmonics (THD for Voltage and Current and individual odd harmonics upto 15th for phase voltage and current)

- Indication of PF (up to 3 demial points e.g. 0.987), preset parameters, Contactors switching operation and capacitors operating life.

- Minimum threshold setting of 1% of CT current.
- No-volt release.

- Protective shut down in case of harmonic overload i.e. either VTHD or ITHD is higher than 5% (settable up to 25%).

- Shall have data logging for all Electrical parameter for 30 days.
- Shall have RS 485 interface.
- Output command shall have minimum 8 outputs.

- Indication for Failure to achieve the target PF, Harmonic overloading, Step failure etc. online per step health monitoring.

- Controller shall maintain PF of 0.8 while system is on DG supply.

- Auto /manual selector switch shall be provided to enable operation of APFC panel in manual mode when required, specially in case of failure of APFC relay.

Construction
The capacitor banks shall be formed out of 50 kVAr (or less) capacitor units as specified in the BOQ shall be used to form a bank of capacitors of desired capacity. The smallest capacitor bank step shall be less than 10 kVAr and the largest capacitor bank step shall not be more than 100 kVAr.

For bank formation, Metalised Poly Propylene (MPP) capacitor shall be used.
Mixed dielectric extra low loss capacitors shall be combination of tissue paper and biaxially oriented polypropylene film impregnated with non PCB bio-degradable compound.

Metalised Poly Propylene capacitors shall be manufactured using Poly propylene film placed between 2 layers of metal foil and winding or using wave cut MPP film. The MPP Capacitors shall be self-heating type and soft resin or oil impregnated for longer life. The impregnant shall be non-PCB, biodegradable type and must be properly treated and de-gasified, so as not to have any degeneration properties and shall be non-oxidizing .
Alternatively, MPP type capacitors filled with inert gas shall be used. The MPP capacitors shall be in cylindrical Aluminium can

For the MDXL capacitors, the elements shall be connected to the external bus bars through the leads in a series-parallel connection to form a three phase unit. These capacitors shall be floor mounting type using minimum floor space. The container of capacitors shall be made out of 2 mm thick M S sheet steel with polyster paint coated finish. The design shall be modular for simple mechanical assembly, no extra accessories / metal parts to be required. Unit must be free standing with an IP 41 protection level.

Capacitors

- Capacitor rated voltage shall be 440 Volts. It shall be 525V when used with 7% reactors, however it shall be derated to give required kVAR output of APFC bank at 415 working voltage.

- General specifications : 3 phase, delta connected, 50 Hz
- Capacitor shall be ISI marked.

- Voltage : Must be designed to withstand system overvoltage, increased voltage due to series reactor and harmonics.

- Overvoltage +10% (12h / 24h), + 15% (30m / 24h), + 20% (5m), +30% (1m) as per Clause 6.1 of IS 13340-1993.

- Overcurrent : 1.5 x In
- Peak Inrush current withstand : 200 x In

- Total watt-losses excluding discharge resistors : < 0.45 W / kVAr for MPP type and 1.5 W/kVAR for APP/MDXL type.

- Temperature category : -25 deg.C to 70 deg.C or at D Class.

- The design shall be modular for simple mechanical assembly, no extra accessories / metal parts to be required. Unit must be free standing with an IP 41 protection level.

Switching Module

Switching module shall consist of Thyristor switches which shall be capable of switching with series reactors of 7% at its rated current suitably cooled by heat sink and forced air cooling.

Thyristor switches shall be suitable for 3 phase, 3 terminal internally delta connected capacitor banks.

The rating of individual thyristor modules shall be:
- dv/dt device rating of 1000 Volts/micros
- full rated current should be defined at temperature >75C
- Vrrm blocking voltage (forward and reverse) should be of minimum 1600 V

Thyristor switches shall be capable to Turn ON capacitor banks (cold start) at rated current in all phases within 20

milliseconds and reaction time shall be 5 milliseconds. The thyristor switches shall be capable to reswitch and Turn ON same step (hot start) within 2 seconds of Turn OFF without generating transients. During Turn ON, inrush current shall be minimum and should not exceed 210% of rated current peak.

For ease of maintenance the thyristor switches should be able to monitor and indicate faults in thyristor and capacitors by indicating Thyristor short circuits (thyristor failure), under current (capacitor failure), over temperature in heat sink (fan failure) and feedback to the front controller display.
Thyristor shall be protected by thyristor duty fuses and shall be suitable for capacitor switching without generating transients during switch ON or OFF.

Total losses shall not be more than 3 Watts/ KVAr. Thyristor shall have feature of thermal cutout if temperature exceeds acceptable limits and restarts automatically when temperature comes down.

Terminals

Each capacitor bank shall be provided with a terminal chamber and cable glands suitable for PVC insulated aluminum conductor armoured cables as specified. Two separate earthing terminals shall be provided. The MPP type capacitor with sigut terminals shall be preferable.

Earthing

Two separate earthing terminals shall be provided for earth connection of each bank. Low Voltage Filter Reactor Application

LV Harmonic Filters shall be used with harmonic filter duty power capacitors to mitigate harmonics, improve power factor and avoid electrical reasonance in LV electrical networks.

Construction, Testing & Protection

The low voltage filter reactor shall be series type having a three phase, iron core construction suitable for indoor use (IP 00). The reactor shall be air cooled and the layout shall be in accordance with IEC 60289/ IS-5553.

The complete unit shall be impregnated under vacuum and over-pressure in impregnation resin. The insulation shall be Class F/ H with maximum temperature rise limited to equivalent of class B.. The reactor coils shall be wound with high grade aluminum / copper and termination shall be provided with suitably designed copper bars.

The reactor shall be fitted with a temperature sensitive micro-switch in the centre coil (normally open) for connection to trip circuit in case of high winding temperature.

The permitted tolerance of inductance shall be ±5% of rated inductance value.

Reactor tuning factor shall be 7 % (189 Hz) and the current rating of the reactor shall include the effects of harmonics and other possible over-currents.

Reactor losses shall not exceed 0.5% of corresponding step kVAR i.e. for a step of 50 kVAR losses shall not be more than 250W
The limit of linearity of inductance of the filter reactor shall be as follows:
1.73• □□□ with L = 0.95 LN Testing
- The reactor shall be tested using a separate source voltage test of 3 KV (coil to core) for one minute as per IEC 76/3.
- Turn to turn overvoltage test with test voltage not less than 975 volts shall be performed to ensure there is no insulation damage of winding material due to abrasion.

Switchgear & Protection
Incomer switchgear shall be TP&N breaker appropriate rating (minimum 1.8 times the normal current) to take care of inrush switching current). The switching of capacitors shall be thyristor based at ‘zero’ cross over to avoid surges in

the system.. The system will be acceptable subject to demonstration of switching at zero cross over during the inspection.
Busbars shall be suitably colour coded and must be mounted on appropriate insulator supports.

Power cables used shall have superior mechanical, electrical and thermal properties, and shall have the capability to continuously operate at very high temperatures upto 125 deg.C.

Internal wiring between main bus-bars, breaker, thyristors and capacitors shall be made with 1100 V grade, PVC insulated, copper conductor cable of appropriate size, by using suitable copper crimping terminal ends etc.

Suitable bus links for input supply cable termination shall be provided. Control Circuit & General Protection
The control circuit shall be duly protected by using suitable rating MCB.

An emergency stop push button shall be provided to trip the entire system (22.5 mm dia, mushroom type, press to stop and turn to reset).

Wiring of control circuit of less than 50 V shall be done by using 0.5/1.0 sq.mm, 660 V grade, PVC insulated, copper wire and all other electrical control circuit wiring shall be done by using 1.5 sq.mm, 1100 V grade, PVC insulated, copper wire.

Following LEDs/indication shall be provided on the firing card/ controller / thyristor module for quick fault finding and ease of maintenance:

- Step ON (Green) - The respective step is ON.
- Power ON (Green) - The control power supply is ON.
- Current Spike (Red) - Unit tripped due to spike current detection.
- Over Current (Red) - Unit tripped due to capacitor over-current.
- Thyristor Short (Red) - Unit tripped due to thyristor short.
- Over Temp. (Red) - Unit tripped due to over temperature at heat sink.
- Power Fail (Red) - Power connection failures or Voltage transients high.

Inspection terminal strip, number ferruling, labeling etc. shall be provided. 440 V caution board on the panel shall be provided.
Testing

The capacitor bank shall be subject to tests as specified in relevant Indian Standards at the factory and the test certificates shall be furnished in quadruplicate.
Installation

- Capacitors banks shall be installed as per installation manual of supplier and shall conform to relevant Indian Standards.

- All interconnections in the control panel shall be checked before commissioning.
- Cable end boxes shall be sealed after cable connections to prevent absorption of moisture.

- Insulation matting as per IS-15652 of an approved make platform shall be provided in front of the full length of the capacitor bank and control panel.

Testing & Commissioning

- Insulation resistance shall be tested with a 1000 volts meagger between phases and phase to earth.

- Residual voltage shall be measured after switching of the capacitors and the same shall not be more than 50 volts after one minute.

- Each discharge resistor shall be tested for its working.
- Complete APFC panel shall be tested on load for temperature rise test All above tests shall be carried out at Manufacturer's works prior to dispatch

5. FINAL DISTRIBUTION BOARDS (FDB's)

Final Distribution Boards (FDBs) shall be suitable for operation on 3 Phase/single phase, 415/240 volts, 50 cycles, neutral grounded at transformer. The DB shall be minimum di-electric strength of 2.5 KV / Sec. All Distribution Boards shall manufactured by a manufacturer listed in Appendix-I.

Specific requirements for distribution boards intended to be operated by ordinary persons shall comply to IEC-61439-3

Construction Features

FDB's shall be made out of 1.6 mm thick high quality CRCA sheet steel and shall be pre- treated and powder coated sheet steel used in the construction of FDB shall be folded and braced as necessary to provide a rigid support for all component. FDB shall be suitable for indoor / outdoor installation, wall mounting free standing type, in double door construction. The Final Distribution Boards shall be totally enclosed, completely dust and vermin proof and shall be with hinged doors, Neoprene gasket, padlocking arrangement. All removable/ hinged doors and covers shall be grounded by 4.0 sq.mm tinned stranded copper connectors. Final Distribution Boards shall be suitable for the climatic conditions. 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 shall confirm to IS-8623-1977 (Part-1) for factory built assembled switchgear & control gear for voltage up to and including 1100 V AC.

All panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with wing nuts. Self-threading screws shall not be used in the construction of FDBs.

Knockout holes of appropriate size and number shall be provided in the FDB's in conformity with the location of cable/conduit connections. Detachable sheet steel gland plates shall be provided at the top / bottom to make holes for additional cable entry at site if required.

Final Distribution Boards shall comprise of the following:

- A panel for mounting where appropriate incoming supply circuit breaker & other auxiliaries for Control & distribution as required.

- Installations accessories shall be part of the DB for fixing conductor and rails for mounting MCB's and RCCB's etc. Neutral bus bars & earthing bus bars required in the circuit. All bus bars in the FDB shall be insulated type.

- Service cable /interconnection shall be part of the Distribution Boards.
- The board shall be installed at a height such that the operating is within reach of the normal human height i.e. 1.2 to 1.8 meters from finish floor level.

- Degree of protection shall be IP-42 for indoor application, IP-55 for kitchen & laundry and IP-65 for outdoor application.
- All three phase distribution boards shall have 4 rows and single phase distribution boards shall have single rows for housing of MCB's and RCCB's unless noted otherwise.
- Phase segregation to be maintained in all three phase distribution boards.
- Earthing shall be provided in each FDB's.

Wiring

In wiring a distribution panel it shall be insured that total load of various distribution panel and/or consuming devices is divided evenly between the phases and number of ways as per Consultants drawing.
Earthing : Earthing shall be provided as per IS:3043-1987. Painting
All sheet steel work shall 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 of Siemens gray paint shade no. RAL-7032 of IS Code No.5.
Labels
Engraved PVC labels shall be provided on all incoming and outgoing feeder. Circuit diagram showing the arrangements of the circuit inside the distribution panels shall be pasted on inside of the panel door and covered with transparent plastic sheet.

Testing

Testing of panels shall be as per following codes:
- IEC-61439-3 for factory built assemblies of switch gear for voltages upto and including 1000 VAC.
- IEC-60529: Degree of protection

6. MEDIUM VOLTAGE 1.1 KV GRADE XLPE / PVC CABLES

General

The MV cables shall be supplied, inspected, laid, tested and commissioned in accordance with drawings, Specifications, relevant Standard Specifications and cable manufacturer's instruction.

Material

The LV cables shall be cross linked polyethylene (XLPE) insulated PVC inner sheathed and LSZH outer sheath of 1100 volts grade as asked for in the schedule of quantities. Cables up to 16 sq.mm shall be with copper conductor and 25 sq.mm and above shall be with aluminium conductor.
The cables 25 sq. mm & above shall be cross linked polyethylene (XLPE) insulated PVC inner sheathed and LSZH outer sheathed of 1100 volts grade. Cables including and below 25 sq.mm shall have four core conductor and above 25sqmm, all cable shall be provided with
3.5 core conductor unless & until specified.
Specifications of PVC insulated copper cable shall be as follows:

a. Conductor
Stranded compacted circular conductor shall be of electrical grade high conductivity copper below 25 sq.mm as per IS 8130 / 84

b. Insulation
The insulation shall be PVC, application shall be by extrusion process insulation confirming to IS 5831-1984. The thickness of insulation will be as per the relevant codes.

c. Laying-up
Insulated conductors of multi core cables shall be with thermoplastic fillers in the interstices. The phase identification of cores shall be by coloured strips.

d. Inner Sheath

Cores shall be surrounded either by a wrapped or an extruded PVC sheath. The thickness of the inner – sheath shall be as per relevant codes.
e. Armouring

The armouring shall be provided over the inner sheath. Single core cable shall have dia - magnetic armouring. Multi core cables shall have either galvanized round steel wires or flat steel strip armouring. Steel wires and strips for

armouring confirm to IS:3975. The direction of lay of armouring shall be opposite to that of cores.

f. Outer Sheath

Single and multi core cables are provided with an extruded FRLS grade PVC outer-sheath. The thickness of the sheath shall be as per IS:1554-1988. The PVC compound for the outer-sheath shall confirm to Type ST1 of IS 5831. The colour of the outer sheath shall be black with marking at every meter.

Specifications for XLPE aluminium / copper cable shall be as follows:

a. Conductor

Stranded compacted circular conductor shall be of electrical grade high conductivity aluminium per IS 8130/84

b. Insulation

The insulation shall be of natural unfilled chemically cross linked polyethylene conforming to IS 7098. The thickness of insulation shall be as per the relevant codes.

c. Laying-up

Insulated conductors of multi core cables shall be with plastic fibre in the interstices. The phase identification of cores shall be by coloured strips.

d. Inner Sheath

The cores shall be surrounded by either a wrapped or by an extruded PVC sheath. The thickness of the inner sheath shall be as indicated in the relevant codes.

e. Armouring

The armouring shall be provided over the inner sheath. Single core cable shall have non- magnetic armouring. Multi core cables shall have either galvanized round steel wires or flat steel strip. Steel wires and strips for armouring confirm to IS:3975. The direction of lay of armouring shall be opposite to that of cores.

f. Outer Sheath

Single and multi-core cables are provided with an extruded LSZH outer-sheath. The thickness of the sheath shall be as per IS:1554-1988. The PVC compound for the outer- sheath shall confirm to Type ST2 of IS 5831. The colour of the outer sheath shall be black with marking at every meter.

Current ratings of the cables shall be as per IS : 3961. The Conductor shall be stranded Aluminum/Copper circular/ sector shaped and compacted. In multi core cables the core shall be identified by red, yellow, blue and black coloring of insulation.

Repaired cables shall not be used.

The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground buried installation with uncontrolled back fill and chances of flooding by water.

Progressive automatic in line sequential marking of the length of cables in meters at every one meter shall be provided on the outer sheath of all cables.

Cables shall be supplied in non-returnable wooden drums as per IS : 10418.

Both ends of the cables shall be properly sealed with PVC/Rubber caps so as to eliminate ingress of water during transportation, storage and erection.

The product should be coded as per IS :- 7098 Part-I as follows :-

Aluminium Conductor A

XLPE Insulation 2X
Steel round wire armour W
Steel strip armour F
Steel Double round wire armour WW
Steel Double strip armour FF Non-magnetic (Al.) round wire armour Wa Non-magnetic (Al.) strip armour Fa

Inspection

All cables shall be inspected by the contractor upon receipt at site and checked for any damage during transit.

Joints in Cables

The Contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilization and avoid cable jointing. This apportioning shall be got approved by the Owner's site representative before the cables are cut to lengths. Where joints are unavoidable heat shrinkable type joints shall be made. The location of such joints shall be got approved from the Owner's site representative and shall be identified through a marker.

Jointing Boxes for Cables

Cable joint boxes shall be installed with heat shrinkable sleeve and of appropriate size, suitable for XLPE armoured cables of particular voltage rating.

Jointing of Cables

All cable joints shall be made in suitable, approved cable joint boxes and the filling in of compound shall be done in accordance with manufactures' instructions and in an approved manner. All straight through joints shall be done in epoxy mould boxes with epoxy resin.

All cables shall be joined colour to colour and tested for continuity and insulation resistance before jointing commence. The seals of cables must not be removed until preparations for jointing are completed. Joints shall be finished on the same day as commenced and sufficient protection from the weather shall be arranged. The conductors shall be efficiently insulated with high voltage insulating tape and by using of spreaders of approved size and pattern. The joints shall be completely topped up with epoxy compound so as to ensure that the box is properly filled.

Cable End Terminations

Cable end termination shall be done in cable terminal box using crimping sockets and proper size of glands of double compression type

Bonding of Cables

Where a cable enters any piece of apparatus, it shall be connected to the casing by means of an approved type of armour clamp and gland. The clamps must grip the armouring firmly to the gland or casing, so that no undue stress is passed on to the cable conductors.

Packing & Dispatch

Cables shall be drummed in maximum continuous lengths:

a) Returnable steel drums for all H.V. cables and L.V. cables of large cross sectional areas or long drum lengths.
b) Non-returnable wooden drums where the manufacturer can guarantee that such drums are of sufficient strength to protect cable during shipping, handling and outdoor storage for three year period.

Cable ends shall be sealed and fixed to the drum so that both ends are accessible. To protect the cable during shipment, battens shall be fitted around the entire periphery of the drum. Drums shall be suitable for long term outdoor storage at site.

All cable drums shall have the Purchase Order Number, Purchase Order Item Number, Drum Number and Stock Code

Number clearly stenciled on the outside of both flanges.
Drum identification labels shall be of non-corrosive, non-hygroscopic material and attached to the outside and inside of the drum flanges. Labels shall be protected by transparent plastic envelopes and give the following information:

a) Drum identification number and its direction of rotation for cable removal.
b) Cable voltage grade
c) Cable construction (e.g. PVC SWA PVC or AYFY)
d) Number of cores and cross sectional area
e) Cable quantity (Metres)
f) Purchase order number and item number
g) Total weight of cable and drum (kg)
h) Manufacturer's name
i) Year of manufacture
j) Stock code number

The following minimum information shall be furnished.

a) Standard and maximum drum lengths for all the types of cable offered and the proposed drum lengths for all items.
b) Inspection test plan.
c) Cable dimensions (together with tolerances) :
i. Diameter of (individual in case of multi stranded) conductor wire
ii. Percentage of compaction as per data sheet.
iii. Diameter under conductor screen (where applicable)
iv. Diameter over conductor screen (where applicable)
v. Diameter over individual core insulators
vi. Lay of cable in case of multi-core cable
vii. Diameter over inner sheath (mm)
viii. Diameter over centre sheath (mm)
ix. Diameter over lead sheath (mm) (where applicable)
x. Diameter under armour (mm)
xi. Diameter over armour (mm)
xii. Diameter of armour wires (mm)
xiii. Overall diameter (mm)
d) Cable Physical Properties:
i. The filler materials to be used.

ii. Cable weight in kg/km
iii. Minimum bending radius (x OD)
iv. Maximum conductor continuous operating temperature (°C)
v. Suitability of outer sheath to resist attack from chemicals.

e) Cable electrical data :
i. Conductor dc resistance per km at 20°C
ii. Conductor ac resistance per km at operating temperature and system frequency
iii. Conductor inductive reactance per km at system frequency
iv. Conductor impedance per km at operating temperature and system frequency
v. Conductor capacitance per km
vi. Cable armour resistance per km

f) The current carrying capacity of single and multi-core cables when installed in defined conditions in air, in ducts and direct buried in the soil, together with rating factors for varying ambient temperatures, grouping and installation conditions and methods.

g) Cable short circuits withstand capacity presented in graphical form or by formulae.

h) Descriptive literature (catalogues etc.).

i) Cross sectional view of the physical make up of each cable.
j) Recommended temperatures below which installation of cable should not be carried out.

k) Minimum ambient temperature at which cables can be used.
l) Maximum pulling force for each cable and any special pulling instructions.

m) Maximum unsupported run of cable both horizontally and vertically.

Test / Inspection

After completion of manufacture of cables and prior to dispatch, the cables shall be subjected to type, routine, acceptance and special tests as detailed below. Consultant's / Owner reserve the right to witness all tests with sufficient advance notice from seller. The test reports for all cables shall be approved from the Engineer before dispatch of the cables.
All routine tests, acceptance tests, type tests and additional type tests for improved fire performance shall be carried out as listed in IS: 1554 and IS: 7098 on PVC and XLPE insulated cables respectively.

The test requirements for PVC insulation and sheath of cables, shall be as per latest revision of IS: 5831.
Test for Resistance to Ultra Violet Radiation: This test shall be carried out as per ASTMG- 53 on outer sheath. Test certificates with respect to this test (not older than one year) from recognised testing laboratory to be furnished for review by Consultant's before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by seller at his own cost in any recognised test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided outer sheath remains same.

Acceptance tests as per IS-1554, IS-7098 and the following special tests to be performed on the cables as per sampling plan.
a) Accelerated water absorption test for insulation as per IS 10810. Test certificates with respect to the test (not older than one year) from recognized testing laboratory to be furnished for review by Consultant's before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by seller at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided type of insulation remains same.

b) Dielectric Retention Test: The dielectric strength of the cable insulation tested in accordance with NEMA WC - 5 at 75 ± 1° C shall not be less than 50 % of the original dielectric strength. (For PVC insulated cables). Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by Consultant's before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by seller at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables.
.Sampling for this test is to be done randomly and once for each order.
c) Oxygen Index Test: The test shall be carried out as per IS 10810 or applicable Indian Standard specifications. Sampling to be done for every offered lot/size as per sampling plan.
d) Flammability Test: The test shall be carried out on finished cable as per IS - 10810. Sampling for these tests is to be done randomly once for each order, provided outer sheath remains same. The acceptance criteria for tests conducted shall be as under: The cable meets the requirement if there is no visible damage on the test specimen within 300 mm from its upper end.
The maximum extent of the charred portion measured on the test sample should not have reached a height exceeding 2.5 m above the bottom edge of the burner at the front of the ladder.

Test for rodent and termite repulsion property: The sellers shall furnish the test details to analyses the property by chemical method. Sampling to be done for every offered lot / size as per sampling plan.

Fire survival armoured cable with annealed copper conductor having cross linkable low smoke zero halogen

insulation and LSZH inner and outer sheath, cable should comply to BS-8519 (Latest edition). The cable should meet fire performance circuit integrity ltest as per BS-5839- 1 for enhanced fire resisting cable when tested in accordance to BS-6387 (CWZ-Test on sample @930 Degree C & not on separate sample).

Cable Installation

Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming kinks.

Laying of Cables in Ground

The width of trench for laying single cable shall be minimum 350 mm. Where more than one cable is to be laid in horizontal formation, the width of the trench shall be workout by providing 200 mm gap between the cables, except where otherwise specified. There shall be clearance of 150 mm between the end cable and the side wall of the trench. The minimum depth of the cable trench shall not be less than 750 mm for single layer of cables. When the cables are

laid in more than one tier the depth of the trench shall be increased by 300 mm for each additional tier.

Excavation of trenches : The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature shall be provided. Where gradients and changes in depth are unavoidable, these shall be gradual. The excavated soil shall be stacked firmly by the side of the trench such that it may not fall back into the trench. The bottom of the trench shall be levelled and shall be made free from stone, brick bats etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 100 mm in depth. Prior to laying of cables, the cores shall be tested for continuity and insulation resistance. The cable drum shall be properly mounted on jacks, at a suitable location, making sure that the spindle, jack etc. are strong enough to carry the weight of the drum and the spindle is horizontal. Cable shall be pulled over rollers in the trench steadily and uniformly without jerks and strains. The entire drum length shall be laid in one stretch. However, where this is not possible the remainder of the cable shall be removed by `Flaking' i.e. by making one long loop in the reverse direction. After the cable has been uncoiled and laid into the trench over the rollers, the cable shall be lifted off the rollers beginning from one end by helpers standing about 10 meters apart and laid in a reasonably straight line. Cable laid in trenches in a single tier formation shall have a cover of clean, dry sand of not less than 150 mm. above the base cushion of sand before the protective cover is laid. In the case of vertical multi-tier formation after the first cable has been laid, a sand cushion of 300 mm shall be provided over the initial bed before the second tier is laid. Finally the cables shall be protected by second class bricks before back filling the trench. The buried depth of uppermost layer of cable shall not be less than 750mm.

Back Filling : The trenches shall be back filled with excavated earth free from stones or other sharp edged debris and shall be rammed and watered, if necessary, in successive layers not exceeding 300 mm. Unless otherwise specified, a crown of earth not less than 50 mm in the centre and tapering towards the sides of the trench shall be left to allow for subsidence.

Laying of Cables on Cable Trays

The relative position of the cables, laid on the cable tray shall be preserved and the cables shall not cross each other. At all changes in direction in horizontal and vertical planes, the cable shall be bent smooth with a radius as recommended by the manufacturers. All cables shall be laid with minimum one diameter gap and shall be clamped at every meter to the cable tray. Cables shall be tagged for identification with aluminum tag and clamped properly at every 20M. Tags shall be provided at both ends and all changes in directions both sides of wall and floor crossings. All cable shall be identified by embossing on the tag the size of the cable, place of origin and termination.

All cables passing through holes in floor or walls shall be sealed with fire retardant Sealant and shall be painted with fire retardant paint up to one meter on all joints, terminations and both sides of the wall crossings. Firestop system for all MEP application shall have 2 hours fire rating when tested in accordance with *ASTM E 814/UL 1479 standards and IS 12458 as per NBC 2016*.

Route Marker

Route marker shall be provided along straight runs of the cables not exceeding 30 meters also for change in the

direction of the cable route and underground joints.
Route marker shall be of cast iron painted with aluminum paint. The size of marker shall be 100 mm dia with “Cable” and voltage grade inscribed on it

Fire retardant Cable Paint & Fire Barrier

The fire retardant paint / barrier shall be listed by independent test agencies such as UL, FM or OPL and be tested to, and pass the criteria of ASTM E 814 (UL1479) standard test method for fire test through- penetration fire stops and ASTM E 1996 (UL 2079) standard test method for fire resistive joint system/

Fire retardant cable Paint

The Fire resistant cable coating / painting shall be intumescent / ablative, water based compound, The coating shall expand up to 10 times, supplied in a manufacturer seal container indicating manufacturing and expiry dates. The coating material shall be non-toxic, asbestos free, & halogen free and shall have good mechanical strength. The colour of paint shall be white and density of coating shall be 1.3kg/ltr , coating shall have a snap time of 30 minutes, the expansion shall begin at 230 deg.C and it shall have a oxygen index of 41%.

Coating shall be applied by ordinary paint brush after cleaning the cables of dust and oil deposition. A minimum textured finish of 3 mm wet film thickness shall be achieved by applying the material in 2-3 layers leaving intervals of 2 to 8 hours depending upon the moisture and thickness, moisture and temperature hours between each coat.

Fire Barrier sheet for floor and wall sealing
The framing & fixing part of fire barrier sheet shall be very simple & directly fixed around walls & floors by help of anchored bolts & washer. For 2 hour fire rating the fire barrier sheet shall be minimum 7.62 mm thick and shall be cut as per the profile of penetration and opening. The small gap left around the penetration shall be closed with fire rated soft & moldable putty. Fire barrier must be design on the intumescent technology to seal larger penetration through the fire rated walls & floors. Fire barrier must be a composite construction with the quality incorporated with organic/ inorganic fire resistive elastomeric sheet with specific gravity of 1.6 gm/ cubic centimeter.

Testing of Cables
Cables shall be tested at works for all routine tests as per IS including the following tests before being dispatched to site by the project team.
- Insulation Resistance Test.
- Continuity test.
- Sheathing continuity test
- Earth test.(in armoured cables)
- Hi Pot Test.

Test shall also be conducted at site for insulation between phases and between phase and earth for each length of cable, before and after jointing. On completion of cable laying work, the following tests shall be conducted in the presence of the Owner’s site representative.
- Insulation Resistance Test (Sectional and overall)
- Continuity test.
- Sheathing continuity test
- Earth test.

All tests shall be carried out in accordance with relevant Standard Code of Practice and Electricity Rules. The Contractor shall provide necessary instruments, equipment and labour for conducting the above tests and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Owner’s site representative, results will be noted and signed by all present and record be maintained.

Cables inside Building

Cables inside buildings shall be laid on the cable trays. All cables passing through walls shall run through GI Pipes

sleeves of adequate diameter 50 mm apart maintaining the relative position over the entire length.

Cable Trays

Ladder and perforated type Cable Trays shall be of Pre Galvanized bolted type and factory fabricated out of CRCA sheet with standard accessories like tee, bends, couplers etc. for different loads and number and size of cables as given below. All outdoor type cable trays shall be Hot dip galvanized cable trays as required.
Ladder type cable trays of the following sizes:
a. 1500 mm wide
Runners 25 x 100 x 25 x 3 mm
Rungs 2# 20 x 40 x 20 x 3 mm 250 mm C/C
Suspenders 2 Nos. 40 x 40 x 5 mm GI angle 1500 mm C/C with base support of 40x 40 x 5mm GI angle.
b. 1200 mm wide
Runners 25 x 100 x 25 x 3 mm
Rungs 2# 20 x 40 x 20 x 3 mm 250 mm C/C
Suspenders 2 Nos. 40 x 40 x 5 mm GI angle 1500 mm C/C with base support of 40x 40 x 5mm GI angle.
c. 1000 mm wide
Runners 25 x 100 x 25 x 3 mm
Rungs 2# 20 x 40 x 20 x 3 mm 250 mm C/C
Suspenders 2 Nos. 40 x 40 x 5 mm GI angle 1500 mm C/C with base support of 40x 40 x 5mm GI angle.
d. 750 mm wide
Runners 20 x 75 x 20 x 2.5 mm
Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C
Suspenders 2 Nos. 32 x 32 x 5 mm GI angle 1800 mm C/C with base support of 40x 40 x 5mm GI angle.
e 600 mm wide
Runners 20 x 75 x 20 x 2.5 mm
Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C
Suspenders 2 Nos. 32 x 32 x 5 mm GI angle 1800 mm C/C with base support of 40x 40 x 5mm GI angle.
f. 450 mm wide
Runners 20 x 75 x 20 x 2.5 mm
Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C
Suspenders 2 Nos. 25 x 25 x 4 mm GI angle 1800 mm C/C with base support of 40x 40 x 5mm GI angle.

Supply and fixing of perforated type cable trays of the following sizes:
i. 600 x 40 x 40 x 2 mm thick
ii. 450 x 40 x 40 x 2 mm thick
iii. 300 x 40 x 40 x 2 mm thick
iv. 150 x 40 x 40 x 2 mm thick
Note : Suitable length of 10 mm dia GI rod suspenders at 1800 mm interval shall be included in the item for perforated type cable tray.

Specification for Hot Dip Galvanizing Process

(for Mild Steel Used For Earthing, Cable Trays, Junction Boxes etc for Electrical Installation.)

Quality of Zinc

Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS:209-1992. Coating Requirement
Minimum weight of zinc coating for mild steel flats with thickness upto 6 mm in accordance with IS:6745-1972 shall be 400 g/sqm.
The weight of coating expressed in grams per square metre shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.

The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs, rust stains bulky white deposits, blisters.

Mild steel flats / wires shall undergo a process of degreasing pickling in acid, cold rinsing and then galvanizing.

Floor Cable Trunking - GI

Trunking and fittings shall comply with BS 2989 or Indian Standard of IS277 with a GI coating thickness of 275GSM.

Trunking shall be top accessed. Inverted trunking is not acceptable.

All multi-compartment trunking systems shall maintain the stated segregation throughout, including all accessories.

Trunking shall be manufactured using pregalvanised sheet steel. Trunking shall be spot welded & arc welded throughout its length for better impact resistant and to prevent concrete seepage during installation. The trunking shall normally be supplied in 2500mm lengths with a material thickness of 1.6mm. Lengths of trunking, shall be coupled together by means of joint sleeves, made of pre galvanized GI with 275 GSM GI coating. At each joint in the trunking, continuity shall be maintained by means of copper links, not less than 25 x 3 mm to achieve an acceptable earth loop impedance level in compliance with BS 2989, fixed with brass nuts, bolts and serrated washers. Removal of any lid no matter how it is fitted shall not affect the earth continuity of the trunking. LSZH copper cable link with cable lugs may be used, if the proper connection method is provided to avoid long term corrosion and electrolytic action. The LSZH cable shall have an equivalent cross sectional area to the copper links. Bonding link shall be fixed on external surfaces.

JUNCTION BOXES

- Junction boxes are made of very high quality materials to withstand heavy load and corrosion. Manufactured from high-pressure die cast material for strength &durability.
- The trap lid is self-adjustable to any floor finish thickness using the leveling screws on all the four corners.
- The Trap cover is made of 3mm thick pre-galvanized steel plate to provide rigidity & added strength.
- The Trap covers to have flexibility for quick mounting on to the base box requiring minimum maintenance.
- The Trap cover must have 8mm recessed for installation of carpet and tiles.
- The Flyover units, trapframe and traps should be made of Electrostatic Polyester Epoxy Coating to provide excellent and enhanced protection on visible parts against chemical or saline corrosion.
- The Junction boxes should carry fly-over made of Electrostatic Polyester Epoxy Coating for cables passage to ensure segregation of service
- Junction boxes are tested to a load bearing of 3.6 tons on the trap lid for heavy traffic areas
- Junction boxes should have provision to Power, Data & Telecom services.
- The system must accommodate to run Mains Voltage & Extra Low Voltage cables.
- The trap cover screws must be made from Stainless Steel for extra protection.
- The system must have Positive Double Earthing connections.
- Earth wire connector should be provided in all the boxes, and complies with the requirement of current IEE regulation.
- The complete system must have excellent protection against rust.
- Four side blanks are made with removable perforations to suit ducts installation of upto 38-mm height.
- The one-piece base frame design ensures minimum openings to prevent concrete seepage into the box during casting of concrete or screeding.
- Standards & Approvals – The system must comply with the relevant specification & IEC 61084 standards

7. EARTHING & LIGHTNING PROTECTION

EARTHING

The system shall be TNS with four wire supply system (R, Y, B, N and. E) brought from the main L T Panel. All the non-current carrying metal parts of electrical installation and all metal conduits trunking, cable sheaths, switchgear, distribution panels, light fittings and all other parts made of metal shall be bonded together and connected by means of

specified earthing conductors to an efficient earthing system. All metal work such as pipe lines, ducts, cable trays, stair case railing etc shall be bonded to earth.

All earthing shall be in conformity with IS:3043 1987, and the basic system of earthing shall be TNS.

Earthing Conductors

Earthing conductors shall be of copper for equipment neutral earthing, IT equipment earthing, Server / Hub rack earthing, Isolation transformer neutral earthing etc. as per as mentioned in Schedule of quantities.
Copper \ GI conductor shall be used for general body earthing as mentioned in the Schedule of quantities. Conductor shall be protected against mechanical injury and corrosion.
Sizing of Earthing Conductors

Sizing of earth conductor for main LV panels, UPS etc. shall be based on actual fault current calculated.
Earthing grid shall be connected together at ground floor for equipotential bonding & to minimize overall resistance of earthing path.

Earthing grids of electronic \ IT equipment shall be separate & shall not be connected to general earthing grids with prior consent from user . Electronic \ IT equipment earthing grids for various buildingscan be interconnected for equipotential bonding & to minimize overall resistance of earthing path

For lighting & power circuits cross sectional area of earthing conductor shall be equal to phase conductor upto 16 sqmm. All fixtures, outlet boxes, junction boxes and power circuits up to 15 amps shall be earthed with PVC insulated copper wire.

Connection of Earthing Conductors
All joints in tapes shall be with four rivets (minimum 2 nos. diagonally opposite in case of smaller width strip) and shall be brazed in case of copper and by welding bolting in case of GI, wires shall be connected with crimping lugs, all bolts shall have spring washers. Sub- mains earthing conductors shall run from the main distribution panel to the sub distribution panel. Final distribution panel earthing conductors shall run from sub-distribution panel.

Circuit earthing conductor shall run from the exposed metal of equipment and shall be connected to any point on the main earthing conductor, or its distribution panel. Metal conduits, cable sheathing and armouring shall be earthed at the ends adjacent to distribution panel at which they originate, or otherwise at the commencement of the run by an earthing conductor in effective electrical contact with cable sheathing. Where equipment is connected by flexible cord, all exposed metal parts of the equipment shall be earthed by means of an earthing conductor enclosed with the current carrying conductors within the flexible cord. Switches, accessories, lighting fitting etc, which are rigidly secured in effective electrical contact with a run of metallic conduit shall not be considered as a part of the earthing conductor for earthing purposes, even though the run of metallic conduit is earthed. The installation shall be complete in all respects for efficient and trouble free service. All work shall be carried out in a first class quality and neat workmanship. Grounding conductors shall be handled carefully to avoid kinking and cutting of the conductors during their installation. All exposed ground conductors run shall be taken in a neat manner horizontal, vertical and parallel to the building walls or columns and shall not be laid haphazardly. All connections to the grounding grid shall be made with earthing strip welded to grid and bolted at equipment ends.

Prohibited Connections

Neutral conductor, sprinkler pipes, or pipes conveying gas, water or inflammable liquid, structural steel work, metallic enclosures, metallic conduits and lightning protection system conductors shall not be used as a means of earthing an installation or even as a link in an earthing system. The electrical resistance measured between earth connection at the main L T panel and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate or circuit breakers, and shall not exceed 1 ohm. All switches carrying medium voltage shall be connected with earth by two separate and distinct connections. The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in G I pipe of adequate size. The overlapping in strips at joints where required, shall be minimum 75 mm. The joints shall be riveted and brazed in case

of copper and by welding / bolting in case of GI in an approved manner. Sweated lugs of adequate capacity and size shall be used for termination of all conductor wires above 6 sq.mm size. Lugs shall be bolted to the equipment body to be earthed after the metal body is cleaned of paint and other oily substances and properly tinned. Equi- potential bonding of all metallic structures shall be done.

Earthing

The following must always be ensured in earthing system.

All earths must be interconnected at the earth pits. This includes UPS neutrals, UPS body, Panel earths etc.

Extraneous conductive parts such as gas pipes, other service pipes and ducting risers and pipes of fire protection equipment and exposed metallic parts of the building structure.
The Contractor shall get the soil resistivity test done at his own cost of the area where earthing pits are to be located before starting the installation.
Resistance to Earth

The resistance of earthing system shall not exceed 1 ohm.

Maintenance free Earthing Electrode System/ Chemical Earthing

In maintenance free earthing copper bonded earthing rod electrode shall be of 14.35 mm in diameter and 3 meter length. The rod shall be placed in a 150 mm dia an augured hole in the ground and then surrounded by ground enhancement material in either a dry form or pre mixed in a slurry. Once set, ground enhancement material becomes hard and as such holds positively to the rod as well as surrounding ground.

Earth rod offered shall have passed the test required of BS7430/ ANSI/ UL467 and confirm to the adhesion of the copper coating to the steel core (Design feature that prevents the ingress of moister and subsequently the integrity of the rod.
Minimum 0.25 mm thickness of copper shall be deposited over the steel core as per BS 7430/ UL 467. Average life of the ground rod shall be 30 years in most soil.

Ground enhancement material shall be as per IEEE-80 clause 14.5d with a resistivity of less than 0.12 ohm-meter. The ground enhancement material shall be permanent and not leach any chemicals in to the ground. The pH value of the ground enhancement material shall be
6.9 to 7.2 of 100 gm/ lit @ 20 deg.C.
Minimum 30 Kg of ground enhancement material shall provided for each earth electrode.

Inspection chamber shall be of 400 x 500 mm with concrete base CI manhole cover with frame painted with bitumastic paint. 2 Nos. of 50 x 6 mm cross section & 300 mm long copper strip to be clamped with copper claded rod electrode have sufficient nos (But not less than 4 Nos.) of 10 mm GI nuts & bolts for connection to the equipment / interconnection to the other pits to form equi-potential bonding.
Earth for Low voltage

Clean earth shall be used for earthing Low voltage systems and shall be separate from safety earthing. Separate earthing electrode shall be provided in the ground and from this electrode, single core copper cable of required size shall be taken as earth conductor to be laid in the vertical shaft. This cable shall be terminated on each floor in a earth terminal box located in the shaft. The earth terminal box shall have 50x6mm copper busbar mounted on insulators. The busbar shall have facility to terminate the incoming earth cable as well as required number of outgoing earth conductors.

LIGHTNING PROTECTION

The scope of work shall include Supply, Installation, testing and commissioning of complete Lightning protection system in compliance with IS/IEC 62305 and shall comprise of following:

1. Air Termination System
2. Down Conductor System
3. Earth Termination System

Contractor shall carry out the complete Risk analysis and provide supporting calculation for level of protection required.
Complete system for protection of structures against lightning, including their internal systems and contents, as well as persons, in general consisting of an LPS and SPM shall be installed to avoid damages to structures, accidents, severe injuries and (may be even) deaths of humans due to direct or indirect lightning. Both protection measures should complement each other. Extract for recommended level of protection from NBC 2016 is as follows:

The main and most effective measure for protection of structures against physical damage is considered to be the lightning protection system (LPS). It usually consists of both external and internal lightning protection systems.

An external LPS which consists of air-termination system, down-conductor system and earthing system is intended to,
a) intercept a lightning flash to the structure (with an air-termination system),
b) conduct the lightning current safely towards earth (using a down-conductor system)
c) disperse the lightning current into the earth (using an earth-termination system).

An internal LPS comprises equipotential bonding or a separation distance (and hence electrical insulation) between the external LPS components and other electrically conducting elements internal to the structure.
Air Termination System

Air-termination system is a part of an external LPS using metallic elements such as rods, mesh conductors or catenary wires intended to intercept lightning flashes. The probability of penetration by a lightning current on a structure is considerably decreased by the presence

of a properly designed air-termination system. Air-termination systems can be composed of any combination of the following elements:
a) Vertical rods (offers certain angle of protection);
b) Catenary wires
c) Meshed/Grid conductors

All types of air-termination systems shall be positioned in accordance with IEC 62305. The individual air terminations rods should be connected together at roof level to ensure current division.

Air-termination components installed on a structure shall be located at corners, exposed points and edges (especially on the upper level of any facades) in accordance with one or more of the following methods:

a) Protection angle method
b) Rolling sphere method
c) Mesh method.
The protection angle method is suitable for simple shaped buildings but it is subject to limits of air termination height. The mesh method is a suitable form of protection where plane/pitch roof surfaces are to be protected. The rolling sphere method is suitable in all cases.

Down Conductor System

Down-conductor system is a part of an external LPS intended to conduct lightning current from the air termination system to the earth-termination system. In order to reduce the probability of damage due to lightning current flowing

in the air-termination system, the down- conductors shall be arranged in such a way that from the point of strike to earth,

a) several parallel current paths exist
b) the length of the current paths is kept to a minimum
c) equipotential bonding to conducting parts of the structure is performed

The minimum number of down-conductors shall be 2 (diagonally opposite to each other) for building with an area less than 100 m2.

Down-conductors shall be installed so that, as far as practicable, they form a direct continuation of the air-termination conductors. It shall be installed straight and vertical such that they provide the shortest and most direct path to earth. The formation of sharp bends and loops shall be avoided. Every down conductor should be connected to a Type B ring/foundation earthing. Connection of down-conductor to a Type A earthing is allowed only

in case of space constraints or existing buildings, where installation is difficult. While routing the down-conductors, separation distance need to be calculated and maintained from live parts/services. Lateral connection of down-conductors at ground level and every 10 m to 20 m of height as a ring conductor. The installation of as many down-conductors as possible, at equal spacing around the perimeter interconnected by ring conductors, reduces the probability of dangerous sparking and facilitates the protection of internal installations. This condition is fulfilled in metal framework structures and in reinforced concrete structures in which the interconnected steel is electrically continuous. Routing of down-conductors (insulated or uninsulated) through electrical and other service shafts are not allowed as it can create fire and explosion during lightning. Separation distance is the distance required between air-terminals/lightning down-conductor and any conductive/metallic/electrical/ electronic part of a building to avoid uncontrolled flashover. Separation distance (S), in m should be calculated. The down-conductor shall be supported on structure like column at every 1 m using suitable clamps or connectors or exothermic welding. The clamps or connectors or exothermic welding shall be tested for the lightning current as per selected LPL. At the structures, which cannot be punctured for holding the down-conductors, like tin roofs, glass structures, etc, the down- conductors should be supported with adhesive type clamps tested for weather durability and for withstanding lightning currents as per selected LPL. The wind speed shall be taken into account while mounting the air-termination and down-conductor system.

Earth Termination System

Earth-termination system is a part of an external LPS which is intended to conduct and disperse lightning current into the earth. When dealing with the dispersion of the lightning current (high frequency behavior) into the ground, whilst minimizing any potentially dangerous over-voltages, the shape and dimensions of the earth-termination system are the important criteria. In general, a low earthing resistance (if possible lower than 10 ohm when measured at low frequency) is recommended. From the viewpoint of lightning protection, a single integrated structure earth termination system is preferable and is suitable for all purposes (that is, lightning protection, power systems and telecommunication systems).

Earth-termination shall comprise of vertical/horizontal conductor and ring earthing/foundation earthing used for satisfying the requirements of Code. Length of the earth electrode depends on the soil resistivity and class of LPS. Minimum number of earth electrodes should be 2.

Earthing arrangement shall comprise of a ring conductor external to the structure to be protected, in contact with the soil for at least 80 percent of its total length, or a foundation earth electrode. Such earth electrodes may also be meshed. For the ring earth electrode (or foundation earth electrode), the area enclosed by the ring earth electrode (or foundation earth electrode) shall be not less than the value of vertical earthing.
The ring earth electrode around the structure or the ring earth electrode in the concrete at the perimeter of the foundation, should be integrated with a meshed network under and around the structure, having a mesh width of typically 5 m. This greatly improves the performance of the earth-termination system. If the basement’s reinforced concrete floor forms a well-defined interconnected mesh and is connected to the earth termination system, typically at every 5 m.

Where required, further potential control for such areas should be provided. More ring earth electrodes should be installed at distances of approximately 3 m from the first and subsequent ring conductors. Ring electrodes further from the structure should be installed more deeply below the surface, that is, those at 4 m from the structure at a depth of 1 m, those at 7 m from the structure at a depth of 1.5 m and those at 10 m from the structure at a depth of 2 m. These ring earth electrodes should be connected to the first ring conductor by means of radial conductors.

For integrating structural steel as down-conductor and earth-termination, earth resistivity measurements are required. Proper drawings should be made based on the actual installation and submitted to authorities if necessary.

Steelwork within reinforced concrete structures is considered to be electrically continuous provided that the major part of interconnections of vertical and horizontal bars are welded or otherwise securely connected. Connections of vertical bars shall be welded, clamped or overlapped a minimum of 20 times their diameters and bound or otherwise securely connected. For new structures, the connections between reinforcement elements shall be specified by the designer or installer, in cooperation with the civil engineer. For structures utilizing steel reinforced concrete (including pre-cast, pre-stressed reinforced units), the electrical continuity of the reinforcing bars shall be determined by electrical testing between the uppermost part and ground level. The overall electrical resistance should not be greater than 0.2 Ω, measured using test equipment suitable for this purpose. If this value is not achieved, or it is not practical to conduct such testing, the reinforcing steel shall not be used as a natural down-conductor. In this case it is recommended that an external down-conductor be installed. In the case of structures of pre-cast reinforced concrete, the electrical continuity of the reinforcing steel shall be established between individual adjacent pre-cast concrete units.
A low impedance bonding network is needed to avoid dangerous potential differences between all equipment inside the building. Moreover, such a bonding network also reduces the magnetic field, thereby reduces the radiated surges inside the building and provides more protection for electrical/electronic equipment. This can be realized by a meshed bonding network integrating conductive parts of the structure, or parts of the internal systems, and by bonding metal parts or conductive services at the boundary of each LPZ directly. The bonding network can be arranged as a three dimensional meshed structure with a typical mesh width of 5 m. This requires multiple interconnections of metal components in and on the structure (such as concrete reinforcement, elevator rails, cranes, metal roofs, metal facades, metal frames of windows and doors, metal floor frames, service pipes and cable trays). Bonding bars (for example, ring bonding bars, several bonding bars at different levels of the structure) and magnetic shields of the LPZ shall be integrated in the same way. Conductive parts (for example, cabinets, enclosures, racks) and the protective earth conductor (PE) of the internal systems shall be connected to the bonding network.

On structures taller than 60 m, flashes to the side may occur, especially to points, corners and edges of surfaces. In general, the risk due to these flashes is low, but electrical and electronic equipment on walls or outside structures may be destroyed even by lightning flashes with low current peak values. An air-termination system shall be installed to protect
the upper part of tall structures (that is, typically the topmost 20 percent of the height of the structure as far as this part exceeds 60 m in height) and the equipment installed on it. The rules for positioning the air termination systems on these upper parts of a structure shall meet at least the requirements for LPL IV with emphasis on the location of air-termination devices on corners, edges, and significant protrusions (such as balconies, viewing platforms, etc.

The maximum values of lightning current parameters for the different lightning protection levels (LPL) are given below and are used to design lightning protection components (for example, cross-section of conductors, thickness of metal sheets, current capability of SPDs, separation distance against dangerous sparking) and to define test parameters simulating the effects of lightning on such components

Lightning Flash Counter
Each protection system shall be supplied with Lightning strike counter. The counter shall have a register that activates

one count for every discharge where the peak current exceeds 400A at the 8/20us standard.

The lightning flash counter shall be robust and easy to install. The counter shall operate from the energy of the lightning discharge and should not work on external or battery power to operate.

The lightning flash counter shall be installed to the manufacturer’s instructions in a readily accessible manner (always 2mts above the Ground) so that reading can be taken at regular intervals. It shall be positioned such that its operating temperature is within the range -20'C to
+ 60'C.

All earthing shall be in conformity with IS:3043 2018, and the basic system of earthing shall be TNS.

Connection of Earthing Conductors

All joints in tapes shall be with four rivets (minimum 2 nos. diagonally opposite in case of smaller width strip) and shall be brazed in case of copper and by welding bolting in case of GI, wires shall be connected with crimping lugs, all bolts shall have spring washers.
The Contractor shall get the soil resistivity test done at his own cost of the area where earthing pits are to be located before starting the installation.

Resistance to Earth
The resistance of earthing system shall not exceed 1 ohm.

Grounding System

The Lightning arrestor grounding system reading shall not exceed 10 ohms static impedance except with prior approval by the specifying engineer or manufacturer of the lightning protection system.

Grounding will be done by copper bonded steel core ground rods especially designed for electrical grounding.

Bonding of the grounding system to metallic parts of the building, the structural reinforcing steel of the building to arriving services is recommended.
Electrically conductive, non-soluble ground enhancing material should be used to achieve low ground resistance. Provided the materials are mixed and installed strictly in accordance with the manufacturer's instructions.

LIGHTNING AND SURGE VOLTAGE PROTECTION

The specified SPD system shall be connected in parallel to the facility’s electrical main incoming (main LT panel) as well as final distribution boards, shall provide effective high energy surge current diversion, and shall be suitable for application in ANSI/IEEE C62.41 Category A, B and C environments or IEC 61643-1 Class I, II and III

The specified system shall be designed, manufactured, tested and installed in compliance with the following codes and standards:

IEC 61643-1: Surge Protective Devices connected to low voltage power distribution systems.

Underwriters Laboratories: (UL 1449, 2nd edition) Standard for Transient Voltage Surge Suppressors. International Standards Organization (ISO) Company certified ISO9001 for manufacturing, design and service and the applicable portions of the American National Standards Institute and Institute of Electrical and Electronic Engineers standards (ANSI/IEEE 1100 ,C62.11, C62.41, C62.45)

Electrical Requirements

A. Nominal system operating voltage

The single phase SPD system shall be suitable for installations operating between 220VAC and 240VAC.
The three phase SPD system shall be suitable for installations operating between 380VAC to 415VAC, Star (Y) Configuration: 3 Phase 4 Wire Plus Ground or Delta Configuration: 3 phase 4 wire including Ground.

B. Maximum Continuous Operating Voltage (MCOV):

The maximum continuous operating voltage of the complete SPD, shall be divide by 1.732 of the nominal system operating voltage to ensure the ability of the system to withstand temporary RMS over voltages (swell conditions).

C. Operation Frequency:
The operating frequency range of the system shall be 50Hz.

D. Protection Modes:

Note: L = Line, G = Ground, N = Neutral

The SPD shall provide protection in all modes (L-N or L-L, L-G and N-G where applicable)

E. Surge Current Capacity:

Location	Class	Surge Current
Main Service Entrance	Class C	200/400 KA
Main Distribution Feeders	Class B	100/160 KA
Sub distribution Panels	Class A	50 KA

G. Over current Protection (fusing)

All components, including suppression, filtering, and monitoring components, shall be individually fused at the component level with the fuses rated so as not to impede maximum specified surge current capacity. The fuse shall be capable of opening in less than one millisecond and clear both high and low impedance faults.

I. Response Time:

The typical response time of all suppression components shall be <0.5 ns.

8. WIRING & CONDUITING

System of Wiring

The system of wiring shall consist of PVC insulated copper stranded conductor flexible FRLS wires in metallic / nonmetallic (Rigid heavy Duty ISI -marked Low smoke fire retarded PVC Conduits of minimum 2mm Wall thickness and Sizes starting from 20 mm diameter) conduits and shall be concealed or surface mounted above false ceiling as called for.

General

Prior to laying and fixing of conduits, the contractor shall mark the conduit route, carefully examine the working drawings prepared by him and approved by the Consultant indicating the layout, satisfy himself about the noninterference in the route, sufficiency of number and sizes of conduits, location of junction boxes, sizes and location of switch boxes and other relevant details. Any discrepancy found shall be brought to the notice of the Owner’s site representative. Any modifications suggested by the contractor should get written approval before the actual laying of conduits is commenced.

In laying of conduits it is important that not more than two right angle bends are provided for each circuit without a pull box. No junction box shall be provided in the entire length of conduit run for drawing of wires. Only switch

outlets, lighting fixture outlets, equipment power outlets and socket outlets shall be considered for drawing of wires.

Metal Conduits & Accessories Conduits
Conduits and Accessories shall conform to latest edition of Indian Standards IS-9537 part 1 & 2. 16/14 (16 gauge up to 32mm diameter & 14 gauge above 32 mm diameter) gauge screwed GI or MS painted conduits as specified on schedule of quantities shall be used. Joints between conduits and accessories shall be securely made by standard accessories, as per IS-2667, IS-3837 and IS-5133 to ensure earth continuity. All conduit accessories shall be threaded type only.

Only approved make of conduits and accessories shall be used.
Conduits shall be delivered to the site of construction in original bundles and each length of conduit shall bear the label of the manufacturer.

Note. : Whatever materials required to be billed by the Contractor should come on site with proper Challan Numbers and quantity mentioned in each such Challan.

JOINTS

All jointing shall be subject to the approval of the Owner's site representative. The threads and sockets shall be free from grease and oil. End termination of conduit on GI boxes shall be by means of hexagon check nuts & spring washer on both sides of the conduit. The joints in conduits shall be free of burrs to avoid damage to insulation of conductors while pulling them through the conduits. Rubberized bushes shall be used in the conduit entry and exit from DBs, switch boxes etc., so that wires are protected from damage to insulation of the incoming and outgoing wires.

RECESSED OR EXPOSED CONDUITS

All conduits shall be as per tender specifications \ Schedule of Quantities. FLEXIBLE CONDUITS
Flexible conduits shall be made of heavy gauge MS strip galvanized after making the spiral. Both edges of the strip shall have interlocking to avoid opening up. Flexible conduit shall be heat resistant, lead coated steel, water leak, fire and rust proof. The flexible conduit shall be heat resistant on continuous temperature up to 150 deg. C and intermittent temperature up to 200 deg. C. The flexible conduit shall be corrosion resistant as per IS-3480 & BS-731.
PVC Conduit and Accessories PVC Conduit
Conduits and accessories shall conform to latest edition of IS-9537 part 3 and shall be heavy duty with minimum wall thickness of 2.0 mm rigid tubes which are unscrewed without coupling and with plain ends. All conduits used shall be ISI-marked and shall not be less than 20 mm diameter.

Heavy duty Low smoke FR PVC conduit shall be used when specified. PVC Conduit Accessories
Accessories used for conduit shall be of an approved brand and type complying to relevant IS code.
All accessories used shall be of standard white or black colour, identical to conduit used.

Plain conduits shall be joined by slip type of couplers with manufacturer's standard sealing cement.
All conduit entries to outlet boxes, trunking and switchgear are to be made with adaptors female thread and screwed male bushes.

PVC-switch and socket boxes with round knockouts are to be used. The colours of these boxes and the conduits shall be the same.
Standard PVC circular junction boxes are to be used with conduits for intersection, Tee- junction, angle-junction and terminal. For the drawing-in of cables, standard circular through boxes shall be used.

Samples of accessories shall be submitted for approval prior to installation.

All jointing of PVC conduits shall be by means of adhesive jointing. Adequate expansion joints shall be allowed to take up the expansion of PVC conduits.

Bends in Conduit

Where necessary, bends or diversions may be achieved by means of bends and / or circular cast iron boxes with inspection cover and with adequate and suitable inlet and outlet screwed joints. In case of recessed system each junction box shall be provided with a cover properly secured and flush with the finished wall surface. No bends shall have radius less than 7.5 cm or three times the outside diameter of the conduits. For metallic conduits, bends of defined radius shall be made by compactly filling fine sand inside the conduit length, to avoid non- uniform shape, once the bend is done. Proper jigs shall be used to ensure that the Enameling
/Galvanizing of the Conduit is not damaged. Fixing of Conduits
All conduits shall be installed so as to avoid direct exposure to steam, hot water or any other process pipes. After the conduits, junction boxes, outlet boxes and switch boxes are installed in position, their outlets shall be properly plugged or covered so that water, mortar, rodents and insects , insects or any other foreign matter does not enter into the conduit system. Surface conduits shall be fixed by means of heavy gauge GI saddles secured at intervals not more than 1000 mm, and on either side of couplers or bends or similar fitting saddles shall be fixed at a distance of 300 mm from center of each fitting. For conduit fixing suitable PVC/Nylon fasteners shall be used.
Recessed conduiting shall be done by making chase in the masonry by chase cutter; the conduit shall be fixed in the chase by means of GI hooks not more than 600 mm apart. After fixing of conduit the chase shall be filled with cement mortar after fixing of chicken mesh and brought to the original finish level of the surface to the entire satisfaction of Owner

Switch outlets and Junction Boxes
All outlet boxes for switches, sockets and other receptacles shall be rust proof and shall be of 1.6 mm thick mild steel sheets with HOT dipped galvanizing (or as specified in SOQ), having smooth external and internal surfaces to true finish. All outlet boxes for receiving plug sockets and switches shall be fabricated to approved sizes. All boxes shall have adequate number of knock out holes of required diameter and earthing terminal screws. Outlet boxes shall generally be of 50mm depth subject to maximum depth of 65 mm.

Inspection Boxes

50 mm dia. inspection boxes and pull boxes shall have smooth external and internal finish to facilitate removal and replacement of wires, where required.
Fish Wire

To facilitate subsequent drawing of wires in the conduit, GI fish wires of 2.0 mm (14 SWG) shall be provided along with the laying of recessed conduit.
Conductors

All PVC insulated copper conductor flexible FRLS, as specified in SOQ, wires shall conform in all respects to Standards as listed under sub-head Indian Standards and shall be IS approved and ISI marked.

Bunching of Wires

Wires carrying current shall be so bunched that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not run in the same conduit. All wires shall have ferrules for identification. Lighting and power circuits shall be separate. Each Power/ Light Circuit‘s Neutral shall be individual per Circuit and shall not be looped from any other Circuit.

Drawing Conductors

The drawing and jointing of PVC insulated copper conductor wires shall be executed with due regard to the following precautions. While drawing wires through conduits, care shall be taken to avoid scratches and kinks which may cause breakage of conductors. There shall be no sharp bends. Wire reel stands to be used for pulling of wires to avoid kinks. Care shall be exercised while drawing the wires from reels, by taking appropriate measures to ensure that wires are not spread on ground, causing dust and dirt accumulation on the new wires.

Maximum permissible number of 1100 volt grade PVC insulated wires that may be drawn into metallic Conduits are given below :

Size of wires Nominal Cross section Area (Sq. mm)	Maximum number of wires within conduit size(mm)				
	20	25	32	40	50
1.5	5	10	14	--	--
2.5	5	8	12	--	--
4	3	7	10	--	--
6	2	5	8	--	--
10	--	3	5	6	--
16	--	2	3	6	6
25	--	--	2	4	6
35	--	--	--	3	5

Maximum permissible number of 1100 volt grade PVC insulated wires that may be drawn into rigid nonmetallic or PVC Conduits are given below :

Size of wires Nominal Cross section Area (Sq. mm.)	Maximum number of wires within conduit size(mm)				
	20	25	32	40	50
1.5	7	12	16	--	--
2.5	5	10	14	--	--
4	4	8	12	--	--
6	3	6	8	--	--
10	--	4	5	6	--
16	--	3	3	6	6
25	--	--	2	4	6
35	--	--	--	3	5

Insulation shall be removed by insulation stripper only. Few Strands of wires shall not be cut/reduced for convenience in connecting into terminals. The terminals shall have sufficient cross sectional area to take all strands and its connecting brass screws shall have flats ends. All looped joints shall be connected through terminal block/connectors. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less. All light points shall be terminated through a connector.
Conductors having nominal cross sectional areas exceeding 10 sq.mm shall always be provided with cable sockets. At all bolted terminals brass flat washer of large area and

approved steel spring washer shall be used. Brass nuts and bolts with brass washers shall be used for all connections.
Only licensed wiremen (Before doing the work or before appointing him on site contractor has to submit his wiring license to Owner) and cable jointers shall be employed to do jointing work. Before entrusting cable jointing work to any technician, or before appointing Cable Jointers or Wiremen on Site, Contractor has to submit such Technicians' / Wireman's / Cable Jointer's licensee to Owner.

All wires and cables shall be embossed with the manufacturer's label with ISI mark and shall be brought to site in original packing. For all internal wiring, FRLS or ZHFR PVC insulated wires of 1100 volts grade shall be used.

The sub-circuit wiring for point shall be carried out in loop system and no joints shall be allowed in the length of the conductors. No wire shall be drawn into any conduit until all defective work of conduit installation of any nature that may cause injury to wire is completed. Care shall be taken while pulling out the wires so that no damage occurs to conduits/wire itself, the conduits shall be thoroughly cleaned of moisture, dust , dirt or any other obstruction. The minimum size of PVC insulated copper conductor wires for all sub-circuit wiring for light points shall be minimum 2.5 sq.mm copper or as specified in the schedule of quantity (SOQ). Separate neutral to be pulled for each circuit.
Joints
All joints shall be made at main switches, distribution boards. socket outlets, lighting outlets and switches boxes only. No joints shall be made in conduits and in junction boxes. Conductors shall be continuous from outlet to inlet.
Mains and Sub-Mains

Mains and sub-mains cable or wires where called for shall be of the rated capacity and approved make. Every main and sub main wires shall be drawn into an independent adequate size of conduit. Earthing shall be in conformity with relevant IS codes and calculations shall be submitted for verification. An independent earth wire of the proper rating shall be provided for every single phase sub-main. For every 3 -phase sub-main, 2 Nos. earth wires of proper rating shall be provided along with the sub-main. The earth wires shall be drawn along with circuit wires through conduit. Where mains and sub-mains cables are connected to switchgear, sufficient extra lengths of cable shall be provided to facilitate easy connections and maintenance. Where ever necessary, powder-coated 1.6 mm thick sheet steel covering (also called trunking) shall be provided to cover the group of conduits and cables entering and exiting the Wall mounted/Floor mounted Sub DBs, DBs, and FDBs, so that the Installation looks neat .The colour of such sheet steel covering (trunking) shall be matching with the colour of the SDBs, DBs and FDBs

Load Balancing

Balancing of circuits in three phase installation shall be as planned by the Consultants in the tender drawings and shall be verified by the contractor before the commencement of wiring and shall be strictly adhered to.

Colour Code of Conductors

Colour code shall be maintained as indicated by the Consultant for the entire wiring installations. Red, yellow, blue shall be for three phases, black for neutral and green with yellow band shall be for earthing.

Switches

All switches shall be enclosed type flush mounted suitable for 240 volts AC. All switches shall be fixed inside the switch boxes on adjustable flat M S strips/plates with tapped holes and brass machine screws, leaving ample space at the back and sides for accommodating wires. Switch controlling the light point shall be connected to the phase wire of the circuit and load shall be restricted to maximum 800 watts per switch & maximum 1500 watts per circuit. All wiring accessories shall be BIS approved. Perfect alignment shall be maintained while fixing of the back boxes.

Socket Outlet

Socket outlets shall be of the three/five pin. The switch controlling the socket outlet shall be on the phase wire of the circuit and not more than two socket outlets of 16 amps shall be connected on one circuit. An earth wire shall be provided along with the circuit wires and shall be connected to earthing screw inside the box. All sockets shall be shuttered type.

a. Every socket outlet shall be controlled by an individual switch unless mentioned otherwise.

b. The switch controlling the socket outlet shall be on the `Live' side of the line.

c. 6 amps and 16 amps socket outlet shall normally be fixed at any convenient height above the floor level as desired by the Architect. The switch for 6 and 16 amps, socket outlet shall be kept along with the socket outlet. However, in special case, if desired by the Architect the 6 amp. socket outlet can be placed at the normal switch level.

d. 16 amps socket outlet shall be fixed at any convenient height above working platform or as specified in drawings / schedule of equipment.

e. Generally, switches and outlets shall be planned at a minimum distance of 1.5 Metre away from any water supply outlet, so that splashed water may not affect the live installation.

f. Where socket outlets are placed at lower level, they shall be enclosed in a suitable metallic box with the system of wiring adopted or shutter type sockets shall be provided as specified.

g. In an earthed system of supply, a socket outlet and plug shall be of three pin type, the third terminal shall be connected to earth.

h. Conductors connecting electrical appliance with socket outlet shall be flexible twin cord with an earthing cord which shall be secured by connecting between the earth terminal of plug and the metallic body of the electrical

appliance.

i. Where use of shutter type of interlocking type of socket is required for any special installation, the items should be separately and specifically listed in the Schedule of Quantities of that particular work.

Lighting Fixtures & Accessories

The light fixtures and fittings shall be assembled and installed in position complete and ready for service, in accordance with details, drawings, manufacturer's instructions and to the satisfaction of the Project Manager.

Scope :

Scope of work under this section shall include inspection at suppliers/manufacturer’s premises at site, receiving at site, safe storage, transportation from point of storage to point of erection, erection and commissioning of light fittings, fixtures and accessories including all necessary supports, brackets, down rods and painting etc as required.

The contractor shall also be required to carry out the Lux level calculations, Lighting Power Density for each area (not exceeding ECBC recommendations) and confirm compliance. Performance test shall consist of three days of 24 hour operation of entire lighting system. The Lux levels, THDi, power consumption results shall be submitted to Client representative/Consultant.

Standards :

The lighting and their associated accessories such as lamps, reflectors, housings, ballasts etc., shall comply with the latest applicable standards.

Light Fittings-General Requirements :

a) Fittings shall be designed for continuous trouble free operation under atmospheric conditions without reduction in lamp life or without deterioration of materials and internal wiring. Degree of protection of enclosure shall be IP-67 for outdoor fittings except bulkhead fitting. Bulkhead fitting shall be provided with IP-54 protection.

b) Fittings shall be so designed as to facilitate easy maintenance including cleaning, replacement of lamps/ ballasts.

c) All fittings shall be supplied complete with lamps and other accessories like drivers, power factor improvement capacitors, harmonic protection, surge protection, starters, etc. Out door type fittings shall be provided with weather proof junction boxes (IP-55) and IP-54 Control gear boxes.

d) Each fitting shall have a terminal block suitable for loop-out connection by 1100 V PVC insulated copper conductor wires upto 4 sq.mm. The internal wiring should be completed by the manufacturer by means of standard copper wire and terminated on the terminal block.

e) Each fitting shall be provided with phase, neutral and earth wire.

f) All hardware’s used in the fitting shall be suitably plated or anodized and passivated.

g) Earthing : Each lighting fitting shall be provided with an earthing terminal. All metal or metal enclosed parts of the housing shall be bonded and connected to the earthing terminal so as to ensure satisfactory earthing continuity throughout the fixture.

h) Painting/Finish : All surfaces of the fittings shall be thoroughly cleaned and degreased and the fittings shall be free from scale, rust, sharp-edges, and burns.

i) The housing shall be powder coated/stove-enameled or anodized as required. The surface shall be scratch resistant and shall show no sign of cracking or flaking when bent through 90 deg. over 12 mm dia mandrel.

j) Metal used in BODY of lighting fixtures shall be not less than 22 SWG or heavier if so required to comply with specification of standards. Sheet steel reflectors shall have a thickness of not less than 20 SWG. The metal parts of the fixtures shall be completely free from burns and tool marks. Solder shall not be used as mechanical fastening

device on any part of the fixture.
Light Fittings – Special Requirements

All LED light fixture shall be complete with efficient reflector and scientifically designed heat sink for optimum thermal management of LED source ensuring specified life and colour quality. It shall be suitable for surface / recessed mounting in the false ceiling. The driver shall be provided with the luminaries. LED shall be of high efficiency, long life in warm white or cool day light, as specified in BOQ, with excellent CRI. The LED shall be of 4 watts – equivalent to 18W CFL – or 8W –equivalent to 2x18W CFL lamp. The estimated life time of LED shall be minimum 50,000 burning hours. THD for any LED light fitting, including driver unit, shall be within 7%. All LED light fixtures and drivers shall be provided minimum 5 year replacement warranty.

Accessories for Light Fittings - Reflectors
The reflectors shall be made of CRCA sheet steel/aluminium /Silvered glass/Chromium plated sheet copper as specified. The thickness of reflectors shall be as per relevant standards. Reflectors made of steel shall have stove enameled/ vitreous enameled/epoxy coating finish. Aluminium used for reflectors shall be anodized/epoxy stove enameled /mirror polished. The finish for the reflector shall be as specified. The reflectors shall be free from scratches / blisters and shall have a smooth and glossy surface having optimum light reflecting coefficient. Reflectors shall be readily removable from the housing for cleaning and maintenance without use of tools.

Drivers

Drivers shall be used with each Light fixture wherever specified in the schedule of quantities. Drivers shall comply with the following:

- IEC 927, IEC 928 for ≤7% total harmonic distortion.
- EMI / RFI – Confirming to FCC / VDE Class A/B / IEC.
- Line Transient as per IEEE C62.41.
- No Stroboscopic Effect
- Constant Wattage / Light output.
- Circuit protection for surge current and inrush current.
- Short circuits, open lamp protection
- PF > 0.92.
- Immunity to interference EN 61547
- Safety EN 60928 / IEC 928 / IS 13021 (Part I)
- Performance EN 60929 / IEC 929 / IS 13021 (Part II)
- IEC 9001
- Quality Standard ISO 9001
- Environmental StandardISO 14001
- DC Operation EN 60924
- Emergency Lighting Operation VDE 0108

PIR Occupancy Sensor

The PIR Occupancy Sensor shall detect passive infrared energy for control of any number of independent electrical loads. The light level shall be adjustable from the front of the unit and shall be used to disable the Occupancy Sensor. Timer settings shall be adjustable from 1 second to 18 hours, in one-second increments. A weatherproof version shall be available for outdoor or industrial use.

In the event of power cycling, a non-volatile memory (NVM) shall be incorporated to retain all address and switching information.
The Supply Voltage to each PIR Sensor shall be 36VDC @ 18mA. No additional 240V supply shall be required for the unit to operate.

The unit shall have suitable operating temperatures between 0-50 Degree C.

The unit shall be suitable for wall or ceiling mounting, up to mounting heights of 2.4m.

The Indoor unit shall have a field of view of 90 degrees. The outdoor unit shall have a field of view of 110 degrees.

The Indoor unit shall have an effective detection area of 6m x 6m. The outdoor unit shall have an effective detection area of 18m radius x 110 degrees.
The Indoor unit shall have 12 overlapping detection zones. The outdoor unit shall have 18 long range, 16 intermediate range, 10 short range and 4 ultra short-range detection zones.

Ultrasonic Occupancy Sensor
The unit shall be an active device utilizing Doppler wave technology as its means of detection. The unit shall include two air transducers to provide volumetric occupancy detection.

The unit shall be suitable for occupancy detection of larger areas, typically 12m x 12m and
2.7m mounting height. The unit shall include its own independent 240V power supply and shall require a socket outlet adjacent to installation point (typically in the lighting wiring loom). To enable the unit to communicate with the control system network, an Auxiliary Switch Input Unit shall be utilized. Each auxiliary unit will allow control of up to four detectors.
The unit will have easily accessible sensitivity adjustment that can be used to accommodate various room sizes.
The unit will have an indicator LED for walk-testing the unit.

The unit shall be ceiling mounted and a 360-degree field of view. The unit shall utilize an ultrasonic frequency of 32.7 kHz.
The unit shall have suitable operating temperatures between 0-50 Degree C.

Combined Technology Ultrasonic/PIR Occupancy Sensor

The unit shall consist of two air transducers and four PIR detectors with a special lens to provide both volumetric and line of sight detection.

The unit shall be suitable for occupancy detection of larger areas, typically 15m x 15m and
2.7m mounting height. The unit shall include its own independent 240V power supply and shall require a socket outlet adjacent to installation point (typically in the lighting wiring loom). To enable the unit to communicate with the control system network, an Auxiliary Switch Input Unit shall be utilized. Each auxiliary unit will allow control of up to four detectors.

The unit shall be ceiling mounted and a 360-degree field of view.

The unit will have easily accessible sensitivity adjustment that can be used to accommodate various room sizes.

The unit will employ programmable walk-testing LED indicators: Red LED for Passive Infrared and Green LED for Ultrasonic modes.
The unit shall utilize an ultrasonic frequency of 32.7 kHz.

The unit shall have suitable operating temperatures between 0-50 Degree C. Ultrasonic Occupancy Sensor for Corridors and Hallways
The unit shall be suitable for occupancy detection of Corridors and Hallways, typically up to
4.6m x 30m and 2.7m mounting height. The unit shall include its own independent 240V power supply and shall require a socket outlet adjacent to installation point (typically in the lighting wiring loom). To enable the unit to communicate with the control system network, an Auxiliary Switch Input Unit shall be utilized. Each auxiliary unit will allow control of up to four detectors.

The unit shall be ceiling mounted and a 360 degree field of view. The unit will have an indicator LED for walk-testing the unit.
The unit shall utilize an ultrasonic frequency of 32.7 kHz.
The unit shall have suitable operating temperatures between 0-50 Degree C

Lighting Controls

1. Lighting Scheduling : If controlling from BMS , then include in provision that Lighting will include a scheduled basis using a time-of-day operated control device that turns lighting off at specific programmed times—an independent program schedule shall be provided for areas of no more than 25,000 ft2 but not more than one floor.

2. Space Control: The controlled lighting shall have at least one control step between 30% and 70% (inclusive) of full lighting power in addition to all off. (Applicability: For Each space enclosed by ceiling height partitions except Lights in corridors, electrical/mechanical rooms, public lobbies, restrooms, stairways, and storage rooms, Spaces with only one luminaire with rated input power less than 100 W, and Spaces types with ASHRAE lighting power allowance of less than 0.6 W/ft2)

3. As per ASHRAE, Mention the use of Occupancy Sensor/ Timer switch for anticipated conference, meeting, and training rooms, employee lunch and break rooms, storage and supply rooms between 50 ft2 and 1000 ft2, rooms used for document copying and printing, office spaces up to 250 ft2, restrooms, and dressing, locker, and fitting rooms

4. Dimming Control for Parking Garage Lighting Control. Parking Garage Lighting shall be controlled by one or more devices that automatically reduce lighting power of each luminaire by a minimum of 30% when there is no activity detected within a lighting zone for no more than 30 minutes. Lighting zones for this requirement shall be no larger than 3,600 ft2,

5. In the Parking Garage Lighting: Daylight transition zone lighting, shall be separately controlled by a automatic control device.

6. Parking Areas: Daylight Sensors For luminaires within 20 ft of any perimeter wall structure that has a net opening to wall ratio of at least 40% and no exterior obstructions within 20 ft, the power shall be automatically reduced in response to daylight.

7. Automatic Day-lighting Controls for Primary Side-lighted Areas. (ASHRAE 90.1-2010) When the combined primary side-lighted area in an enclosed space equals or exceeds 250 ft2, the lamps for general lighting in the primary side-lighted area shall be separately controlled by at least one multilevel photo-control (including continuous dimming devices). The multilevel photo-control shall reduce electric lighting in response to available daylight with at least one control step that is between 50% and 70% of design lighting power and another control step that is no greater than 35% (including off) of design power.

8. Automatic Day-lighting Controls for Top-lighting (ASHRAE 90.1-2010) . When the total daylight area under skylights plus the total daylight area under rooftop monitors in an enclosed space exceeds 900 ft2, the lamps for general lighting in the daylight area shall be separately controlled by at least one multilevel photo-control (including continuous dimming devices). the multilevel photo-control shall reduce electric lighting in response to available daylight with at least one control step that is between 50% and 70% of design lighting power and another control step that is no greater than 35% of design power.

9. Additional Controls for the following:

a. Display/Accent Lighting—display or accent lighting shall have a separate control device.

b. Case Lighting—lighting in cases used for display purposes shall have a separate control device.

c. Task Lighting—supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided the control device is readily accessible and located so that the occupant can see the controlled lighting.

d. Nonvisual Lighting—lighting for nonvisual applications, such as plant growth and food warming, shall have a separate control device.

e. Demonstration Lighting—lighting equipment that is for sale or for demonstrations in lighting education shall have a separate control device.

10. Staircase: Lighting in stairwells shall have one or more control devices to automatically reduce lighting power in any one controlled zone by at least 50% within 30 minutes of all occupants leaving that controlled zone.

11. Exterior Lighting shall be controlled by a device that automatically turns off the lighting when sufficient daylight is available.

12. All building façade and landscape lighting shall be automatically shut off between midnight or business closing whichever is later, and 6am or business opening, whichever comes first, or between times established by the authority having jurisdiction.
13. Lighting not specified in point above, including advertising signage, shall be controlled by a device that automatically reduces the connected lighting power by at least 30% for at least one of the following conditions

- from 12 midnight or within one (1) hour of the end of business operations, whichever is later, until 6am or business opening, whichever is earlier; or
- during any period when no activity has been detected for a time of no longer than 15 minutes.

14. Luminaires serving outdoor parking areas and having a rated input wattage of greater than 78 W and a mounting height of 24 ft or less above the ground shall be controlled to automatically reduce the power of each luminaire by a minimum of 50% when no activity has been detected in the area illuminated by the controlled luminaires for a time of no longer than 15 minutes. No more than 1500 W of lighting power shall be controlled together.
All time switches shall be capable of retaining programming and the time setting during loss of power for a period of at least ten hours.

15. Lighting Wattage of Exit Signs: Internally illuminated exit signs shall not exceed 5 W per face.
16. The installed exterior lighting power shall not exceed the exterior lighting power allowance as mentioned in ASHRAE Standard 90.1

17. Functional Testing: Lighting control devices and control systems shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with the construction documents and manufacturer's installation instructions.

18. When occupant sensors, time switches, programmable schedule controls, or photo- sensors are installed, at a minimum, the following procedures shall be performed:
a. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance, lights turn off only after space is vacated and do not turn on unless space is occupied
b. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off
c. Confirm that photo-sensor controls reduce electric light levels based on the amount of usable daylight in the space as specified.

9. UPS (UNINTERRUPTED POWER SUPPLY)

The scope of work for supply and installation of UPS system shall include design manufacture, supply, installation, testing and commissioning of all related equipment together with all accessories and auxiliaries as per specifications.

The system shall be fully operational and shall comply to the specified codes and standards. The contractor shall be responsible for providing all materials, equipment and engineering services specified or which are required to fulfill the intent of ensuring reliability of the total work covered under these specifications within his quoted price.

Supply and installation of the UPS system covered under this specification shall conform to the latest editions of codes and standards mentioned in the Special Conditions of Contract, as applicable, and all other applicable Standards.
The contractor shall submit his offer for UPS systems as indicated in the tender document. All components of the UPS equipment shall have Surge Withstand Capability (SWC) to meet the requirements of ANSI C62.41-1980. ANSI C 37.90a, IEEE Standard 472-1974. All components of UPS system shall withstand short circuit current without any damage.

Following general requirements shall be met for ensuring proper circuit protection.

a) Fuses shall not be larger than 125% of the transformer primary circuit current where the secondary circuit fuse protection has not been provided.

Where the secondary fuses are sized not larger than 125% of the secondary current of the transformer, fuses shall not be required in the primary circuit, provided the primary feeder fuses are not larger than 250% of the transformer primary current.

b) All control shall be designed and positioned such that possibility of inadvertent or accidental operations are eliminated.

c) All UPS system cabinets, frames and power equipment shall be double earthed.

d) For modular system, to achieve higher reliability and availability of the system Individual battery bank and individual static bypasses per UPS or per Module shall be preferred within the architecture of the UPS.

The UPS design shall ensure that a single component/ device failure shall not result in failure of the entire UPS system. The design of UPS System shall be modular rack mountable, compact having all cabling internal and from the front without any need to access other sides to permit easy maintenance.

The various overload capacities of inverters, static switch, step down transformer/voltage stabilizer as specified herein are the minimum requirements. However, if the Contractor's offered system has better overload capacities for the above devices, the same shall be highlighted by the Bidder in his bid .

The UPS system offered by the contractor shall be suitable for operating continuously at the rated capacity indicated in tender with in ambient temperature 0-40 deg C and relative humidity of 0 to 95% noncondensing. Also the UPS system shall be suitable for operation as per full rating upto 1000 meters above sea level without derating. The Contractor shall furnish a certificate towards compliance on ambient conditions permissible.

The UPS system to be supplied by the contractor shall have maximum humming noise level of 65 DB one meter away from the UPS cabinets. Suppression of Radio Interference shall be provided to meet statutory requirements. Detailed literature should be provided showing Quality Assurance Procedure adhered to. The contractor shall submit detailed item by item compliance statement along with the tender.

FUNCTIONAL REQUIREMENTS

Contractor shall furnish On-Line Uninterruptible Power Supply (UPS) system of continuous duty of the ratings mentioned in Bill of Quantities. Each UPS shall give regulated filtered & uninterruptible power supply as described in the specifications.

Contractor shall note that the KVA ratings of the UPS systems shall be guaranteed at 40 deg.C ambient temperature. In case contractor's standard UPS KVA rating are based at a lower temperature, the contractor must consider a derating factor of atleast 1.5% per deg.C for arriving at the specified UPS capacity at 40 deg.C ambient temperature.

In case the calculated /specified UPS capacity is not the same as one of the standard KVA ratings of the UPS manufacturer, the next higher standard KVA rating shall be selected. UPS of non standard rating shall not be acceptable. UPS system supplied by the contractor shall be the latest state of the art technology system fully digitalized using microprocessor controlled full wave rectification and IGBT inverter.

Batteries shall be valve regulated lead acid specially meant for UPS application. UPS shall be able to charge VRLA batteries too. Monitoring and control system shall also be state of the art technology LCD touch panel type providing all relevant data described in this document. The monitoring and control system shall be capable of RS485 with MODBUS protocol input software for connecting to customer's computer system for data display and monitoring. All necessary components required for protecting UPS equipment and connected inputs and outputs shall be furnished by the Contractor as an integral part of the UPS system. The control logic power supply shall have redundant power supply AC input and the system battery as power sources.

The UPS systems shall include but not be limited to the following equipment :

a. UPS system includng 100% capacity float-cum-boost charger with 100% sealed valve regulated lead acid battteries with guaranteed battery life of 5 years.

b. Suitable factory built battery cabinet or shelf for housing the batteries, including terminal isolator / breaker

and power disconnect device. The enclosure shall conform to IP 20 as minimum.

c. All cables, connectors, accessories like trunkng, cable trays, conduits etc. required for connection between battery and the UPS unit.

In case of modular UPS design, each UPS module shall have hot-swappable capability. In a parallel redundant system, if one UPS module fails, the UPS system shall have the capability to replace the faulty UPS module ON LINE without transfer the load on by-pass.

STATIC CONVERTER

General

The static converter (rectifier) shall be a multi-functional converter providing functions of power conversion, battery charging and shall have the additional functions of input power factor improvement and current harmonics reduction. The converter equipment shall include all necessary independent decentralized control circuitry and device to conform requirements like voltage regulation, current limiting, wave shaping, transient recovery, automatic synchronization etc. as given below.

The converter shall be a solid state static PWM converter using Insulated Gate Bipolar Transistors (IGBT) or Intelligent Power Module (IPM) transistors and shall include intelligent features like the drive circuitry, over current protection, over temperature protection, control power failure protection and short circuit protection.

The IGBT / IPM transistors shall enable high speed switching at 6 KHz thus reducing the heat dissipation in the UPS and thereby providing high efficiency. The PWM converter shall be used to achieve unity power factor and reduce input current harmonics at full load independent of the load and thus improve the overall input power factor of the converter achieving input KVA savings. The converter (rectifier) shall accept a wide range of input voltage and frequency tolerances without using the batteries to supply the inverter.

During any step inverter load change (0-100%) the converter shall only supply 100% current to the inverter. The battery shall not be cycled at any time during this step load changes.

Input Current Limit

The converter logic shall provide input current limiting by limiting the DC output current. Two (2) line-side current transformers shall be employed as a means of sensing the current amplitude. The converter logic shall also be capable of providing auxiliary current limited when the logic is signaled to do so via an external dry contact closure (e.g. UPS fed from generator). The converter shall be capable of supplying overload current in excess to the full load rating. It shall also have sufficient capacity to provide power to a fully loaded inverter while simultaneously recharging the system battery to 95% of full capacity within 10 times the discharge time. The DC output current limit values shall be as follows:

- Rectifier output current (maximum) 100%.
- Rectifier output current (aux.) 25% - 100% variable.

Note : 100% current shall be under the battery recharging mode.

Battery Charge Current Limitations

Battery charging shall work with a min. DC- voltage ripple (e.g. smaller 2 % or ripple free). The battery charger shall have the possibility to charge the battery depending of their temperature. The converter logic shall provide current limiting function of battery charging to prevent the battery from damage. The following battery current limit and protection shall be provided.

- Battery charge current limit 10% of battery Ah rate.
- Over-current protection at 120% of above item.

Voltage Regulation

The rectifier / charger output voltage including variation effects of input voltage does not deviate by more than +/- 1% of the nominal output voltage, due to the following conditions:

- Form 0 to 100% loading.
- Rectifier input variations of voltage and frequency within the limitations set in Section 3.10.
- Environmental condition variations within the limitations set in Section 3.10.

Automatic Input Current Walk-in

The converter logic shall employ circuitry to allow a delayed and timed ramping of input current. Subsequent to energizing the converter input, the ramping of current shall be delayed by a maximum of 3to 5 seconds. Upon starting the walk-in process, the ramping of current is timed to assume the load gradually within 1 through 60 seconds (every 1 second selectable).

Input Overload Protection

The A/C input fuses shall be provided at the converter input as a means of overload protection. The AC maximum current shall be controlled by the Converter.

Equalizing Charge Timer

The UPS logic shall provide an electronic automatic equalize charge timer which shall be selectable 24 hours for Lead Acid type or 8 hour for Alkaline type batteries. The charger shall be limiting the battery ripple < 2 %. The timer circuit, once activated shall provide a high rate equalizing charge voltage to the system battery for the selected time. The circuit shall also be capable of manual activation via the LCD touch panel mounted on the front door. The level of equalizing voltage shall be equal to that stated by the battery manufacturer. Upon completion of the timer count, the converter output voltage shall automatically return to the specified float voltage.

Step Load Change

During any step inverter load change (0-100%), only the converter shall supply 100% current to the inverter. The batteries SHALL NOT be cycled at any time during these step load changes.

Input Voltage

The converter shall be fed from the Normal Power Supply source. The converter shall meet the specifications given in data sheets in addition to other requirements stated above

STATIC INVERTER

General

The static inverter shall be of solid state type using proven Pulse Width Modulation (PWM) technique. The inverter equipment shall include all necessary control circuitry and devices to conform requirements like voltage regulation, current limiting, wave shaping, transient recovery, automatic synchronization etc. as given below.

The inverter shall utilize Insulated Gate Bipolar Transistors (IGBT) or Intelligent Power Module (IPM) Transistors which shall provide intelligent features like the drive circuitry,

over-current protection, over temperature protection, control power failure protection and short circuit protection.
The IGBT / IPM transistors shall enable high speed switching of 6 Khz thus reducing the heat dissipation in the UPS and thereby providing high efficiency.

The UPS shall utilize both Voltage and Current feedback control circuits so that the inverter shall act not only as a constant voltage source but also as a load required current source. This shall enable the inverter to quickly adapt to the changing load current value and wave shape.

Voltage Regulation

The inverter output voltage shall not deviate by more than + 1% RMS due to the following steady state conditions :
Form 0 to 100% loading
Inverter DC input voltage varies from maximum to minimum.

Environmental conditions variations within the limitations set in the section 4.8.
Frequency Control

The inverter output frequency shall be controlled by an oscillator internal to the UPS module logic. It shall be capable of synchronizing to an external reference (e.g. the bypass source or another UPS module) or operating asynchronously. The oscillator shall maintain synchronization with the external reference within the limitations set hereunder. The inverter shall operate on self run mode without synchronism if the bypass frequency exceeds the set value. The oscillator, while running asynchronously, shall maintain the frequency as 50 Hz + 0.01% (or + 0.005 Hz). Automatic adjustment of phase relationship between inverter output and standby bypass source shall be gradual at a controlled slew rate which shall be adjustable at the rate of 0.5, 1.0, 2.0, 3.0 Hz / second. (default 2.0 Hz / second). The inverter output frequency shall not vary during steady state or transient operation due to the following conditions:

a. From 0 to 100% loading.
b. Inverter DC input varies from maximum to minimum.
c. Environmental condition variations within the limitations set in section 4.8.

Output Voltage Harmonic Distortion

The inverter output shall limit the amount of harmonic content to the values stated in section 4.8. The use of excessive or additional filtering shall not be required to limit the harmonic content thus maintaining a high level of efficiency, reliability and original equipment footprint.

Output Overload Capability
The inverter output shall be capable of providing an overload current while maintaining rated output voltage to the values stated in section 4.8. An LED indicator shall be located on the control panel to identify this condition. If the time limit associated with the overload condition expires or the overload is in excess of the set current amplitude, the load shall be transferred to the bypass source without interruption.

Inverter Current Limit

The inverter output shall be limited to 150% of rated load current. The two sensing locations shall operate separately and independently thus providing redundancy and, in the event of a failure, preventing unnecessary damage to power transistor components / fuses. Load current above 150% shall cause an immediate transfer of the load to the bypass source for fault clearing.

Inverter Overload Protection

The AC output from the inverter shall utilize fuses for overload protection. The inverter shall utilize a contactor to isolate the inverter output from the critical bus. The inverter fuses shall be the fast acting semiconductor type. The inverter output isolation contactor shall be located in the UPS module and shall be controlled by the internal UPS module system logic. The inverter shall meet the following specifications in addition to other requirements stated in the enclosed data sheets.

Reverse Phase Sequence Protection

In the event of Phase sequence reversal at the input, UPS system shall continue to work on the main power supply, or UPS systems shall go into battery mode, and shall not trip the UPS system. Wrong phase rotation on the input of the converter (rectifier) shall not stop the inverter neither switching the UPS into battery mode.
BYPASS AND STATIC TRANSFER SWITCH

A bypass circuit shall be provided as an alternate source of power other than the inveter. A high speed switch shall be used for the critical load during automatic transfers to the bypass circuit. The static switch shall be fully sized to conduct the full nominal current as well the full overload capability of the UPS. There shall not be any wrap around contactors parallel to the static switch. The static switch shall drive power from an upstream bypass feed circuit

breaker internal to the UPS module provided for overload protection. . The bypass circuit shall be capable of supplying the UPS rated load current and also provide fault clearing current. The UPS system logic shall employ sensing which shall cause the static switch to energize within 150 microseconds thus providing an uninterrupted transfer to the bypass source when any of the following limitations shall exceed :
Inverter output under voltage or over voltage. Overload beyond the capability of the inverter DC circuit under voltage or over voltage
Final end voltage of system battery is reached. Bypass source present and available
System failure (eg. Logic fail, fuse blown, etc.)

Keeping the above requirements in view, the static switch shall have the following minimum rating.

Capacity continuous equal to 100% of continuous rating of the inverter. Capacity overload equivalent to overload characteristics specified for UPS.

Automatic Re-Transfer
In the event that the critical load must be transferred to the bypass source due to an overload, the UPS system logic monitors the overload condition and, upon the overload being cleared, perform an automatic re-transfer back to the inverter output. The UPS system logic shall only allow a re-transfer to occur three times within a ten minute period.

Re-transfer shall be inhibited on the fourth transfer due to the likelihood of a recurring problem at the UPS load distribution. The re-transfer a load to the inverter shall also be inhibited due to the limitations set in section 5.1.

Manual Transfer

The UPS shall be capable of transferring the critical load to / from the bypass source via LCD touch panel. When performing manual transfer to inverter or automatic re-transfers, the UPS system logic shall force the inverter output voltage to match the bypass input voltage and then parallel the inverter and bypass source providing a make-before-break transition allowing a controlled walk-in of load current to the inverter.
Maintenance Bypass Switch (MBS)

The UPS shall include as standard equipment, a zero energy maintenance bypass switch. Full UPS wrap-around enables personnel to do work inside the UPS module or maintenance bypass switchboard without danger fro high voltage conditions.
UPS BATTERY SYSTEM

a. The UPS system shall, as an integral part, provide battery system for backup time as specified in the Schedule (Full Load) standby capacity.

b. The latest state of the art Valve Regulated Sealed Maintenance Free Lead Acid Batteries shall be used with a 20 hours discharge rating.
c. The battery system shall be sized to provide back up time as specified in the schedule of quantity when the UPS is supplying 100% rated load at 0.8 load power factor.

d. An ageing factor of 15% shall be applied to the capacity arrived at, to allow for compensation against capacity loss during float operation.

e. The battery system design shall be provided with necessary devices to prevent deep discharge beyond recommended limits to prevent the batteries discharging beyond end cell voltage specified by the battery maker. The connections from battery to battery shall be by using copper bus bar strips and the entire battery system shall be used in IP20 steel cabinet enclosure or on shelves and shall be similar to the UPS enclosure.

f. All batteries shall be clearly identified and identification numbers marked on the batteries and a schematic diagram along with the complete calculations, including manufacturers supporting curves, shall be submitted with the tender.

g. The UPS shall have a properly rated and sized circuit breaker to isolate it from the battery
h. In modular system, The battery system shall be able to be individual per modules as well be able to be configured as a common battery for a whole n+1 system. Individual battery per module shall be preferred

OPERATION

The UPS shall be designed to operate as a true on-line, double conversion Voltage and Frequency Independent (VFI) system in the following modes:

a. Under normal operation, the UPS load will be fed from the Inverter with the bypass switch inhibited. The Converter, apart from providing DC power to the Inverter, also charges the battery under the float charge mode. The battery charge system shall have float charge, equalizing charge and recovery charge modes, to replenish the batteries self-discharging part while the battery is fully charged, equalizing the battery cell voltage to a constant value forcibly, and recharging the battery system to the required values when the batteries have been used, respectively.

b. The Inverter shall constantly monitor the AC source frequency and shall be in synchronization with the AC input source till the frequency of the AC input source is within synchronizing limit and if the frequency of the standby source exceeds the synchronizing limit the Inverter will work on its own internal oscillator maintaining an output frequency of 50 Hz +/- 0.01% under all conditions of load. When the Inverter operates on its internal oscillator, it shall continuously monitor the frequency of the input source and when the input source frequency returns to within synchronization limit, the Inverter shall automatically synchronize itself with the input A/C source frequency and use it as a signal for Inverter output frequency control.
c. Battery Operation:

i) When the A/C input voltage drops below specified limits or in case of a power failure the Inverter continues to supply AC power of constant voltage and constant frequency utilizing the battery system as a power source until the input voltage returns to normal requirement. When the power supply is resumed or the input voltage returns to limits, the Converter shall automatically start and the load fed for normal operation status.
ii) If the power failure continues beyond battery back up time or the battery voltage drops to the final discharge voltage, the Inverter should automatically stop and at the same time transferring the load to the bypass circuit. On resumption of power supply, the Converter shall automatically re-start the operations and charge the batteries with minimized AC ripple whereas the Inverter should inhibit automatic start and should be started manually.

d. Bypass Operation:

When power is supplied from the Inverter in synchronization with the bypass, it shall accomplish the following:
i) When the UPS output current reaches overload status it shall automatically transfer the load to bypass circuit with no interruption and when the overload status is cleared it automatically re-transfers the load to Inverter.

ii) When the battery final discharge condition is reached, the load shall automatically be transferred to the bypass circuit without interruption.

iii) In case of failure of the UPS, the load shall be automatically transferred to the bypass circuit with no interruption and when the failure is cleared, re-transfer the load to the Inverter shall be done manually.

iv) There should be provision made in the system to prevent, when necessary, asynchronous transfer.
v) When the UPS goes on bypass mode in any of the conditions described above and if at that time there is no bypass power supply available due to power failure, the UPS shall remain in standby mode and as soon as the bypass power supply is available will transfer the load to bypass.

v) A maintenance bypass transfer switch shall be provided with lock and key arrangement and should be manually done by authorized personnel only.

BATTERY MONITORING SYSTEM

a. The Battery Monitoring System shall provide for the automatic acquisition, trending, alarming and storage of information from every cell or jar in a battery bank. It will have the interactive ability to first identify and then provide an isolated equalizing charge current to any individual cell or jar that deviates below a user- specified set point, from the cell average, within the same string or bank.

b. The Battery Monitoring System shall test the relative charge state and health of each individual cell or jar by injecting a DC current, recording the magnitude of this current & comparing it to previous benchmark values. Systems that require battery discharge for testing are not acceptable. The system shall provide estimated backup time remaining during an actual discharge.

c. The Battery Monitoring System shall monitor and maintain historical files for:

a) Individual cell or jar voltage
b) Total bank voltage
c) Discharge current
d) Ambient and pilot cell temperature
e) Relative current response value

d. Display shall be via local LCD display, with capability for viewing at a remote terminal. All files shall be written to a fixed solid state disk within the enclosure. All functions shall be accessible via modem using common communications software.

e. The system shall operate a “form C” relay contact when any parameter is in alarm. Alarm data shall be written to a file in ASCII format for future retrieval.

f. The system shall be capable of remote communications for remote access to all functions via modem or ANSI terminal.

g. The Battery Monitoring System shall be capable of monitoring a minimum 264 jars per string, 9 parallel strings per system, 6 cells per jar.

h. Resolution shall be 12 bit accuracy, with up to 10 per second channel test rate.

i. Cell voltage measurements must be made to within plus or minus 5 milli volts over the entire operating and temperature range.

j. Documentation, Manuals and installation documentation for the equipment shall be provided which lists block diagrams, schematics parts list and theory of operating for each unique component of the system. Installation drawings and documentation shall be site specific for each string at this facility. Marked up

building drawings shall be provided to show any changes to building wiring including power wiring and communications cables.

k. The system shall be factory tested fully and completely before shipment.

CABINET AND ENCLOSURES

The entire UPS system, including all components like inverter, static switch, maintenance bypass, shall be housed in free-standing steel type factory-finished enclosures complying with the protection standards of IP20. For modular system, the housing shall include all wires to able the rack mountable modules to be hot swapped without any need to disconnect power cabling or without any need to put the load on bypass during swap operations . The enclosure shall be open able using a special tool for internal access. The color shall be light grey. All parts for maintenance requirement shall be front accessible

Ventilation

Forced air-cooling shall be provided to allow components to operate within their rated temperature specified. The cooling fans shall have thermal relays protection using a latched cut fire re-setting, as a protection for the cooling fans.

Similarly, the backup battery system shall also be housed as described earlier in an IP20 cabinet.

CONTROL AND MONITORING

a. The UPS shall utilize state of the art full DDC control software driven Control and Monitoring System.

b. It shall be provided with LED displays.

c. The UPS logic should provide one set of normally open dry contact / relay output to allow interfacing of UPS operating status to an external system and should be capable of providing, as a minimum, 10 numbers status and, should the UPS manufacturer's standard product does not provide such software, the bidder must add additional equipment and cost for the same.

d. The UPS shall also have an RS485 port with MODBUS interface card if required for interfacing to BAS system or client's centralized computer network.

e. LCD touch panel (Optional)

i. The UPS shall be provided with a operator friendly large scale LCD touch panel.

ii. The LCD touch panel shall also include graphic measurement display, operational procedures of each activity, fault status display and also have capability to record at least 50 faults.

iii. The touch screen panel shall clearly define specified areas for operational function, execution and message display.

iv. It should be possible to operate the entire UPS system and its components and obtain all measurements and data through the touch screen operation. The measurement software should provide capability to measure phase

voltage, current in each phase, frequency, power factor, available battery time etc.

v. Under all operating conditions, the system software should have capability for displaying fault alarm automatically. The tenderer should describe in detail the faults that would be displayed under this mode.

UPS TESTING

a. The Contractor shall perform the following tests, as a minimum, at site prior to handing over, to confirm the functional and the performance specification of the UPS as specified. All required test equipment like Digital Oscilloscope, Voltage Regulator and Measurement Meters etc. shall be the responsibility of the Contractor without any additional cost.

b. The Contractor shall demonstrate as a minimum the following features on site by providing all required test equipment, such as power factor improvement, input current THD, output voltage THD, output frequency and all other performance monitoring requirements detailed before as required by the Owner.

10. CABLING FOR TV SYSTEM

The Co-axial cable shall be of wideband type with operation capability upto 500 MHz.

The ageing resistance of the co-axial cable shall comply with DIN 47252, Part 2, i.e. max. 5% increase in attenuation at 200 MHz. measured by artifical ageing (14 days at 80 deg. C)

Cables shall meet or exceed the following specifications.

Construction	RG-6 MATV Type	RG-11 MATV Type
a Center Conductor	18 AWG tinned copper	14 AWG tinned copper
b. Dielectric	Foam Polyethylene Nom. dia 0.180	
	Foam Polyethylene Nom. dia 0.280	

c. Shield Foil - 0.003 AI. Tape Braid - 34 AWG 4 end
AL. 60% coverage dia 0.212

Foil - 0.003 AI. Tape Braid - 34 AWG 6 end
AL. 60% coverage dia 0.314.

d. Jacket dia

Black PVC flame	retardant	Black PVC flame	retardant
dia over jacket 0.272 +		over jacket 0.405 + 0.010	
0.008 Min. spot 0.023		Min. spot 0.032.	

Electrical Properties

a.	Dielectric Strength	Conductor to shield	Conductor to shield
2000 VDC	1500 VDC		
b.	Capacitance	16.2 PF / FT, Nom	16.2 PF / FT. Nom
c.	Impedance	75.0 + 3.0 ohms	75.0 + 3.0 ohms.
d.	Attnuation	DB/100 ft.	DB/100 ft.
0.65 DB @ 5 MHZ		0.35 DB @ 5 MHZ	
0.76 DB @ 10 MHZ		0.94 DB @ 50 MHZ	
0.96 DB @ 20 MHZ		1.28 DB @ 100 MHZ	
1.98 DB @ 100 MHZ		1.78 DB @	200 MHZ
4.21 DB @ 450 MHZ		2.20 DB @	300 MHZ
4.80 DB @ 550 MHZ		2.75 DB @	450 MHZ
6.49 DB @ 1000 MHZ		4.30 DB @	1000 MHZ
e.	Velocity of propagation	82.0% Nom	82.0% Nom
f.	DCR	35.47 ohms / 1000 ft.	14.29 ohms / 10000 ft.

g. SRL 30 DB (10 MHz to 300 MHz) 20 DB (5 to 450 Mhz)

DIRECTIONAL COUPLERS

These shall be of Ultra Wideband type and of hybrid circuit design.

These shall have a near flat frequency response over the entire operating range. These shall have an aluminium cast housing for high frequency radiation resistance. These shall have ‘F’ sockets for all input, output and branch ports.
The Tapoffs shall be available in one way, two way and four way configurations. The splitters shall be available in two way, three way and four way configurations.
The Tapoffs shall be available in different tap values ranging from 11 dB, 15 dB, 20 dB, 25 dB and 30 dB.

These shall meet or exceed the following specifications:

		Tap off Splitters	
a.	Tap Loss	11-30 dB	--
b.	Through Loss	0.5-4 dB	4..0 - 8.0 dB
c.	Isolation	> 22 dB	> 22 dB
d.	Screening factor	> 50 dB	> 50 db

11 CABLING FOR VOICE SYSTEM

Scope

This document defines the cabling system and subsystem components to include cable, termination hardware, supporting hardware, and miscellany required to supply, and to install a complete cabling infrastructure supporting voice and video. The intent of this section is to provide pertinent information to allow the vendor to bid the labor, supervision, tooling, materials, and miscellaneous installation hardware and consumables to install a complete system. However, it is the responsibility of the vendor to propose any, and, all items required for a complete system whether or not it is identified in the specification, drawings and bill of materials attached to this specification.
Applicable Documents:

The cabling system described in this specification is derived in part from the recommendations made in industry standard documents. The list of documents below (or the latest revisions) has bearing on the desired cabling infrastructure are incorporated into this specification by reference:
1) This Technical Specification and Associated Drawings
2) ANSI/TIA/EIA 568-B C Commercial Building Telecommunications Cabling Standard – March 2001 – Aug 2009
4) ANSI/EIA/TIA-569-A - ANSI/TIA-569-C Commercial Building Standard for Telecommunications Pathways and Spaces - February, 1998 – Sept 2009
5) ANSI/EIA/TIA-606 - ANSI/TIA-606-B Administration Standard for the Telecommunications Infrastructure of Commercial Buildings - February, 1993 - 2010
6) ANSI/TIA/EIA-607 - ANSI/NECA/BICSI- 607-2010 Commercial Building Grounding and Bonding Requirements for Telecommunications - August, 1994
7) ANSI/TIA-568-C.2 for Category 6 channel.
8) All products must be RoHS / ELV compliant
Backbone Wiring General
The function of the backbone wiring shall be to provide interconnections between telecommunications closets, equipment rooms and entrance facilities in the telecommunications wiring system. The backbone wiring shall consist of the transmission media, intermediate and main cross connects, and mechanical terminations for interconnection of telecommunications closets, equipment rooms and entrance facilities. The backbone wiring shall include transmission media in the building.
The backbone wiring shall use the star topology wherein each telecommunications closet shall be wired to a main cross connect / patch panel or an intermediate cross connect then to a main cross-connects / patch panel. There shall be no more than two hierarchical levels of cross connects / patch panel in the backbone wiring. Interconnections between any two telecommunications closet shall pass through three or fewer cross-connects / patch panel.

Bridged taps shall not be permitted as part of the backbone wiring.

One of the following types of cables shall be used for backbone wiring as defined in schedule of quantities.

1. 100-ohm UTP multiplier backbone cable.

2. 62.5 / 12.5 um optical fiber cable. – 50/125 um optical fiber cable

The contractor has to assure that cross talk coupling between individual, unshielded twisted-pairs shall not affect the transmission performance of multi-pair cables.

Horizontal Wiring General
The horizontal wiring shall be the portion of the tele communications wiring system that
will extend from the work area telecommunications outlet to the telecommunications closet. The horizontal wiring shall include the telecommunications outlet in the work area, mechanical termination for the horizontal cables, and cross-connections located in the telecommunications closet.
The horizontal wiring shall be capable of handling the following minimum services.

1. Voice telecommunications.
2. Premises switching equipment.

The horizontal wiring shall be a star topology with each work area telecommunications outlet connected to a telecommunications closet. Horizontal wiring shall preferably contain no more than one transition point between different forms of the same cable type.

Bridged taps shall not be permitted as part of the horizontal wiring.

The maximum horizontal distance shall be limited to 90 meters (295 ft) independent of media type i.e. the cable length from the mechanical terminating of the media in the telecommunications closet to the telecommunications outlet in the work area shall be limited to this distance. This horizontal distance includes cabling required from the telecommunications outlet to the work station. Horizontal cable shall be limited to one of the following types as listed out in the schedule of quantities.

1. Four-pair 100-ohm unshielded twisted pair (UP - UTP) cables.
2. 62.5 / 12.5 um optical fiber cable. – 50/125 um optical fiber cable

Grounding Considerations

Grounding system shall be an integral part of the telecommunications wiring system. In addition to helping protect personnel and equipment from hazardous voltages, the grounding system shall reduce the effect of electromagnetic interference ((EMI) to and from the telecommunications wiring system.

Grounding & Bounding shall meet the NEC , NFPA780, IEEE & ANSI requirements and practices or local authorities or codes whichever impose a more stringent requirement.

The following shall be considered for the grounding system. Installation conforms with proper practices and requirements.
Each telecommunications closet shall have an appropriate grounding access.
Grounding shall be available for cross-connect frames, patch panel racks, telephone and data equipment and equipment required for maintenance and testing.

Backbone Wiring Distances

Telecommunications Closet to Main Cross-Connect

The maximum backbone distance between the main cross-connect patch panel and the mechanical termination in the telecommunications closet shall be as follows:
For 62.5 / 125 ohms – 50/125 um optical Fiber cable the distance between Telecommunication closet and main cross connect / patch panel shall not exceed 2000 mts. (550 mtr for 1Gbps)

For 100 ohm UTP cable, maximum distance between telecommunication closet and main cross connect / panel shall be 800 mts.

Telecommunications equipment which connect directly to main or intermediate cross- connects / patch panel shall done via cables of 30 m or less.
Telecommunications Closet

A telecommunications closet shall be defined as an area within the building set aside for the exclusive purpose of housing equipment associated with the telecommunications wiring system. There shall be no upper limit on the number of telecommunications closets which may be provided within the building. The telecommunication closet shall have following three possible configurations.
Horizontal Backbone Connection

The telecommunications closet shall contain the mechanical terminations for a portion of the horizontal wiring system and a portion for the backbone wiring system. In such a case the telecom closet shall provide facilities (space, power, grounding etc.) for the passive (cross-connect) / patch panel or active devices or both used to interconnect the two system.

Backbone Wiring System Interconnection
The telecommunications closet may contain the intermediate cross-connect / patch panel or main cross connect / patch panel for different portions of the backbone wiring system. In this usage, the telecommunications closet shall provide facilities for the passive or active devices or both used to interconnect two or more portions or the backbone wiring system.

Entrance Facilities
A telecommunications closet may be used to contain the demarcation point or an interbuilding entrance facility. In this usage, the telecommunications closet shall provide facilities for the active and / or passive devised required interconnecting the demarcation point or interbuilding entrance facility or both to the telecommunication wiring system.
The design of the telecommunications closet shall be as per the requirements of EIA/TIA-
569. - ANSI/TIA-569-C of 2010 & ISO/IEC 18010:2002. Information Technology— Pathways and Spaces for Customer Premises Cabling.
Equipment Room

The equipment room shall be defined as an area within the building where telecommunications systems shall be housed along with the mechanical termination of one or more portions of the telecommunications wiring system. Equipment room shall be

considered to be distinct from telecommunications closets because of the nature or complexity of the equipment they contain. Any or all of the functions of a telecommunications closet shall be alternatively provided by an equipment room.
Cable Specifications UTP Cabling System
Unshielded twisted pair cabling system, TIA / EIA 568-B.1 addendum -
TIA/ANSI – 568-C.2 & ISO/IEC 11801 Category 6 Cabling system

a. Networks Supported 10 / 100 Ethernet, 155 Mbps ATM, 1000 Mbps IEEE
802.3ab Ethernet, and proposed Cat 6 Gigabit Ethernet
b. Warranty 25-year systems - performance warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs – Site certificate to be issued for 25 years.

c. Performance characteristics to be provided along with bid

Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel along with the UL and ETL verification report

Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2 - TIA/ANSI –
568-C.2 & ISO/IEC 11801
a. Material: Solid Copper cable
b. Conductors 23 AWG solid bare copper or better with OD of approx 6.2mm
c. Insulation Polyethylene
d. Jacket Flame Retardant PVC
e. Pair Separator Cross-member fluted Spline.
f. Approvals UL Listed &UL Verified, ETL Verified ETL verified to TIA / EIA Cat 6 as per TIA/EIA 568-C.2

g. Operating temperature
h. Frequency tested up to

-20 Deg. C to +60 Deg. C Minimum 600 MHz

i. PackingBox of 305 meters

j. Delay Skew 45ns MAX. – 35ns Max
k. Impedance 100 Ohms + / - 15 ohms, 1 to 600 MHz.

l. Performance characteristics to be provided along with bid

Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR

Category 5 Riser Cable

This cable shall consist of solid copper conductors insulated with expanded polyethylene covered by a PVC sheet. The core shall be covered with a layer of plastic tape and overlaid with a corrugated PVC plastic. it shall be suitable to be used without conduit. The cable shall meet. EIA/TIA -568 – ANSI/TIA 568-C, C S A T -529, IEEE 802.3 & 10 B A S E -T. The pair sizes shall be as per the schedule of quantities. The cable shall meet the following specifications.

a. Maximum DC Resistance 26.5 ohm per 100 ft.

b. Maximum D C Unbalanced Resistance 17%

c. Mutual Capacitance at 1 kHz 16 nF per 1000 ft.

Warranty

Owner seeks warranty for the installed cable plant from the OEM equipment supplier after implementation by certified engineer. Bidder shall ensure that the OEM norms for supply, installation, testing and documentation as specified by the OEM supplier shall be adhered to, provided those are in line with TIA / EIA / ANSI standards and Owner requirement specifications. The warranty shall be provided by the OEM vendor to Owner and shall be administered in India. The duration of the warranty shall be for a minimum of 25 years after site certification and shall cover the system performance, Product Warranty and application assurance and the costs of the supply of components and installation.

CABLING FOR DATA SYSTEM

Scope

This document defines the cabling system and subsystem components to include cable, termination hardware, supporting hardware, and miscellany required to supply, and to install a complete cabling infrastructure supporting data and video. The intent of this section is to provide pertinent information to allow the vendor to bid the labor, supervision, tooling, materials, and miscellaneous mounting hardware and consumables to install a complete system. However, it is the responsibility of the vendor to propose any, and, all items required for a complete system whether or not it is identified in the specification, drawings and bill of materials attached to this specification.

Applicable Documents

The cabling system described in this specification is derived in part from the recommendations made in industry standard documents. The list of documents below (or the latest revisions) has bearing on the desired cabling infrastructure are incorporated into this specification by reference:

1) This Technical Specification and Associated Drawings

ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard – March 2001 – TIA/ANSI 568-C Commercial Building Telecommunications Cabling Standard – Aug 2009

3) ANSI/EIA/TIA-569-A ANSI/TIA-569-C Commercial Building Standard for Telecommunications Pathways and Spaces - February, 1998 – Sept 2009

4) ANSI/EIA/TIA-606 ANSI/TIA-606-B Administration Standard for the Telecommunications Infrastructure of Commercial Buildings - February, 1993 - 2010

5) ANSI/TIA/EIA-607 - ANSI/NECA/BICSI- 607-2010 Commercial Building Grounding and Bonding Requirements for Telecommunications - August, 1994

6) ISO/IEC 11801 Ed.2:2002. Information Technology—Generic Cabling for Customer Premises.

7) ANSI/TIA-568-C.2 for Category 6 channel.

8) All products must be RoHS / ELV compliant

Cabling System and Component Specifications

UTP Cabling System
Unshielded twisted pair cabling system, TIA / EIA 568-B.1 addendum
- TIA/ANSI – 568-C.2 & ISO/IEC 11801 Category 6 Cabling system
Networks Supported 10 / 100 Ethernet, 155 Mbps ATM, 1000 Mbps
IEEE 802.3ab Ethernet, and proposed Cat 6 Gigabit Ethernet
Warranty 25-year systems - performance warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs – Site certificate to be issued for 25 years.

Performance characteristics to be provided along with bid

Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel along with the UL and ETL verification report

Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2 - TIA/ANSI –
568-C.2 & ISO/IEC 11801
Material:
Conductors Solid Copper cable
Insulation 23 AWG solid bare copper or better with OD of
approx 6.0mm
Jacket Polyethylene
Pair Separator Flame Retardant PVC Approvals Cross-member fluted Spline.
UL Listed & UL Verified, ETL Verified

Operating temperature Frequency tested up to

ETL verified to TIA / EIA Cat 6 as per TIA/EIA 568- C.2
-20 Deg. C to +60 Deg. C

PackingMinimum 600 MHz
Delay Skew Box of 305 meters
Impedance 45ns MAX. – 35ns Max

Performance characteristics to be provided along with bid

100 ms + / - 15 ohms, 1 to 600 MHz.

UTP Jacks
Type PCB based, Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2 -TIA/ANSI – 568-C.2 & ISO/IEC 11801
Durability
Modular Jack 750 mating cycles minimum
Wire terminal 200 termination cycles
Accessories Strain relief and bend-limiting boot for cable Integrated hinged dust cover
Materials
Housing Polyphenylene oxide, 94V-0 rated
Wiring blocks Polycarbonate, 94V-0 rated
Jack contacts Phosphorous bronze, plated with 1.27micro-meter
thick gold – 50 micron Gold over 100 micron nickel Plating
Approvals UL listed and UL Verified, ETL Veified

Performance Characteristics to be provided with bid

Attenuation, NEXT, PS NEXT, FEXT and Return Loss

UTP Jack Panels

Type 24-port, PCB based, Unshielded Twisted Pair, Category 6, , TIA / EIA 568-B.2 -TIA/ANSI – 568-C.2 & ISO/IEC 11801
Ports 24
Port arrangement Modules of 6-ports each, arranged 1port x 6. –
Individually replaceable keystone jacks port.
Category Category 6

Circuit Identification Scheme

Icons on each of 24-ports

Port Identification 9mm or 12mm Labels on each of 24-ports (to be included in supply)

Height 1 U (1.75 inches) Durability
Modular Jack 750 mating cycles

Wire terminal (110 block)

200 termination cycles

Accessories Strain relief and bend limiting boot for cable Materials
Housing Polyphenylene oxide, 94V-0 rated
Wiring blocks Polycarbonate, 94V-0 rated
Jack contacts Phosphorous bronze, plated with 1.27micro-meter thick gold – 50 micron Gold over 100 micron nickel Plating
Panel Black, powder coated steel
Approvals UL listed and UL Verified, ETL Veified Termination Pattern TIA / EIA 568 A and B;

Performance Characteristics to be provided along with bid

Attenuation, NEXT, PS NEXT, FEXT and Return Loss

Faceplates
Type 1/ 2 / 4-port, White surface box
Material ABS / UL 94 V-0
No. of ports One / Two / Four ports with shutter

Warranty
Owner seeks warranty for the installed cable plant from the OEM equipment supplier after implementation by certified engineer. Bidder shall ensure that the OEM norms for supply, installation, testing and documentation as specified by the OEM supplier shall be adhered to, provided those are in line with TIA / EIA / ANSI standards and Owner requirement specifications. The warranty shall be provided by the OEM vendor to Owner and shall be administered in India. The duration of the warranty shall be for a minimum of 25 years after site certification and shall cover the system performance, Product Warranty and application assurance and the costs of the supply of components and installation.

12. EXTERNAL / STREET LIGHTING POLES
M.S. Tubular Poles

7 Meter High Pole with Ladder Bars

7 meter high (5.75 meters above and 1.25 meters below ground shall be M.S.step tubular pole in 3 steps (bottom part shall be 4 meters high, 114.3 mm outer dia and 3.65 mm walll thickness, middle part shall be 1.5 meter high, 88.9 mm outer dia and 3.25 mm wall thickness, top part shall be 1.5 meters high, 76.1 mm outer dia and 3.25 mm wall thickness) with 300 mm x 300 mm x 6 mm thick base plate. Foundation for the pole shall be of cement concrete in 1:2:4 ratio. (1 part cement, 2 parts, coarse sand and 4 parts stone aggregate) IP-55 weather proof junction box shall also be provided to accommodate 1 No. 3 phase and neutral terminal block and 1 No. 6 amps SP MCB including 2.5 sq.mm PVC insulated copper conductor wire from the terminals block to the fixture and 2 Nos. 32 mm dia GI sleeves of suitable length shall be provided to the junction box.

4.5 Meter High Pole

4.5 meter high (3.6 meter above and 0.9 meter below ground) shall be 75 mm dia, 3.25 mm wall thickness MS tubular straight pole with a cast aluminium adaptor for post top mounting. Pole shall be provided with 300 mm x 300 mm x 6 mm thick MS base plate. Foundation for the pole shall be of cement concrete in 1:2:4 rates (1 part cement, 2 parts coarse sand and 4 parts stone aggregate) IP-55 weather proof junction box shall also be provided to accommodate 1 No. 3 phase and neutral terminal block and 1 No. 6 amps SP MCB including 2.5 sq.mm PVC insulated copper conductor wires from the terminal block to the fixture and 2 Nos. 32 mm dia GI sleeves of suitable length shall be provided to the junction box.

Cast Aluminium Poles Design & Construction

Ornamental cast aluminum pole shall be made out of cast aluminum as per requirements
of IS:202 (1993). Casting of all pole Sections shall be accurately done from permanent moulds and cores of the design submitted to Achieve uniformity in all design aspects in internal and external shape of the unit. All sections shall be free from defects like blow holes, porosity, hard spots, cracks, Hot tears, cold shuts, distortion, sand and slag inclusion and other harmful defects. All the casted sections used in the pole shall be free from welding of any kind used to repair it. The casted sections shall be machined from all the locations used to insert the pieces into one another using either threading or socket method. Accuracy of all machined parts shall be maintained through out a lot for random replacements of sections if and when required. All the threaded joints shall be mechanically tightened and sealed using industrial tools to make the entire unit vandal resistant.

Aesthetic appearance

All the grooves and carvings of the pole unit shall be free from any kind of distortion for a pleasing aesthetic appearance.

Material

Cast aluminum material used for casting pole unit shall be Grade FG-220 type, as described in IS:202 and shall have minimum tensile strength of the order of 200 N/mmsq.

Pre-treatment

Each and every casted piece shall be subject to Sand blasting at a pressure of 10-15 kgf to remove all its external dirt and sand remains etc..

Painting and Finishing

Entire unit shall be given an extensive three stage treatment with PU based two packZn- Ph primer and paint prescribed for CI surfaces to make it absolutely rust and corrosion proof, as well as giving it a pleasing appearance. PU based paint shall be MRF make or equivalent.

Thickness of the coating

A minimum of 80 microns of coating thickness shall be achieved on the final piece.

Mounting arrangement

Pole unit shall be grouted using 4 nos. anchor bolts of size M-16x450 mm confirming to
6.8 Gr. as per IS 2062. Pole unit shall be grouted on a foundation made out of 1:3:6 concrete cement after excavating the earth with proper cable sleeves etc.. laid in the foundation itself.

Dimensions of the unit

Total height = 3000 mm

Dia of base plate = 380 mm Pitch Circle Dia = 335 mm
Description of top bracket / arms
Single double decorative arm shall be provided on the pole (as asked for in B.O.Q.), secured with the help of two nos. bolts outreach not less than 400 mm.

Service window

A service window of the size 150 mm x 100 mm shall be provided in the base of the pole to allow access to electrical connections and terminations. It shall be covered with MS plate and proper rubber gaskets shall be provided to prevent any ingress of water etc..

Electrical connections
Four way connectors shall be provided along with Slide lock and 1 no. 6 amps Sp MCB including 2.5 sqmm PVC insulated copper conductor wires from the terminal block to the fixture and 2 nos. 32 mm dia GI sleeves of suitable length shall be provided upto the service window. An earth boss is provided on the control plate along with connectors and interrupters.

Galvanized Octagonal Poles Design
The Octagonal poles shall be designed to withstand the maximum wind speed of 169 KM
/ Hr. as per IS 875. The top loading i.e. area and the weight of fixtures are to be considered to calculate maximum deflection of the pole and the same shall meet the requirement of BS : 5649 Part VI 1982.
Pole Shaft

The pole shaft shall have octagonal cross section and shall be continuously tapered with single longitudinal welding. There shall not be any circumferential welding. The welding of pole shaft shall be done by submerged Arc Welding (SAW) process.

All octagonal pole shafts shall be provided with the rigid flange plate of suitable thickness with provision for fixing 4 foundation bolts. This base plate shall be fillet welded to the pole shaft at two locations i.e. from inside and outside. The welding shall be done as per qualified MMAW process approved by Third Party Inspection agency.

Door opening

The octagonal poles shall have door of approximate 500 mm length at the elevation of 500 mm from the Base plate. The door shall be vandal resistance and shall be weather proof to ensure safety of inside connections. The door shall be flush with the exterior surface and shall have suitable locking arrangement. There shall also be suitable arrangement for the purpose of earthing.

The pole shall be adequately strengthened at the location of the door to compensate for the loss in section.
Material

Octagonal PolesHT Steel Conforming to grade S355JO

Base Plate Fe 410 conforming to IS 226 / IS 2062
Foundation Bolts EN.8 grade Welding
The welding shall be carried out confirming to approved procedures duly qualified by third party inspection agency. The welders shall also be qualified for welding the octagonal shafts.

Pole sections

The Octagonal Poles shall be in single section (upto 11 mtr). There shall not be any circumferential weld joint.
Galvanization

The poles shall be hot dip galvanized as per IS 2629 / IS 2633 / IS 4759 standards with average coating thickness of 70 micron. The galvanizing shall be done in single dipping.

Xing type

The Octagonal Poles shall be bolted on a pre-cast foundation with a set of four foundation bolts for greater rigidity.

Top Mountings

The galvanized mounting bracket shall be supplied along with the Octagonal Poles for Installation of the luminaries.

Manufacturing

The pole manufacturing & galvanizing unit shall be ISO 9001 : 2000 & ISO 14001 certified to ensure consistent quality & environmental protection.

Service window
A service window of the size 150 mm x 100 mm shall be provided in the base of the pole to allow access to electrical connections and terminations. It shall be covered with MS plate and proper rubber gaskets shall be provided to prevent any ingress of water etc..

Electrical connections
Four way connectors shall be provided along with Slide lock and 1 no. 6 amps Sp MCB including 2.5 sqmm PVC insulated copper conductor wires from the terminal block to the fixture and 2 nos. 32 mm dia GI sleeves of suitable length shall be provided upto the service window. An earth boss is provided on the control plate along with connectors and interrupters.

13. TESTING

GENERAL

At the completion of the work, the entire installation shall be subject to the following tests in the presence of the Owner’s site representative.

Wiring continuity test. Insulation resistance test. Earth continuity test.
Earth resistivity test.
Test as per Appendix `E' of IS:732 -1989

Besides the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the Contractor at his own cost.

TESTING OF WIRING
All wiring systems shall be tested for continuity of circuits, and earthing after wiring is completed and before installation is energized.

INSULATION RESISTANCE TEST
The insulation resistance shall be measured between earth and the whole system of conductors, or any section thereof,

with all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 660 volts for medium voltage circuits. Where the supply is derived from AC three phase system, the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less than 50 divided by the number of points provided on the circuit, the whole installation shall have an insulation resistance greater than one megaohms. The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant standard specification or where there is no such specification, shall not be less than one a megaohms. All equipments, cables shall be inspected at works by the Architect as per relevant IS and testing commissioning of installation as per Appendix
`E' of IS:732-1989 shall be done and all record to be maintained.

TESTING OF EARTH CONTINUITY PATH

The earth continuity conductor metallic envelopes of cables shall be tested for electric continuity and the electrical resistance of the same, along with the earthing lead but excluding any added resistance or earth leakage circuit breaker, measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation, shall not exceed one ohm.

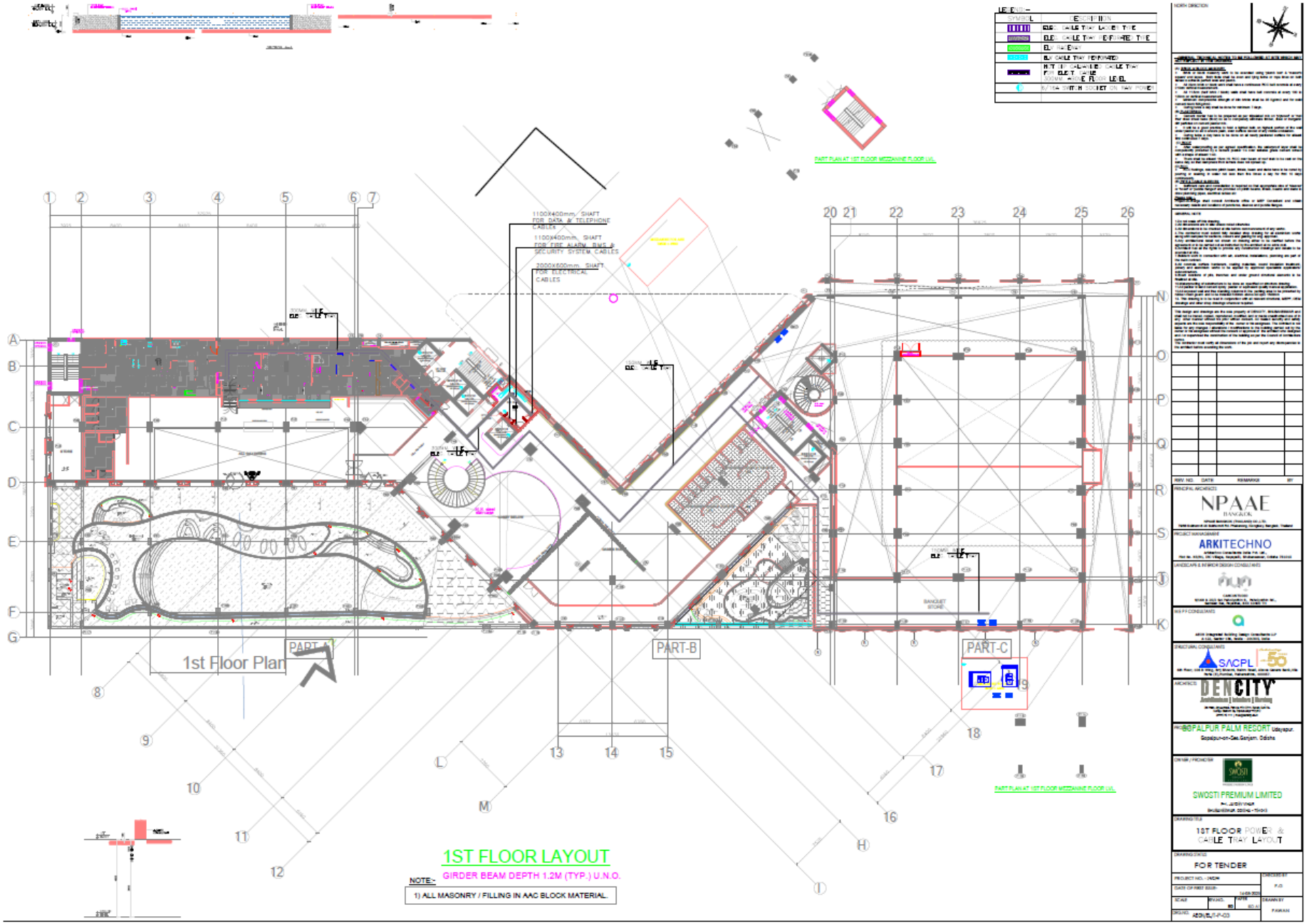
TESTING OF POLARITY OF NON-LINKED SINGLE POLE SWITCH

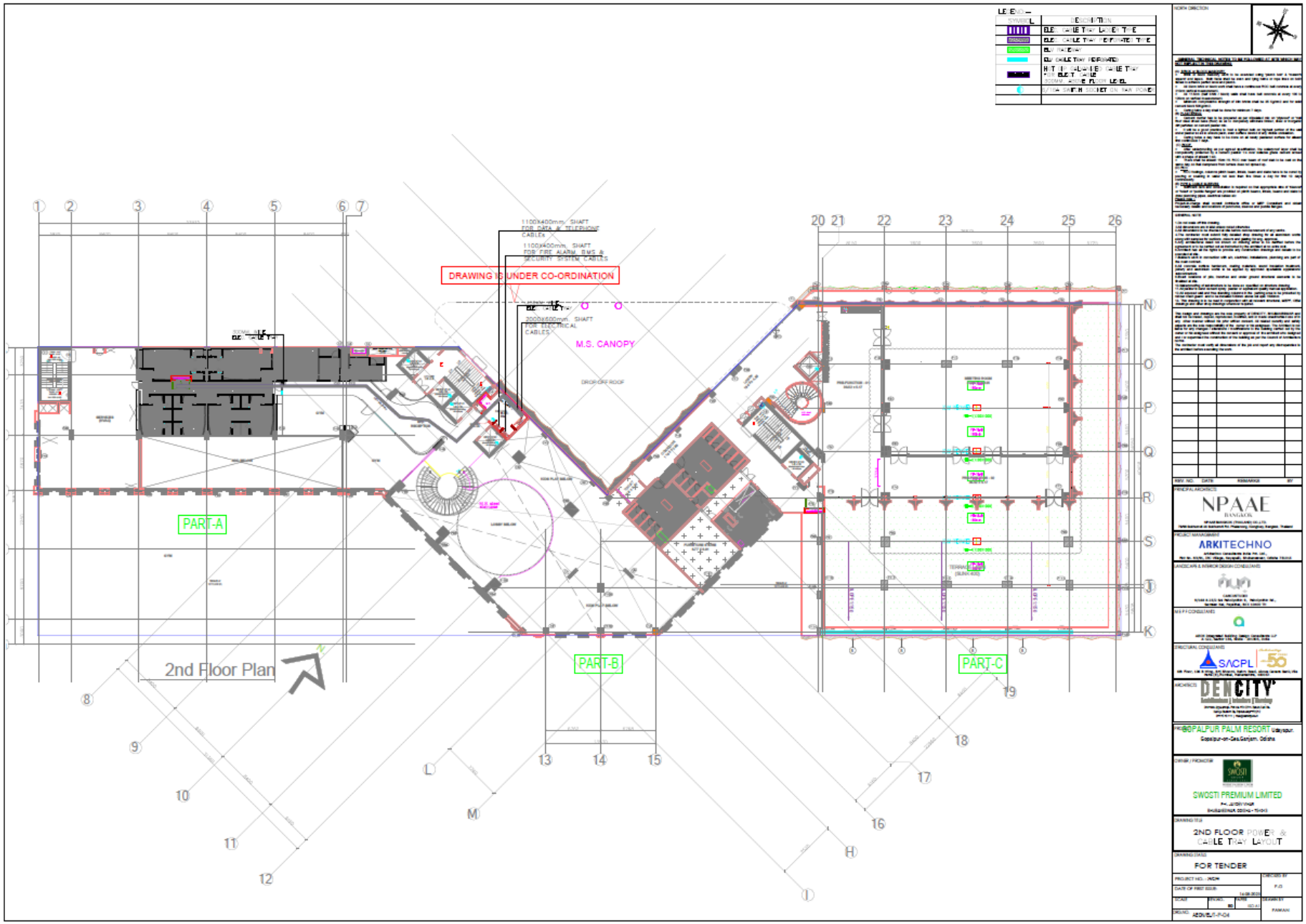
In a two wire installation a test shall be made to verify that all non-lined single pole switches have been connected to the same conductor throughout, and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non- earthed conductor of the supply. In the three or four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted to one of the outer or phase conductor of the supply. The entire electrical installation shall be subject to the final acceptance of the Owner’s site representative as well as the local authorities.

DRAWINGS

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

Sl No	Drawing name
1.	1ST FLOOR LAYOUT
2.	1ST FLOOR LIGHTING LAYOUT
3.	2nd FLOOR LAYOUT
4.	2ND FLOOR LIGHTING LAYOUT
5.	3RD FLOOR POWER & CABLE LAYOUT
6.	3RD FLOOR POWER & CABLE TRAY LAYOUT
7.	4-7TH FLOOR POWER & CABLE LAYOUT
8.	4-7th Power & Cable Tray Layout
9.	8 & 9TH FLOOR POWER & CABLE LAYOUT
10.	8-9th Power & Cable Tray Layout
11.	column location at ground floor
12.	duct floor power & cable tray layout
13.	GROUND FLOOR LIGHTING LAYOUT
14.	Ground Floor Power & Cable Tray Layout
15.	LIGHTING LAYOUT
16.	LOWER GROUND FLOOR PLAN
17.	TERRACE FLOOR POWER & CABLE LAYOUT
18.	Terrace Floor Power & Cable Tray Layout


1100X400mm SHAFT FOR DATA & TELEPHONE CABLES
1100X400mm SHAFT FOR FIRE ALARM, BMS & SECURITY SYSTEM CABLES
2000X600mm SHAFT FOR ELECTRICAL CABLES
PART-A
PART-B
PART-C
1st Floor Plan
PART PLAN AT 1ST FLOOR MEZZANINE FLOOR LVL
PART PLAN AT 1ST FLOOR MEZZANINE FLOOR LVL
1ST FLOOR LAYOUT
GIRDER BEAM DEPTH 1.2M (TYP.) U.N.O.
NOTE:-
1) ALL MASONRY / FILLING IN AAC BLOCK MATERIAL.
NPAAE
BANGKOK
ARKITECHNO
SACPL
DENCITY
BOPALPUR PALM RESORT, Udayapur, Gopalpur-on-Sea,Ganjam, Odisha
SWOSTI PREMIUM LIMITED
1ST FLOOR POWER & CABLE TRAY LAYOUT
FOR TENDER



SYMBOL	DESCRIPTION
	ELECTRICAL CABLE TRAY LADDER TYPE
	ELECTRICAL CABLE TRAY PERFORATED TYPE
	ELV TRAY
	ELV CABLE TRAY PERFORATED
	HT & LT CABLE TRAY FOR ELECTRICAL CABLE 300MM ABOVE FLOOR LEVEL
	EXTRA SWITCH SOCKET ON TRAY POINT

NORTH DIRECTION

GENERAL NOTES

REV. NO.	DATE	REMARKS	BY

PRINCIPAL ARCHITECTS
NPAAE BANGKOK

PROJECT MANAGEMENT
ARKITECHNO

LANDSCAPE & INTERIOR DESIGN CONSULTANTS
PALPU

M.E.P.F CONSULTANTS

STRUCTURAL CONSULTANTS
SACPL

ARCHITECTS
DENCITY

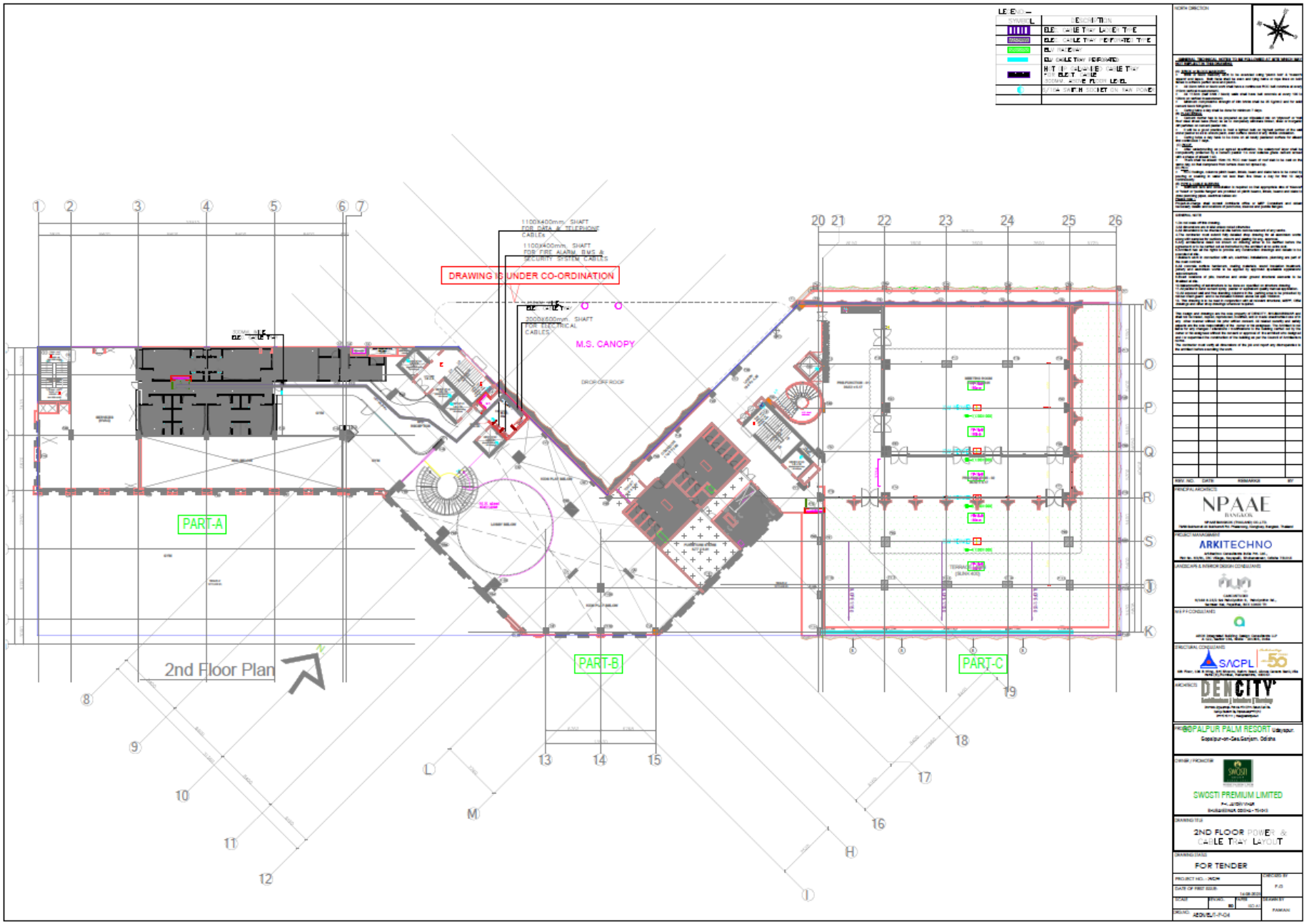
PROJECT
@PALPUR PALM RESORT Gopalpur
Gopalpur-on-Sea,Ganjam, Odisha

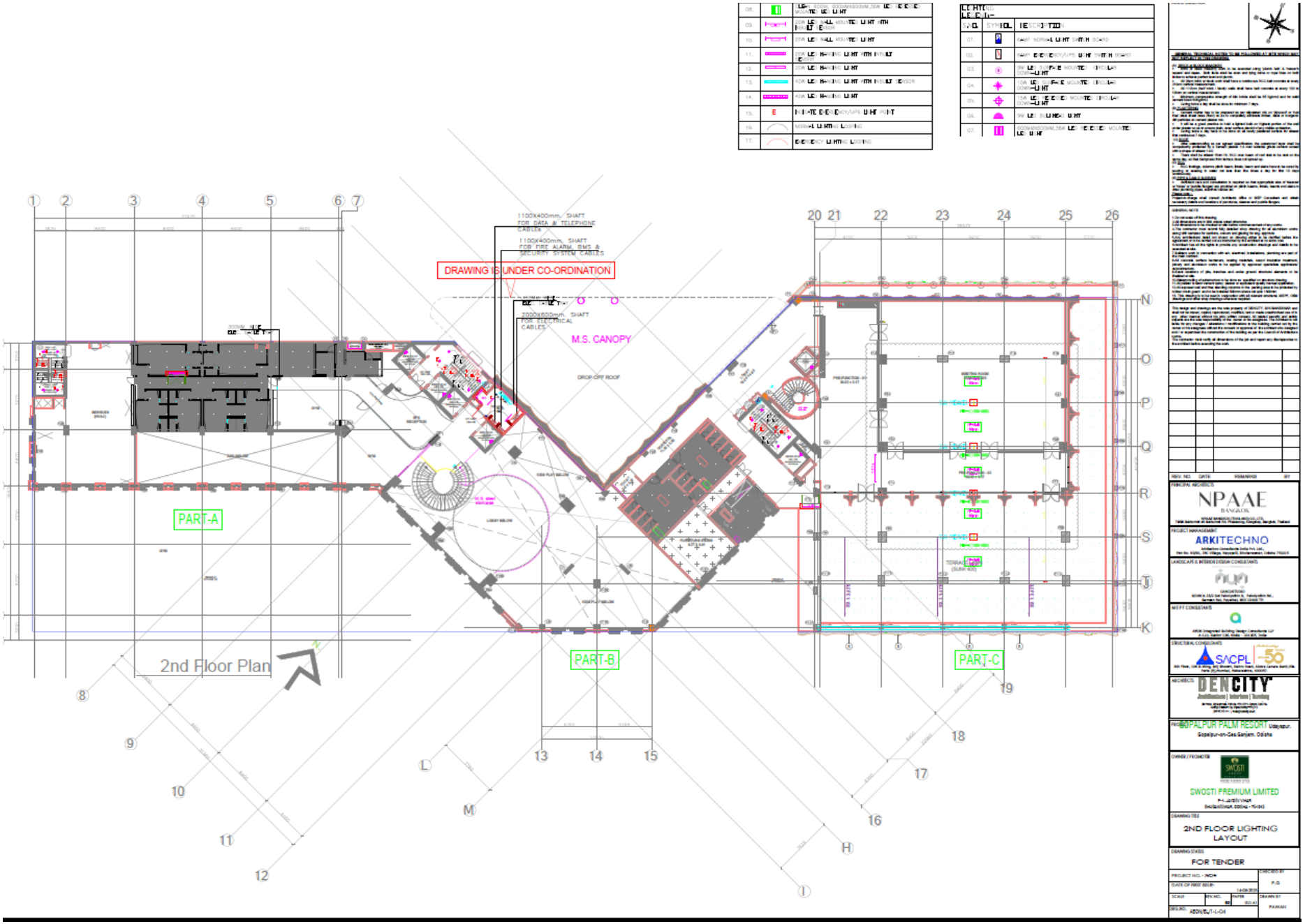
OWNER / PROMOTER
SWOSTI PREMIUM LIMITED

DRAWING TITLE
2ND FLOOR POWER & CABLE TRAY LAYOUT

DRAWING STATUS
FOR TENDER

PROJECT NO.	CHECKED BY
DATE OF ISSUE	
SCALE	DRAWN BY
DRG NO.	


DRAWING IS UNDER CO-ORDINATION
M.S. CANOPY
PART-A
PART-B
PART-C
2nd Floor Plan
1100x400mm SHAFT FOR DATA & TELEPHONE CABLES
1100x400mm SHAFT FOR FIRE ALARM, BMS & SECURITY SYSTEM CABLES
2000x600mm SHAFT FOR ELECTRICAL CABLES
DROP OFF ROOF
1 2 3 4 5 6 7
8 9 10 11 12
13 14 15
16 17 18 19
20 21 22 23 24 25 26
N O P Q R S J K
L M H I
PALPUR PALM RESORT
SWOSTI PREMIUM LIMITED
2ND FLOOR POWER & CABLE TRAY LAYOUT
FOR TENDER



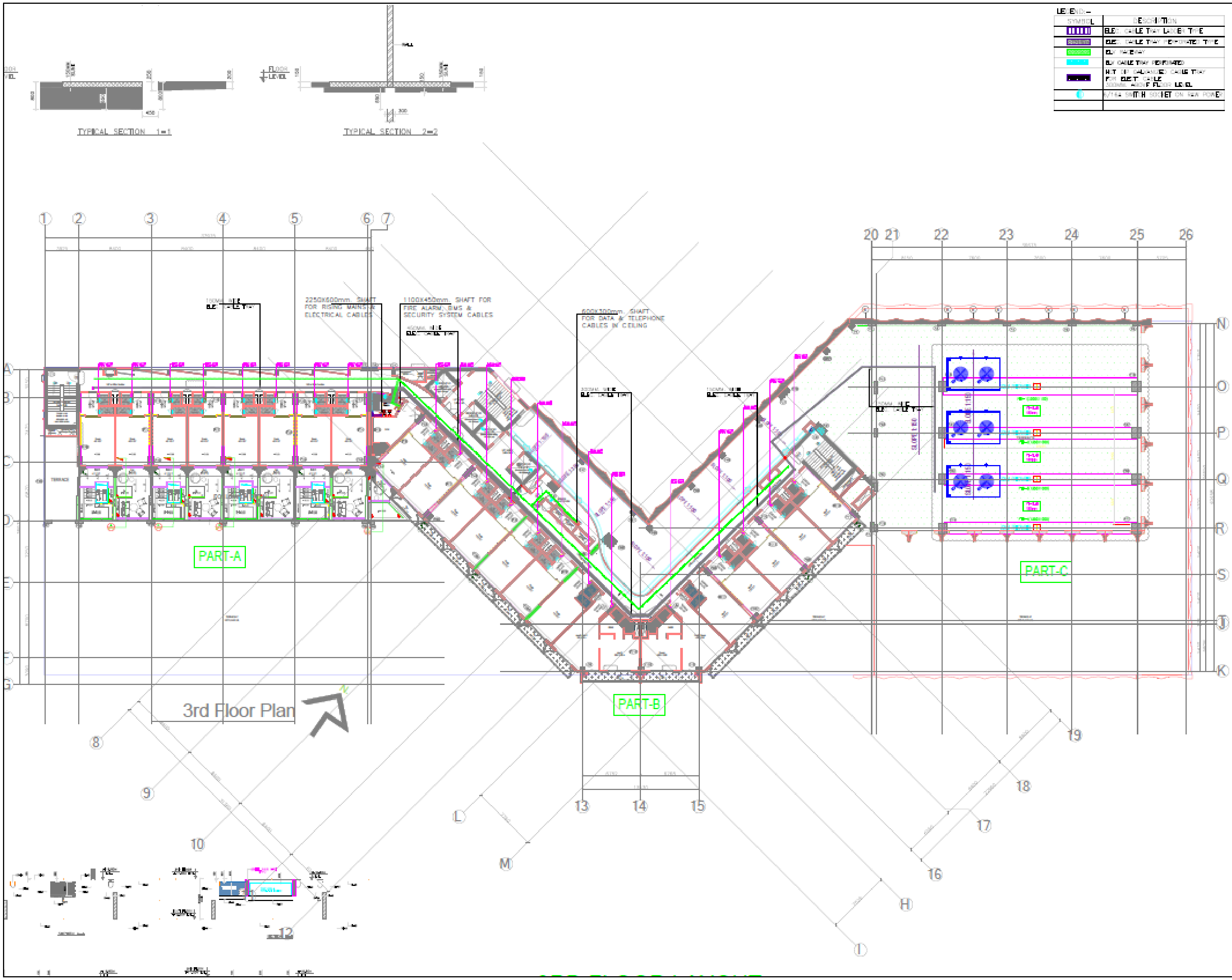
NPAAE
BANGKOK

ARKITECHNO

SWOSTI PREMIUM LIMITED

2ND FLOOR LIGHTING LAYOUT

FOR TENDER



REV. NO.	DATE	REMARKS	BY

PRINCIPAL ARCHITECTS

NPAAF BANGKOK

PROJECT MANAGEMENT

ARKITECHNO

LANDSCAPE & INTERIOR DESIGN CONSULTANTS

MEP CONSULTANTS

STRUCTURAL CONSULTANTS

SACPL

ARCHITECTS

DENCITY

PROJECT: GOPALPUR PALM RESORT Udaypur, Gopalpur-on-Sea, Ganjam, Odisha.

OWNER / PROMOTER

SWOSTI PREMIUM LIMITED

DRAWING TITLE

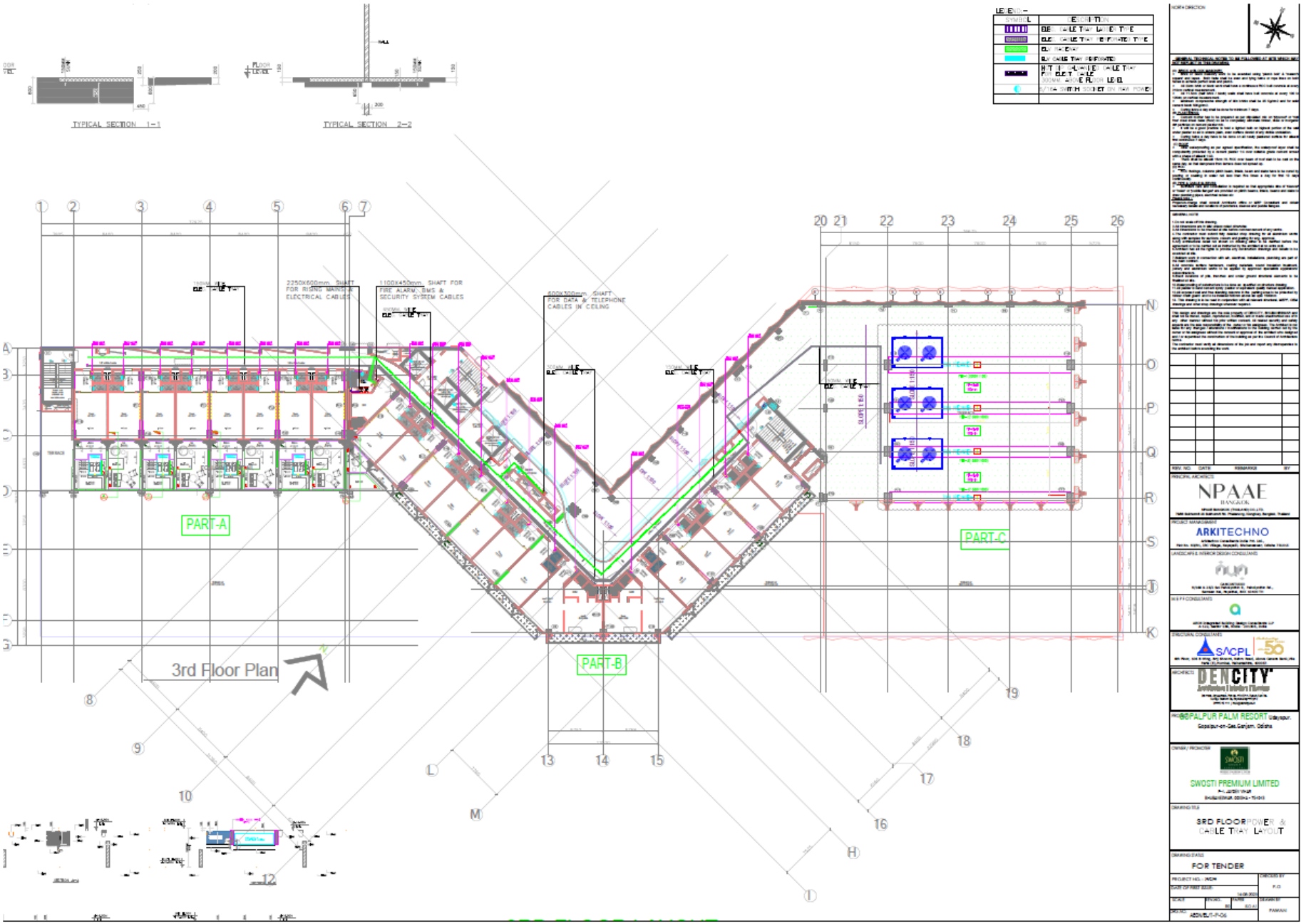
3RD FLOOR POWER & CABLE TRAY LAYOUT

DRAWING STATUS

FOR TENDER

DRAWN BY: PAWAN

DRG. NO. ABDN/ELT-P-06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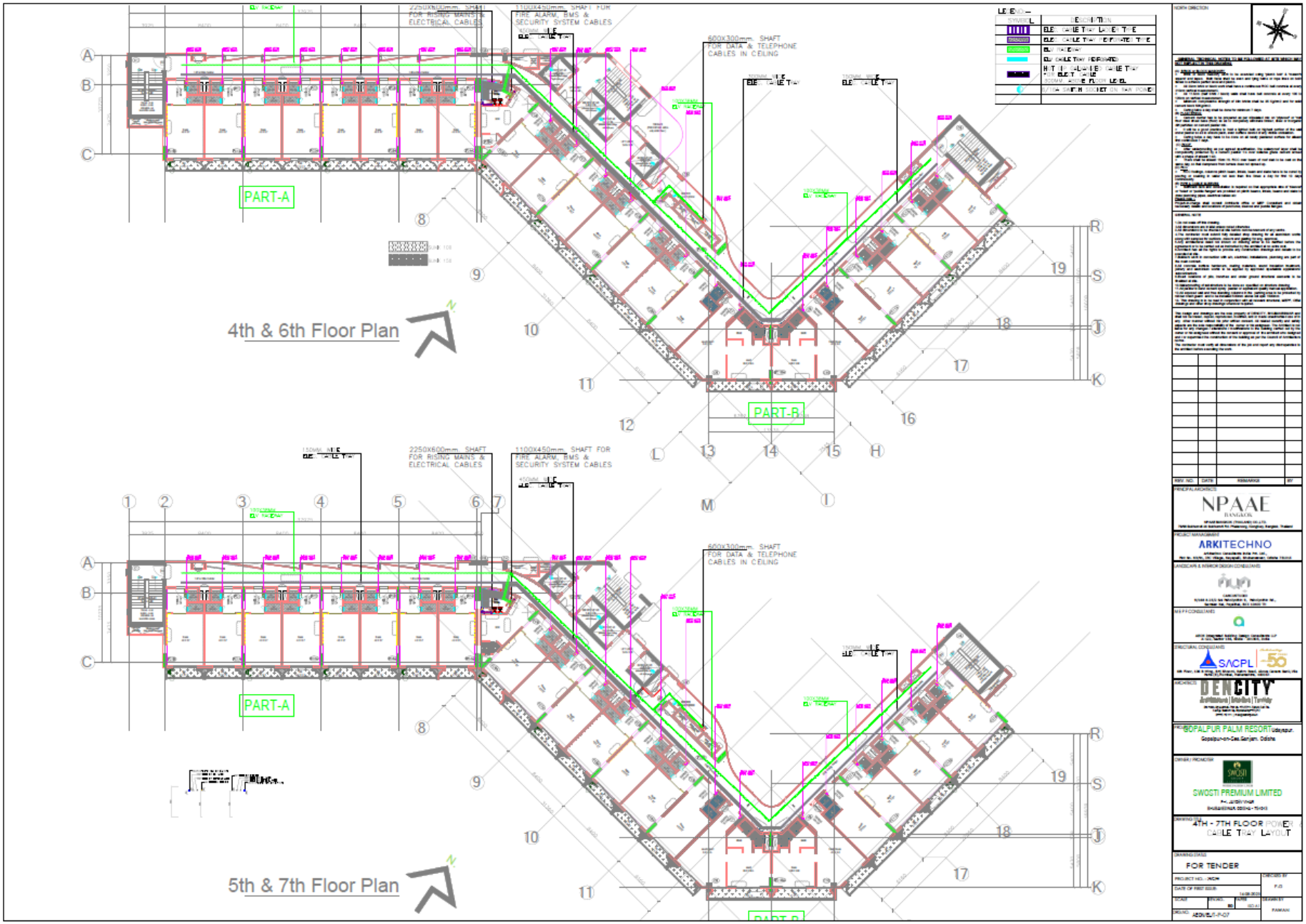
TYPICAL SECTION 2-2
LEGEND
SYMBOL
DESCRIPTION
2250X600mm SHAFT FOR RISING MAINS & ELECTRICAL CABLES
1100X450mm SHAFT FOR FIRE ALARM, BMS & SECURITY SYSTEM CABLES
600X300mm SHAFT FOR DATA & TELEPHONE CABLES IN CEILING
PART-A
PART-B
PART-C
3rd Floor Plan
NORTH DIRECTION
NPAAE
BANGKOK
ARKITECHNO
S/CPL
DENCITY
@BALPUR PALM RESORT
SWOSTI PREMIUM LIMITED
3RD FLOOR POWER & CABLE TRAY LAYOUT
FOR TENDER



NPAAE BANGALORE

ARKITECHNO

SVCPL

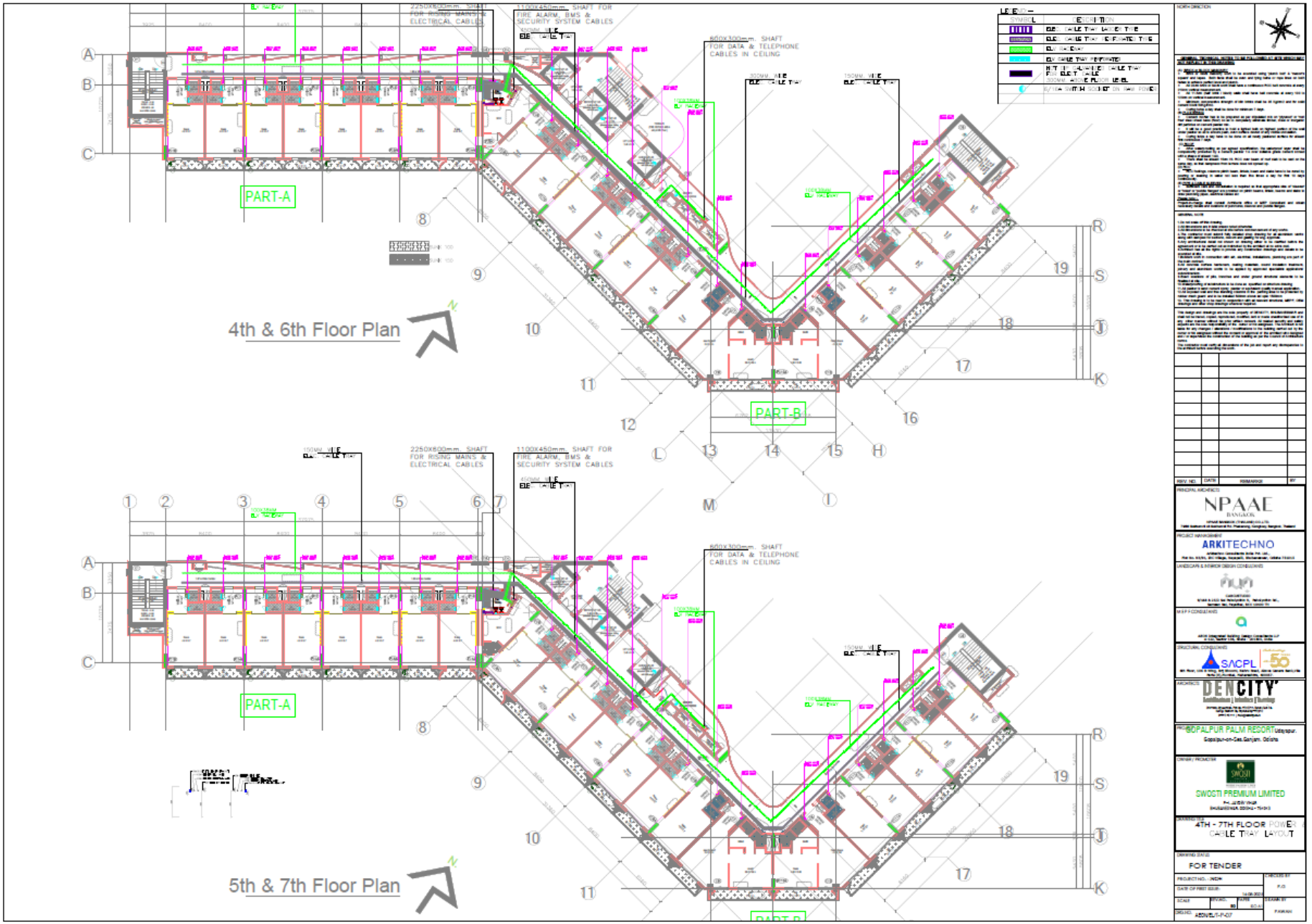
DENCITY Architecture | Interiors | Turnkey

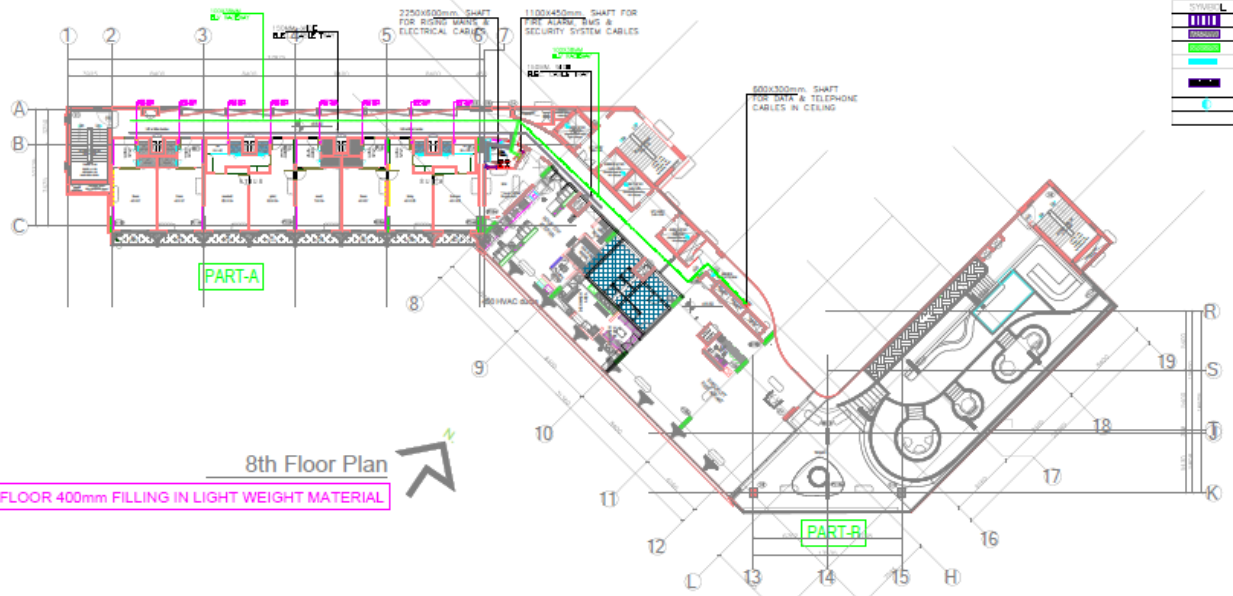
BOPALPUR PALM RESORT Udayapur, Gopalpur-on-Sea,Ganjam, Odisha

SWOSTI PREMIUM LIMITED

4TH - 7TH FLOOR POWER CABLE TRAY LAYOUT

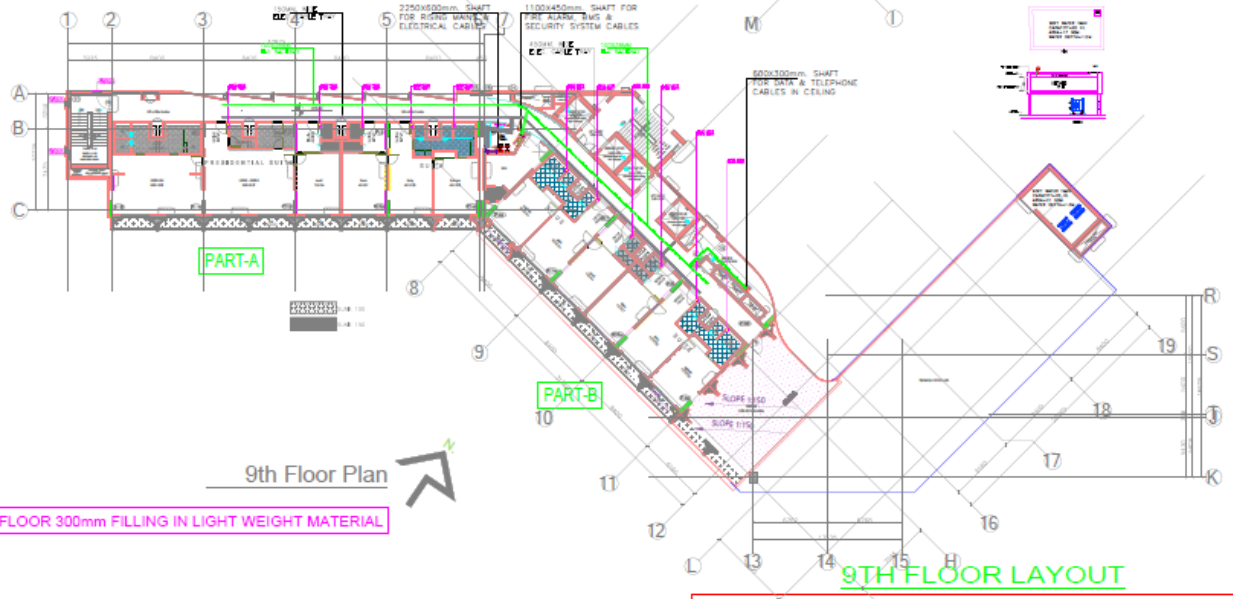
FOR TENDER


2250X600mm SHAFT FOR RISING MAINS & ELECTRICAL CABLES
1100X450mm SHAFT FOR FIRE ALARM, BMS & SECURITY SYSTEM CABLES
600X300mm SHAFT FOR DATA & TELEPHONE CABLES IN CEILING
PART-A
PART-B
4th & 6th Floor Plan
5th & 7th Floor Plan
SYMBOL
DESCRIPTION
SWOSTI PREMIUM LIMITED
4TH - 7TH FLOOR POWER & CABLE TRAY LAYOUT
FOR TENDER



8th Floor Plan

WHOLE FLOOR 400mm FILLING IN LIGHT WEIGHT MATERIAL



9th Floor Plan

WHOLE FLOOR 300mm FILLING IN LIGHT WEIGHT MATERIAL

9TH FLOOR LAYOUT

WHOLE FLOOR 300mm FILLING IN LIGHT WEIGHT MATERIAL IS TO BE CONSIDERED

NOTE:-

NPAAE BANGKOK

ARKITECHNO

SACPL

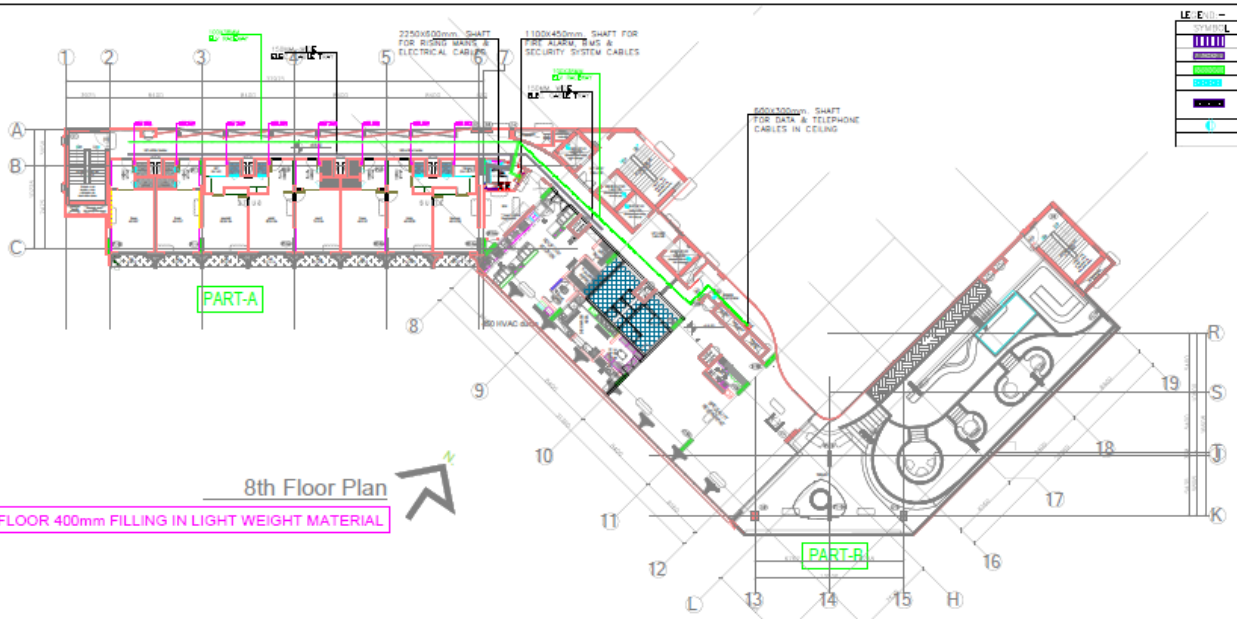
DENCITY Architecture | Interiors | Turnkey

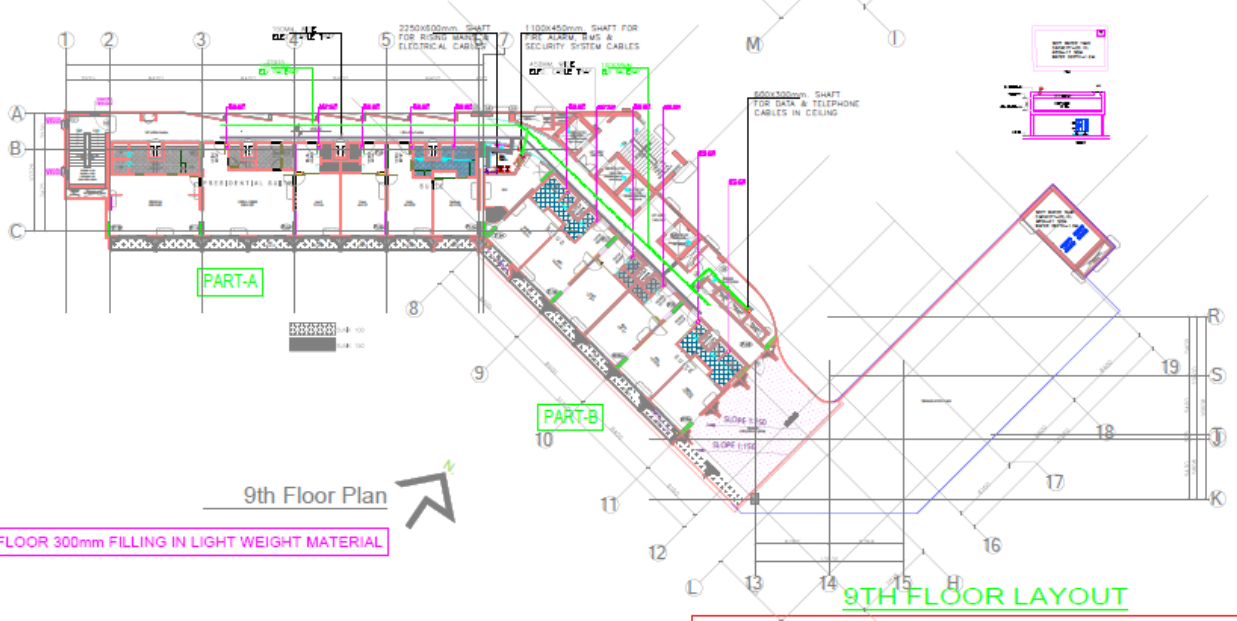
PROJECT: SOPALPUR PALM RESORT Udaipur, Gopalpur-on-Sea, Ganjam, Odisha

OWNER / PROMOTER: SWOSTI PREMIUM LIMITED

DRAWING TITLE: 8TH & 9TH FLOOR POWER & CABLE TRAY LAYOUT

DRAWING STATUS: FOR TENDER





9TH FLOOR LAYOUT

WHOLE FLOOR 300mm FILLING IN LIGHT WEIGHT MATERIAL IS TO BE CONSIDERED

NOTE:-

NPAAE BANGKOK

ARKITECHNO

SACPL

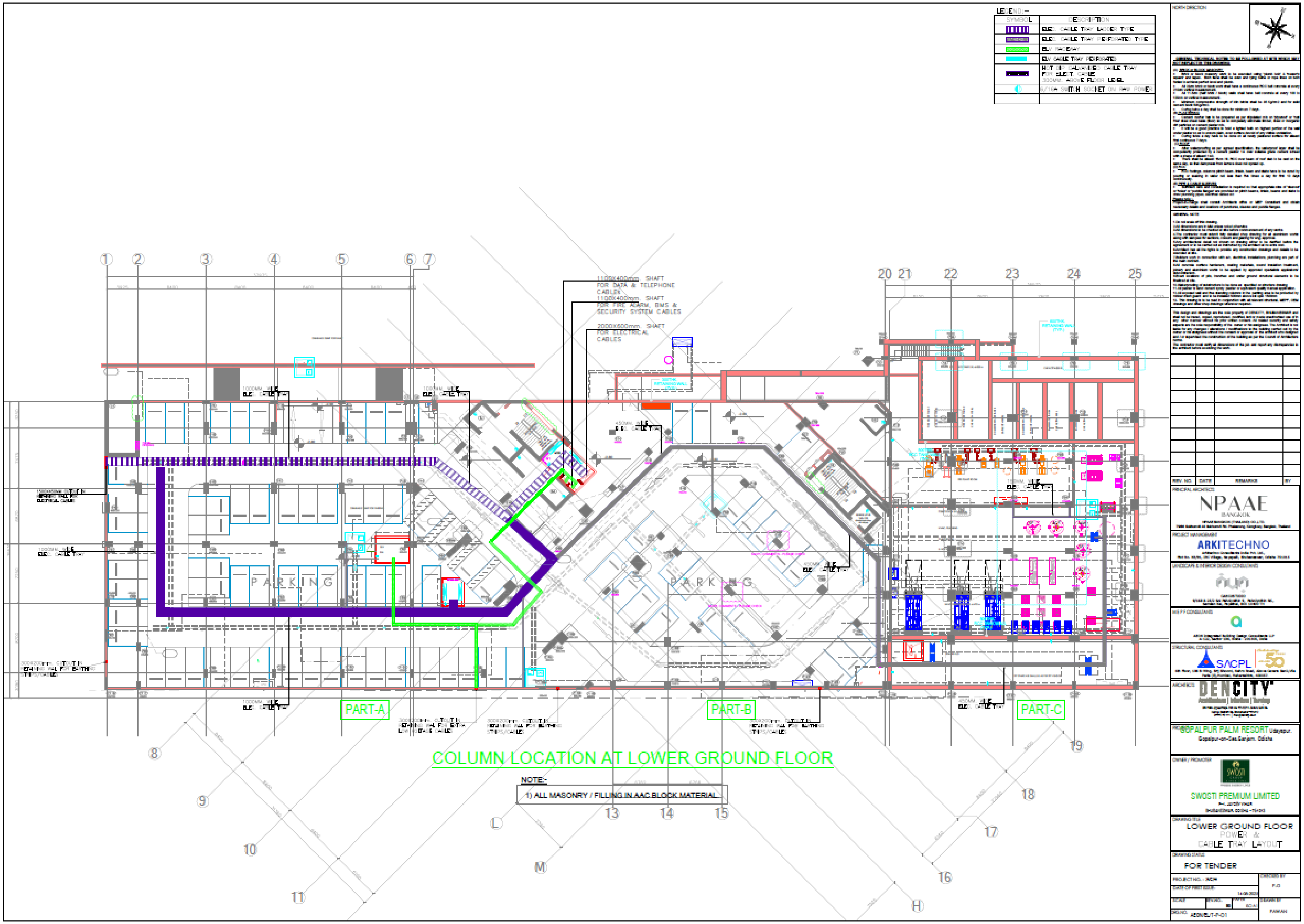
DENCITY

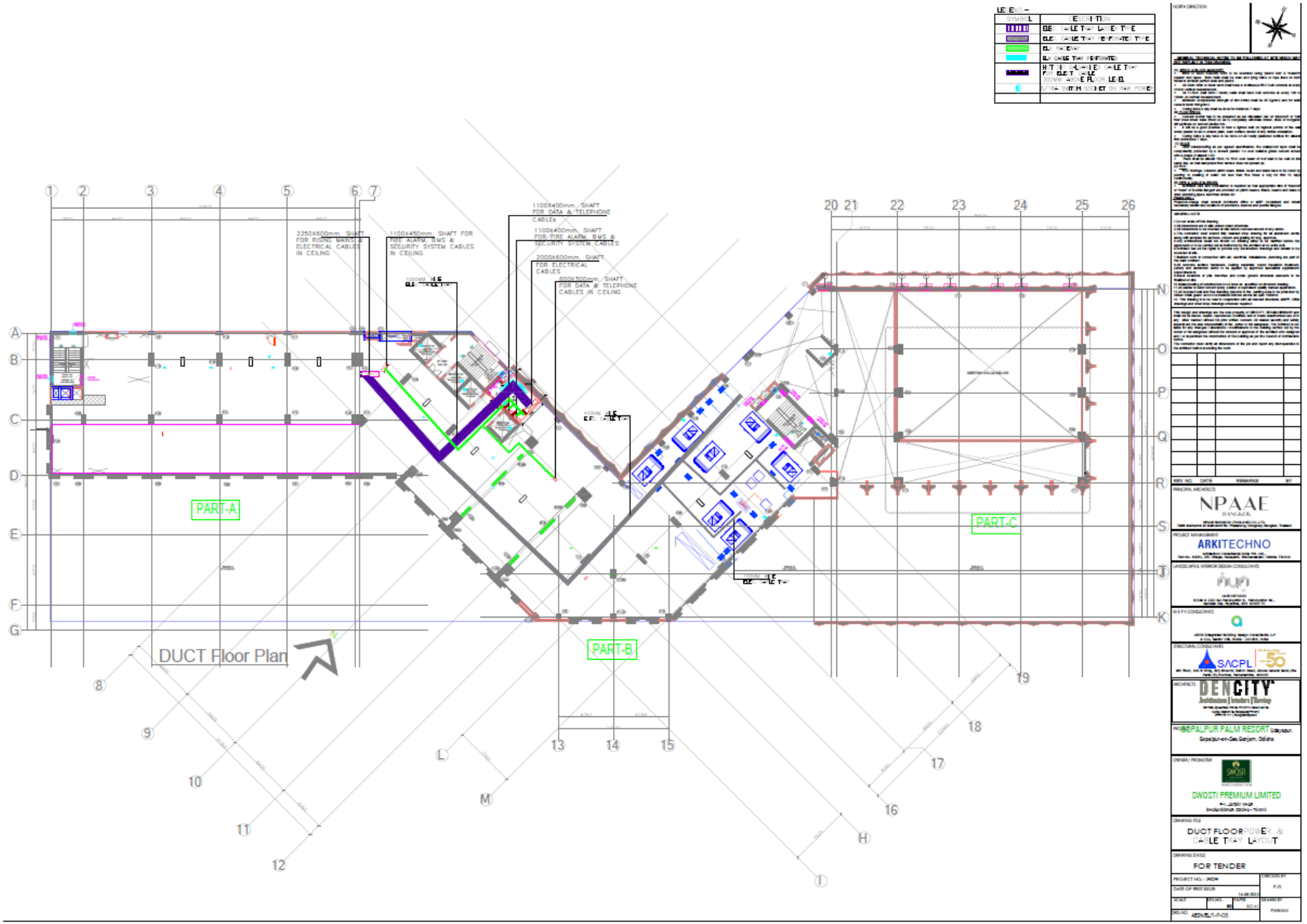
GOPALPUR PALM RESORT Udaypur, Gopalpur-on-Sea,Ganjam, Odisha

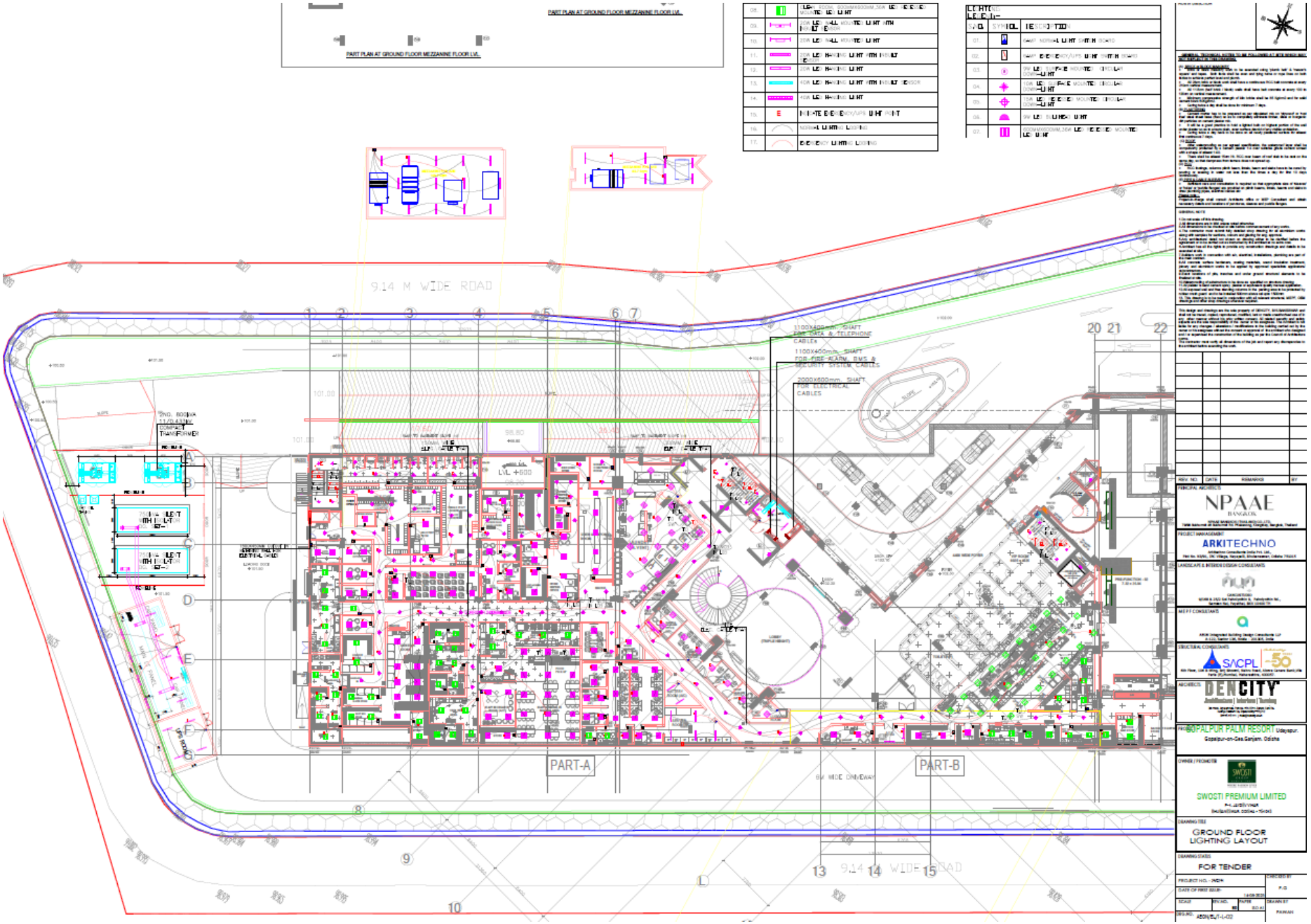
SWOSTI PREMIUM LIMITED

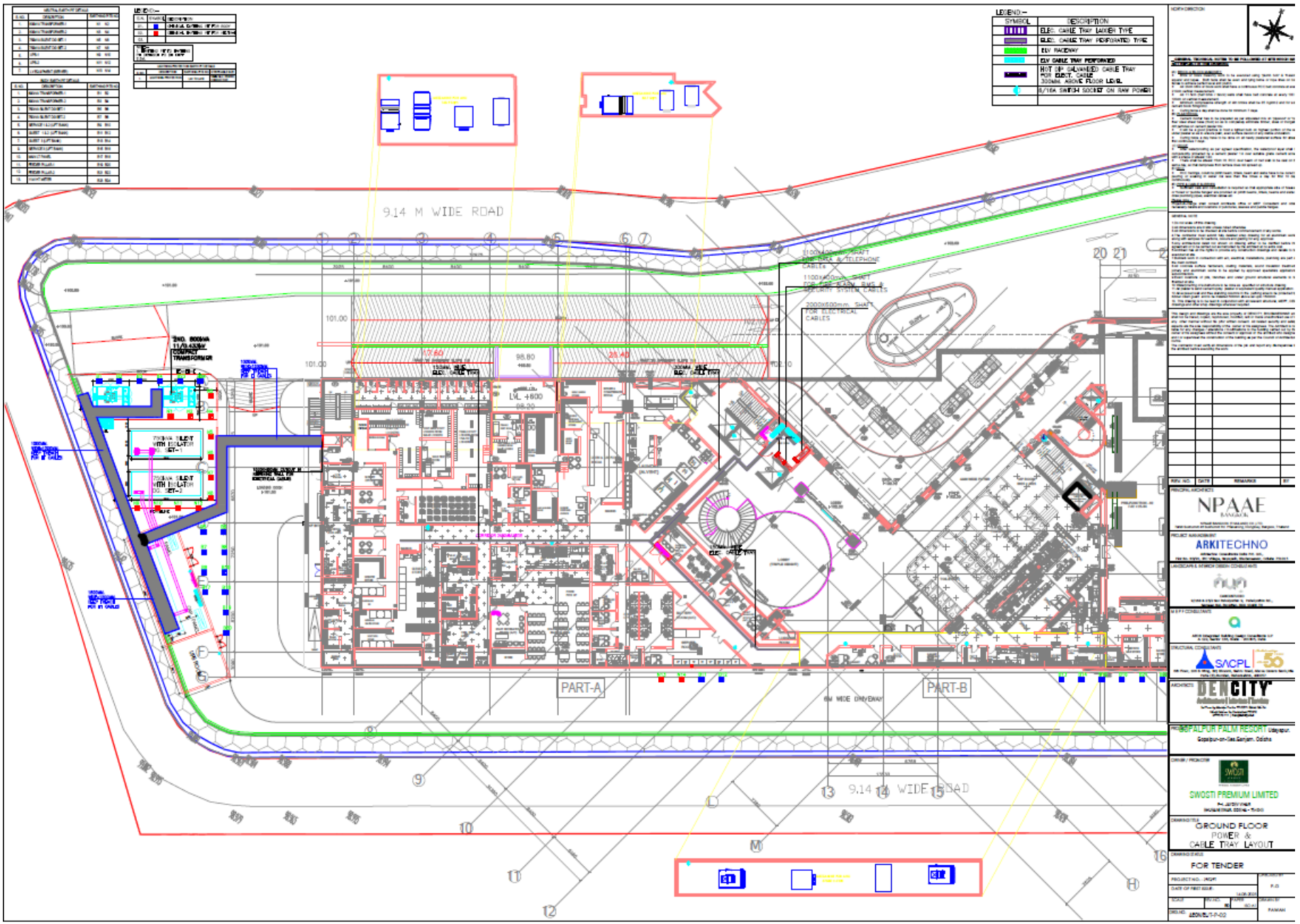
5TH & 9TH FLOOR POWER & CABLE TRAY LAYOUT

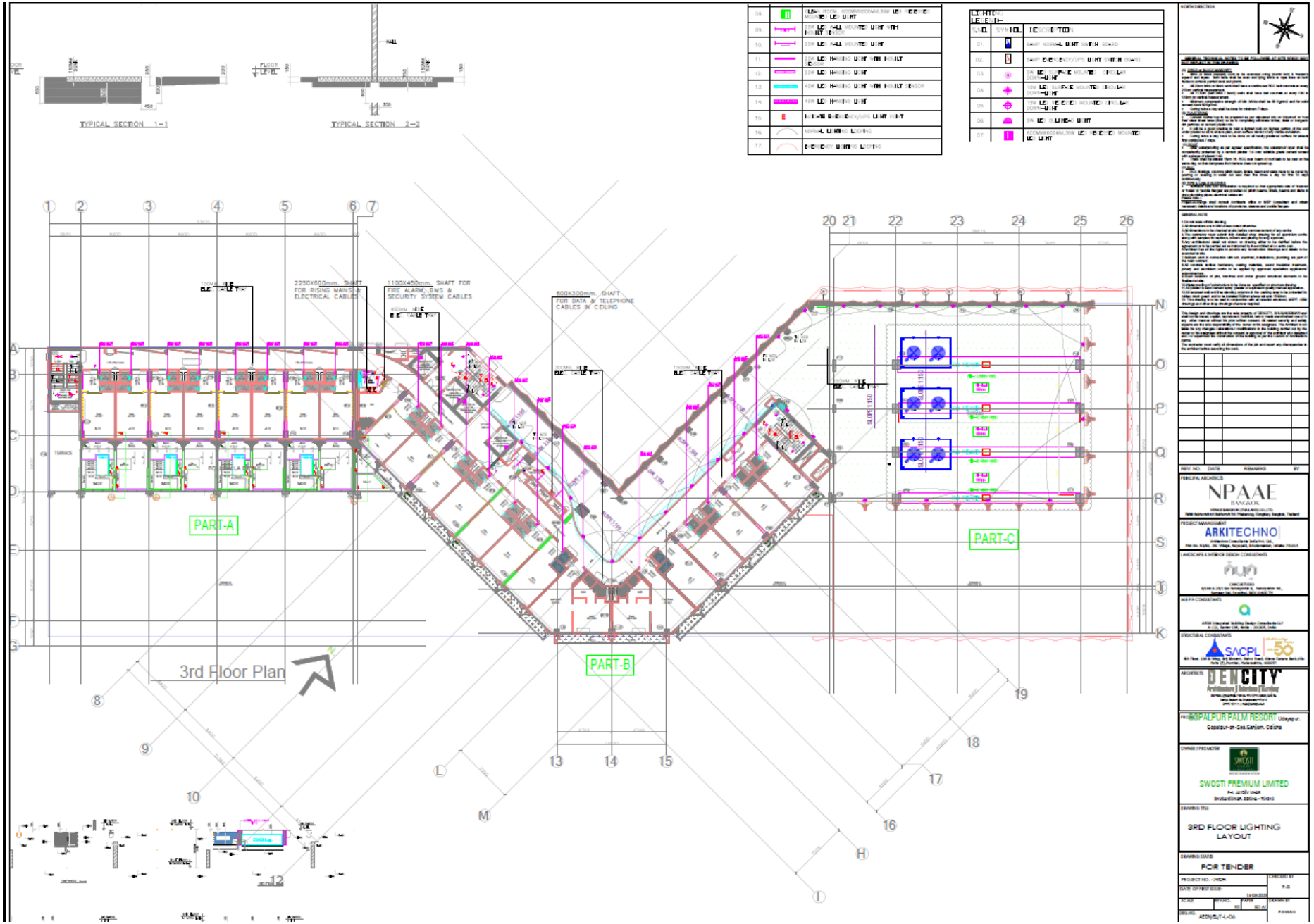
FOR TENDER


LEGEND:-
SYMBOL
DESCRIPTION
ELEC. CABLE TRAY LADDER TYPE
ELEC. CABLE TRAY PERFORATED TYPE
ELV RACEWAY
ELV CABLE TRAY PERFORATED
HOT DIP GALVANIZED CABLE TRAY FOR ELECT. CABLE 300MM. ABOVE FLOOR LEVEL
6/16A SWITCH SOCKET ON RAW POWER
1100X400mm. SHAFT FOR DATA & TELEPHONE CABLES
1100X400mm. SHAFT FOR FIRE ALARM, BMS & SECURITY SYSTEM CABLES
2000X600mm. SHAFT FOR ELECTRICAL CABLES
PARKING
PARKING
PART-A
PART-B
PART-C
COLUMN LOCATION AT LOWER GROUND FLOOR
NOTE:-
1) ALL MASONRY / FILLING IN AAC BLOCK MATERIAL
NPAAE
BANGKOK
ARKITECHNO
SACPL
DENCITY
GOPALPUR PALM RESORT Udaypur,
Gopalpur-on-Sea,Ganjam, Odisha
SWOSTI PREMIUM LIMITED
LOWER GROUND FLOOR
POWER &
CABLE TRAY LAYOUT
FOR TENDER


DUCT Floor Plan
PART-A
PART-B
PART-C
2250X600mm SHAFT FOR RISING MAINS & ELECTRICAL CABLES IN CEILING
1100X450mm SHAFT FOR FIRE ALARM, BMS & SECURITY SYSTEM CABLES IN CEILING
1100X400mm SHAFT FOR DATA & TELEPHONE CABLES
1100X400mm SHAFT FOR FIRE ALARM, BMS & SECURITY SYSTEM CABLES
2000X600mm SHAFT FOR ELECTRICAL CABLES
600X300mm SHAFT FOR DATA & TELEPHONE CABLES IN CEILING
NPAAE
BANGKOK
ARKITECHNO
SWOSTI PREMIUM LIMITED
DUCT FLOOR POWER & CABLE TRAY LAYOUT
FOR TENDER

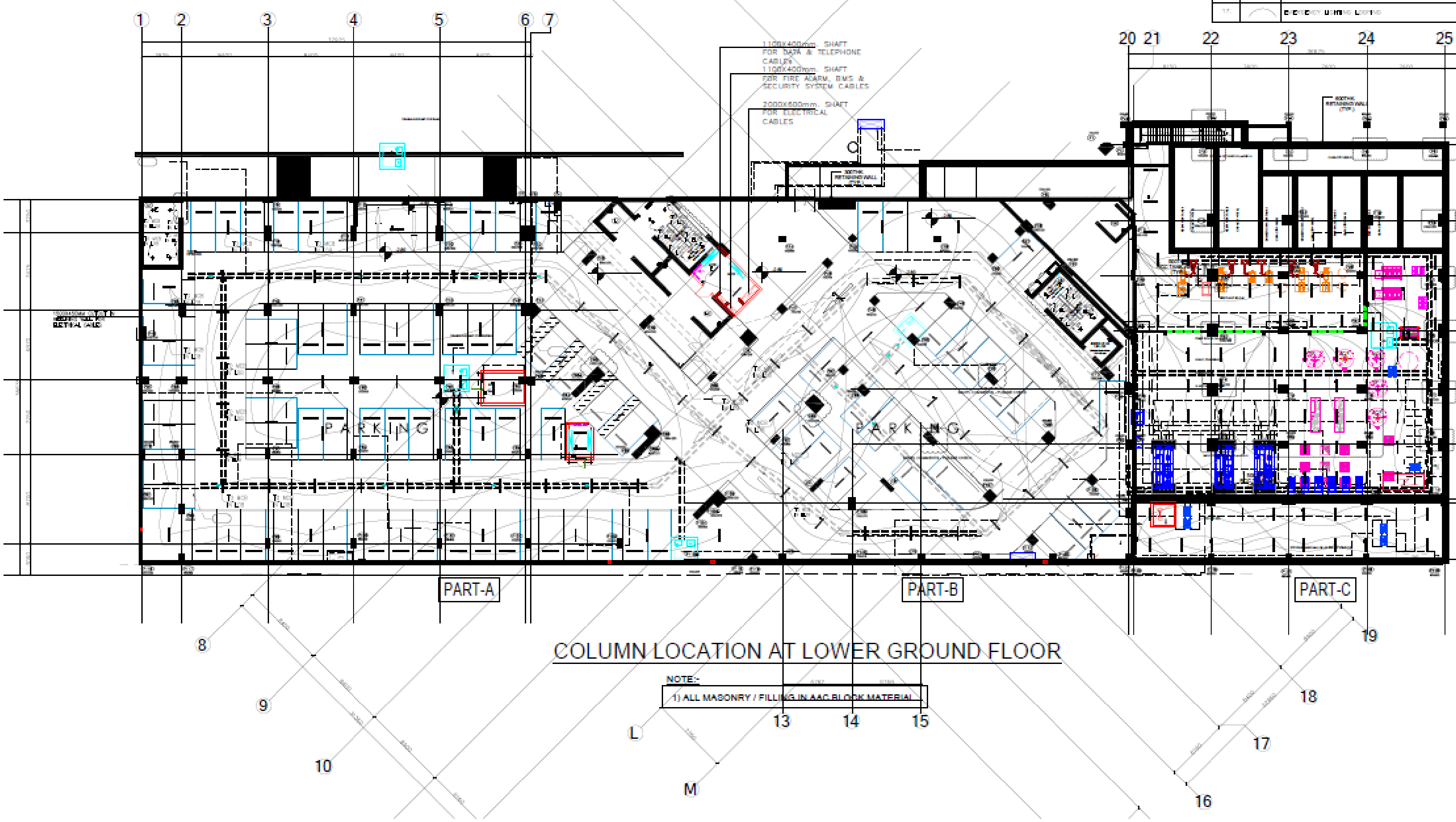

PART PLAN AT GROUND FLOOR MEZZANINE FLOOR LVL
9.14 M WIDE ROAD
PART-A
PART-B
9.14 M WIDE ROAD
GROUND FLOOR LIGHTING LAYOUT
FOR TENDER
NPAAE
BANGKOK
ARKITECHNO
DENCITY
SWOSTI PREMIUM LIMITED
GOPALPUR PALM RESORT
AEON/ELT-L-02


9.14 M WIDE ROAD
PART-A
PART-B
9.14 M WIDE ROAD
LEGEND –
SYMBOL
DESCRIPTION
ELEC. CABLE TRAY LADDER TYPE
ELEC. CABLE TRAY PERFORATED TYPE
ELV RACEWAY
ELV CABLE TRAY PERFORATED
HOT DIP GALVANIZED CABLE TRAY FOR ELECT. CABLE 300MM. ABOVE FLOOR LEVEL
16/16A SWITCH SOCKET ON RAW POWER
NORTH DIRECTION
NPAAE
ARKITECHNO
SACPL
DENCITY
SWOSTI PREMIUM LIMITED
GROUND FLOOR
POWER &
CABLE TRAY LAYOUT
FOR TENDER


TYPICAL SECTION 1-1
TYPICAL SECTION 2-2
2250X600mm SHAFT FOR RISING MAINS & ELECTRICAL CABLES
1100X450mm SHAFT FOR FIRE ALARM, BMS & SECURITY SYSTEM CABLES
600X300mm SHAFT FOR DATA & TELEPHONE CABLES IN CEILING
PART-A
PART-B
PART-C
3rd Floor Plan
LIGHTING LEGEND
SYMBOL
DESCRIPTION
NPAAE
BANGALORE
ARKITECHNO
SVCPL
DENCITY
Architecture | Interiors | Planning
GOPALPUR PALM RESORT Udayapur, Gopalpur-on-Sea,Ganjam, Odisha
SWOSTI PREMIUM LIMITED
3RD FLOOR LIGHTING LAYOUT
FOR TENDER

LIGHTING LEGEND

S.NO.	SYMBOL	DESCRIPTION
01.		6AMP NORMAL LIGHT SWITCH BOARD
02.		6AMP EMERGENCY/UPS LIGHT SWITCH BOARD
03.		6W LED SURFACE MOUNTED CIRCULAR DOWN-LIGHT
04.		10W LED SURFACE MOUNTED CIRCULAR DOWN-LIGHT
05.		15W LED RECESSED MOUNTED CIRCULAR DOWN-LIGHT
06.		9W LED BULKHEAD LIGHT
07.		600MMX600MM,36W LED RECESSED MOUNTED LED LIGHT
08.		CLEAN ROOM, 600MMX600MM,36W LED RECESSED MOUNTED LED LIGHT
09.		20W LED WALL MOUNTED LIGHT WITH INBUILT SENSOR
10.		20W LED WALL MOUNTED LIGHT
11.		20W LED HANGING LIGHT WITH INBUILT SENSOR
12.		20W LED HANGING LIGHT
13.		40W LED HANGING LIGHT WITH INBUILT SENSOR
14.		40W LED HANGING LIGHT
15.	E	INDICATE EMERGENCY/UPS LIGHT POINT
16.		NORMAL LIGHTING LOOPING
17.		EMERGENCY LIGHTING LOOPING



COLUMN LOCATION AT LOWER GROUND FLOOR

NOTE:-
1) ALL MASONRY / FILLING IN AAC BLOCK MATERIAL

REV. NO.	DATE	REMARKS	BY

PRINCIPAL ARCHITECTS
NPAAE BANGKOK

PROJECT MANAGEMENT
ARKITECHNO

LANDSCAPE & INTERIOR DESIGN CONSULTANTS

M E P F CONSULTANTS

STRUCTURAL CONSULTANTS
SACPL 50

ARCHITECTS
DENCITY Architecture | Interiors | Turnkey

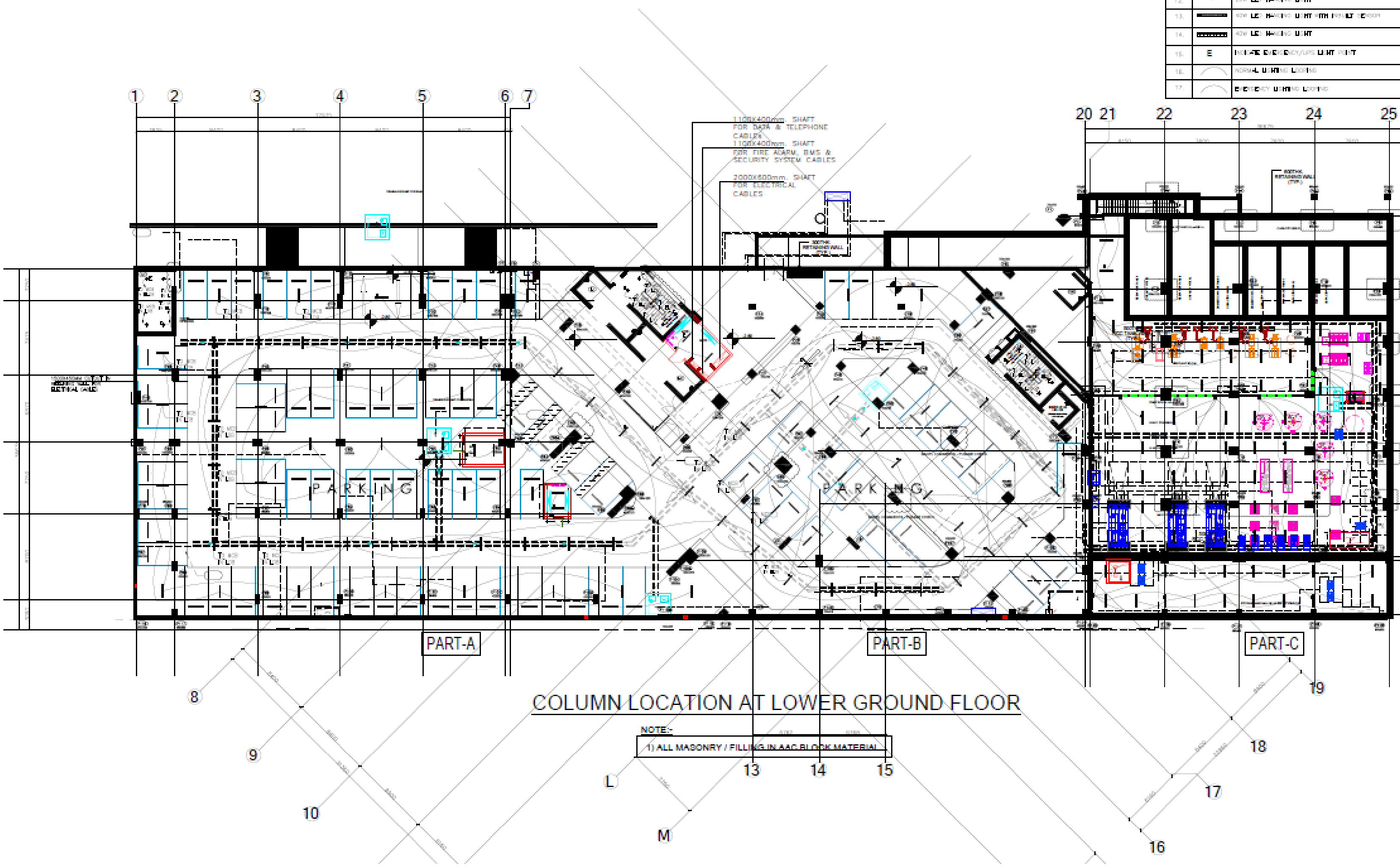
PROJECT
GOPALPUR PALM RESORT Udayapur, Gopalpur-on-Sea, Ganjam, Odisha

OWNER / PROMOTER
SWOSTI PREMIUM LIMITED

DRAWING TITLE
LOWER GROUND FLOOR PLAN LIGHTIGN LAYOUT

DRAWING STATUS
FOR TENDER

DRG.NO. AEON/EL/T-L-01



COLUMN LOCATION AT LOWER GROUND FLOOR

NOTE:-
1) ALL MASONRY / FILLING IN AAC BLOCK MATERIAL

LIGHTING LEGEND:-

S.NO.	SYMBOL	DESCRIPTION
01.		6AMP NORMAL LIGHT SWITCH BOARD
02.		6AMP EMERGENCY/UPS LIGHT SWITCH BOARD
03.		6W LED SURFACE MOUNTED CIRCULAR DOWN-LIGHT
04.		10W LED SURFACE MOUNTED CIRCULAR DOWN-LIGHT
05.		15W LED RECESSED MOUNTED CIRCULAR DOWN-LIGHT
06.		9W LED BULKHEAD LIGHT
07.		600MMX600MM,36W LED RECESSED MOUNTED LED LIGHT
08.		CLEAN ROOM, 600MMX600MM,36W LED RECESSED MOUNTED LED LIGHT
09.		20W LED WALL MOUNTED LIGHT WITH INBUILT SENSOR
10.		20W LED WALL MOUNTED LIGHT
11.		20W LED HANGING LIGHT WITH INBUILT SENSOR
12.		20W LED HANGING LIGHT
13.		40W LED HANGING LIGHT WITH INBUILT SENSOR
14.		40W LED HANGING LIGHT
15.	E	INDICATE EMERGENCY/UPS LIGHT POINT
16.		NORMAL LIGHTING LOOPING
17.		EMERGENCY LIGHTING LOOPING

REV. NO.	DATE	REMARKS	BY

PRINCIPAL ARCHITECTS: NPAAE BANGKOK

PROJECT MANAGEMENT: ARKITECHNO

LANDSCAPE & INTERIOR DESIGN CONSULTANTS

M E P F CONSULTANTS

STRUCTURAL CONSULTANTS: SACPL

ARCHITECTS: DENCITY Architecture | Interiors | Turnkey

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

OWNER / PROMOTER: SWOSTI PREMIUM LIMITED

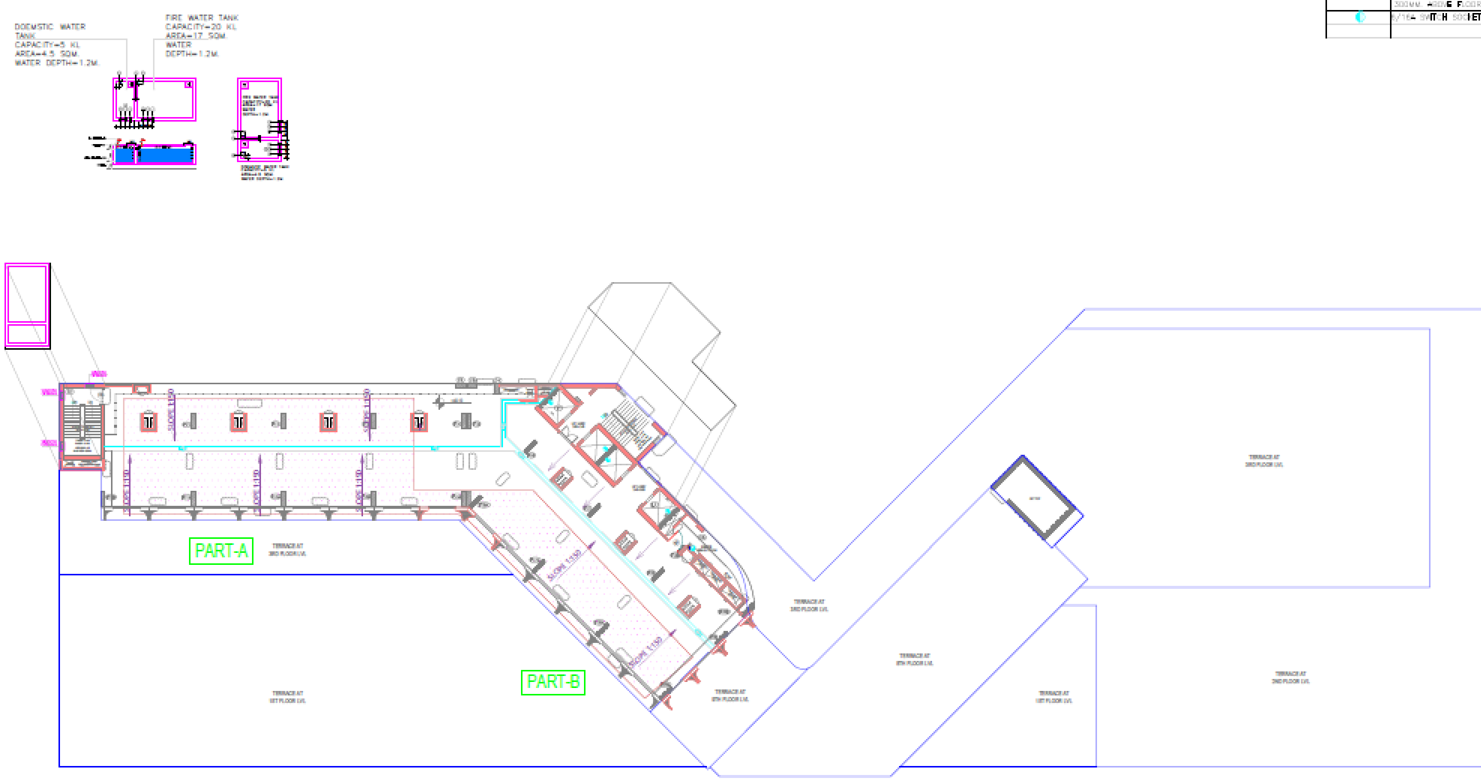
DRAWING TITLE: LOWER GROUND FLOOR PLAN LIGHTIGN LAYOUT

DRAWING STATUS: FOR TENDER

CHECKED BY: P.G

DRAWN BY: PAWAN

DRG.NO. AEON/EL/T-L-01



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.

LEGEND:-

SYMBOL	DESCRIPTION
	ELEC. CABLE TRAY LADDER TYPE
	ELEC. CABLE TRAY PERFORATED TYPE
	ELV RACEWAY
	ELV CABLE TRAY PERFORATED
	HOT DIP GALVANIZED CABLE TRAY FOR ELECT. CABLE 300MM. ABOVE FLOOR LEVEL
	6/16A SWITCH SOCKET ON RAW POWER

NORTH DIRECTION

PRINCIPAL ARCHITECTS
NPAAE
BANGKOK

PROJECT MANAGEMENT
ARKITECHNO

LANDSCAPE & INTERIOR DESIGN CONSULTANTS

M E P F CONSULTANTS

STRUCTURAL CONSULTANTS
SACPL

ARCHITECTS
DENCITY

PROJECT: GOPALPUR PALM RESORT Udaypur,
Gopalpur-on-Sea,Ganjam, Odisha

OWNER / PROMOTER
SWOSTI PREMIUM LIMITED

DRAWING TITLE
TERRACE FLOOR
POWER &
CABLE TRAY LAYOUT

DRAWING STATUS
FOR TENDER

DRG.NO. AEON/ELT-P-09
DRAWN BY: PAWAN

SECTION-4

FINANCIAL PROPOSAL SUBMISSION FORM

(To be submitted in separate sealed Envelop)

{Location, Date}

To

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

Dear Sirs:

We, the undersigned, offer to provide the services for "Supply, Installation, Testing & Commissioning of External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) & Allied Services 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 External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) &Allied Servics

Item No.	Description	Unit	Qty	Rate (INR)	Amount (INR)
A	**SUBSTATION EQUIPMENT**				
	The rates shall also include the following :				
1	Supporting rigid steel framework.				
2	All fixing accessories such as foundation bolts, nuts and bolts etc. as required.				
3	Complete with interconnections and distribution bus bars along with connector strip.				
4	Proper bonding to earth as per standard.				
5	Painting/lettering on Breakers and distribution boards, the location they serve, providing on each panel its circuit diagram.				
6	Rubber mats shall be provided in front and back of the HT switchgear as per IS 15652-2006.				
7	All control cabling including termination between transformer and HT switchgear as required.				
8	Provision shall be made for all HT breakers to be hooked up with BAS for status indication.				
A	**SUBSTATION EQUIPMENT**				
1	Supplying & laying of following **11 kV** grade XLPE insulated Aluminium conductor armoured cables as per specification **laid in existing Trench** clamped to wall/ceiling with suitable clamps including, saddles fixing bolts, connecting testing and commissioning complete in all respect as required as per site conditions. Note: The price shall be inclusive of all straight thru joints wherever required.				

1.1	3 core 240 sq. mm Al arm (E)	RM	100		
2	Supplying and making Cable end termination of the following XLPE insulated Aluminium conductor armoured cables of **11 kV** grade including termination kits, heat shrinkable sleeves etc with earthing testing and commissioning complete in all respect as required as per site conditions.				
2.1	Outdoor type Heat strinkable type termination kit suitable for 11kV (earthed) grade, 3C x 240 sqmm XLPE Al. Ar. cable	No.	4		
2.2	Indoor type Heat strinkable type termination kit suitable for 11kV (earthed) grade, 3C x 240 sqmm XLPE Al. Ar. cable	No.	R.O		
3	Supplying & laying of following 1100 volt grade XLPE insulated PVC sheathed Copper conductor armoured/Unarmored cables as per specification laid in trench, pipe, cable tray including cost of digging upto required depth, over a bed of sand, brick protection, route marker, back filling etc with suitable clamps including, saddles fixing bolts, connecting with appropriate thimble, metal glands, termination, testing and commissioning complete in all respect as required as per site conditions.				
3.1	2 core 2.5 sq.mm Cu arm.	RM	150		
3.2	3 core 2.5 sq.mm Cu arm.	RM	100		
3.3	4 core 2.5 sq.mm Cu arm.	RM	100		
3.4	7 core 2.5 sq.mm Cu arm.	RM	150		
3.5	19 core 2.5 sq.mm Cu arm.	RM	150		
4	Supplying and laying class `B' NP 2 GI / RCC/Heavy Duty PVC Hume pipe embedded in wall / floor / below ground level. The rate shall include excavation, laying of pipe, refilling, consolidating, making the chase in the brick wall, embedding the pipes and redoing the surface. Any specials like nipples, collars shall also be included in this item rate only.				
4.1	300 mm dia PVC	RM	50		
4.2	150 mm dia PVC	RM	50		

5	Supply, installation, testing and commissioning of 110VAC DC Charger for Protection System complete with rectifier, Inverter or DC charger as required for the 11kV switchgear including BMS monitoring. Supply, unload, install, store at site, test and commission 100Ah Inverter or DC charger, batteries etc. with 1 hour back up				
	>> Battery breakers.				
	>> Interconnecting cable between batteries.				
	>> Cable between inverter and batteries.				
	>> Battery stand.	Set	1		
6	Supply and fixing in position the approved “Shock Treatment Charts” written in English and Local Language. These charts shall be framed in teak wood frame and covered with glass. (1 No. each in LT room, HT room, Transformer,)	No.	3		
7	Supply and fixing in position the best quality Danger Boards of approved shape and size as specified by Local Electricity Authorities written in English & Local Languages. (1 No. each in LT room, HT room, Transformer)	No.	3		
8	Supply & Laying of non skid Electro mat 1mtr wide and 2.5 mm thick 11 kV grade IS 15652 as required including cutting to required length complete as per requirement of local electricity authorities.	RM	50		
9	Providing and fixing HV danger notice plate of 250 X 200 mm, made of mild steel at least 2 mm thick and vitreous enameled white on both sides and with incscription in single red colour on front side as required (English & Local Languages) (1 No. each in HT room, Transformer)	Set	2		
10	Providing and fixing LV danger notice plate of 200 X 150 mm, made of mild steel at least 2 mm thick and vitreous enameled white on both sides and with incscription in single red colour on front side as required (English & Local Languages.) (1 No. each in main LT room)	Set	2		
11	Supplying of Rubber hand gloves suitable for 11 kV.	Set	1		
12	Supply of First aid box containing material as prescribed by St. John Ambulance brigade OR Indian Red Cross complete as required.	Set	1		

13	Providing Single Line Diagram on 5mm thick Aluminium sheet in A1 Size duly laminated.	Set	1		
14	Receiving, unloading, inspection, handling, storing, shifting to foundation, installation, testing and commissioning of 11/0.433 kV 800 kVA distribution transformer Substation etc complete in all respect as required as per specification.	Set	2		
	TOTAL CARRIED TO SUMMARY				
B.	**<u>LT PANELS & DISTRIBUTION BOARDS</u>**				
	The rates for the distribution boards apart from the Breakers and instruments shall also include the following :				
1	Supporting rigid steel framework.				
2	Cubicle type, 16 gauge CRCA sheet steel enclosed & Type 4b/3b/2b modular construction.				
3	Complete with interconnections and distribution bus bars along with connector strip.				
4	Proper bonding to earth as per standard.				
5	Painting/lettering on Breakers and distribution boards, the location they serve, providing on each panel its circuit diagram.				
6	Providing cable clamps / supports within distribution boards cable alley.				
7	All MCB's shall be of minimum 10 kA breaking capacity.				
8	Distribution panels / bus ducts / rising mains shall be Powder Coated with RAL-7032 shade or as approved.				
9	Following Degree of protection for all type of distribution panel enclosure shall be as per IS:13947-1993:				
a	IP 42 for indoor panels.				
b	IP 54 for kitchen and laundry panels.				
c	IP 55 for outdoor panels.				
10	Current density of shall be 0.8 A per sqmm for Aluminium & 1.4 A per sqmm for Copper				

	for rated current of bus bars.				
11	GI earth bus shall be provided through out the length of each board as per schematic diagram.				
12	All measuring instruments (Meters) shall be of digital electronic (LED Type) of approved make.				
13	All hinged door shall be earthed through 2.5 sq mm tinned braided copper wire.				
14	All panels shall have provision of the Pad locking of MCCB's handles in "OFF" Position.				
15	Additional set of C.T.s, potential free contacts, connectors, contactors with wiring etc are to be provided for BAS including space required for various transducers in main LT panel sections, etc. Only transducers shall be supplied by BAS tenderer.				
16	All MCB's used for protection of resistive and lightly inductive load shall be type "B" characteristic and inductive (motor) load shall be of type "C" characteristic and discharge lamps and UPS etc. shall be of type D characteristic.				
17	All incoming and outgoing air circuit breakers shall be placed on middle portion of the vertical in single tier formation.				
18	CT's shall be properly mounted and clamped. Connection of CT's for measuring instrument / relays shall be done through connector / terminals.				
19	Model, current capacity location and frame size of switchgear shall be written inside of the panel doors with paint / permanent marker as approved shop drawings / site requirement.				
20	All electronic meters with RS - 485 port and ACB's communication port shall be wired with shielded wire upto separate marshalling box for termination of all control wires and communication system.				
21	Compliance to the technical specifications.				

B.	**LT PANELS & DISTRIBUTION BOARDS**				
1	Design, fabrication, assembling, wiring and supply, installation, testing and commissioning of Main LT Panel (TTA) fabricated out of (load bearing member of 2mm and non load bearing member 1.6 mm thick) CRCA sheet steel in cubicle compartmentised modular 4b construction, free standing floor mounted with bottom cable entry, dust and vermin proof with reinforcement of suitable size angle iron, channel, `T' sections and / or flats wherever necessary. 3 mm thick cable gland plates shall be provided on top as well as at the bottom of the panels. Panels shall be treated with all anticorrosive process before powder coating as per specifications and final approved shade. 2 Nos. earthing terminals shall be provided for all distrtibution panels. Panels shall be suitable for 415V, 3 phase, 4 wire, 50 HZ supply system. Lifting hooks shall also be provided in case of large panels. Approval shall be taken for each panel in the form of shop drawings before fabrication. Galvanised hardwares with zinc passivation shall be used in fabrication of panels.				
	All Panels shall conform to relevant IEC/IS standard including the earth leakage protection complete as per specification & drawings as required and as given below. All internal wiring in the panels shall be carried out using high temperature FRLSZH wires.				
	All live accessible parts shall be shrouded and all equipment shall be finger touch proof. The busbars shall be insulated with heat shrinkable sleeves. SMC/DMC shrouds and busbar supports suitably spaced shall be used. Hinged doors with padlocking facility shall be provided on all outgoing feeders with switch handles lockable in OFF position.				
	Space provision @ 15% for future expansion				
	All MCCBs shall be current limiting type microprocessor based, rated for requisite specified Service short circuit breaking capacity (Ics suitable for isolation conforming to latest IEC947-2/IS13947-2 duly marked on MCCB, at operating voltage (Ue) of 415 V, insulation voltage (Ui) 750 V and with trip free mechanism, handle indicating ON/OFF/tripped position. The breaking capacity as mentioned shall be Ics values.				
	All MCCB has inbuilt feature of earth fault protection.				

	MCCBs shall be compact (As the Engineer may decide), suitably designed to provide protection of motors, cables, busbars to suit rated current, unbalanced power distribution as required and with front adjustable overload and short circuit releases and minimum electrical endurance of the order of 7000-8000 operation cycles for capacity of 100-250 amps.				
	MCBs shall conform to IEC898/IS 8828 (latest) and, with breaking capacity 9/10 kA at 415 V AC, current limiting type lower powerloss appx 40 - 70% of the stipulated value and suitable for magnetic releases operating between 3 to 5 times rated current for normal power distribution application and 5 to 10 times rated current for moter application duty, with minimum Electrical endurance of the order of 20000 operation cycles.				
1.1	**MAIN LT PANEL (LT Panel Room)**				
a	**Incomer Air Circuit Breaker (from Transformer 1 & 2), Each comprising of following**				
	1250 amps 4 pole (Icu=Ics=Icw-50 kA/ Second) electrically operated manually draw out type air circuit breaker with microprocessor release unit with RS-485 connectivity port having following protection: • Over current (L), Short Circuit (S), Ground Fault (G), Current Unbalance, Voltage Unbalance, Under and over Voltage, Trip Circuit supervision, Phase sequence reversal. Maximum demand, Fault History records, Event records facilities, LED display, % loading with adjustable setting.				
	Multi function meter (Equivalent to ABB M1M 30B) (CT: Core-1: 2 Nos. 1250/5 amps burden: 7.5VA, Accuracy class-1.0) RS-485 connectivity port for measuring following electrical parameters; % THD up to 15 harmonic, Voltage, Current, Energy, Power, Peak Demand Power, Maximum demand, LED display				
	Core-2: 2 Nos. 1250/5 amps 7.5VA CTs, CL - 1.0 & RS-485 connectivity port for Automatic power factor corrention relay				
	Digital Voltmeter with inbuilt selector switch (Equivalent to ABB M1V-3)				
	Digital Ammeter with inbuilt selector switch (Equivalent to ABB M1A-3)				
	24 V DC Shunt trip coil. - 1 Set				

	240 V AC under voltage release. - 1 Set				
	Auto-manual / test selector / switch - 1 Set				
	Breaker control switch - 1 Set				
	Phase indicating light shall be protected by 2 amps MCB's. 1 Set				
	Breaker ON / OFF / TRIP/ TCH/ spring charge indicating lights with control MCB's. 1 Set				
	SPD type-I Spark gap technology, IMP Wave- 10/350 µs peak current waveform, Un/Uc- 400/440 V AC , Up - >1.5 kV, limp 25kA per pole, In- 25 kA , Surge Arrester with inbuilt fuse and indication for both the states (green for 'ok' and red for failure) on all modules - 1 Set				
b	**Incomer Air Circuit Breaker (From DG Set - 1 & DG Set - 2) Each comprising of following**				
	1250 amps 4 pole (Icu=Ics=Icw-50 kA/ Second) electrically operated manually draw out type air circuit breaker with microprocessor release unit with RS-485 connectivity port having following protection: • Over current (L), Short Circuit (S), Ground Fault (G), Current Unbalance, Voltage Unbalance, Under and over Voltage, Trip Circuit supervision, Phase sequence reversal. Maximum demand, Fault History records, Event records facilities, LED display, % loading with adjustable setting.				
	Multi function meter (Equivalent to ABB M1M 30B) (CT: Core-1: 3 Nos. 1250/5 amps burden: 7.5VA, Accuracy class-1.0) RS-485 connectivity port for measuring following electrical parameters; % THD up to 15 harmonic, Voltage, Current, Energy, Power, Peak Demand Power, Maximum demand, LED display				
	Core-2: 3 Nos. 1250/5 amps 7.5VA CTs, CL - 1.0 & RS-485 connectivity port for Multi Function relay				

	Multi function numeric relay with RS-485 communication ports for the following protection with CT: 3 Nos. 1250/1 amps burden:15VA, Accuracy Class-1.0. Check synchronizing Relay (25) Under Voltage relay (27) Reverse power realy (32) Loss of excitation relay (40) Current unbalance (46) Thermal over load (49) Breaker failure protection (50 BF) Voltage restrained instantaneous over current protection (50V) , high set shall be provided on all phases. Voltage restrained IDMT over current protection (51V) , low set shall be provided on all phases. Ground fault protection Device No.50N, high set shall be provided and Device No.51 N, low set shall be provided. Over Volatge Relay (59) Under / Over frequency (81) Engine cranking relay				
	Emergency Push Button.				
	Control wiring for Synchronizing Module (for Synchronizing System)				
	Audio visual annunciation windows with, accept, reset & test,start stop push buttons				
	16 Window Solid state Annunciator for each DG sets				
	Set fails to start (only alarm)				
	Over current (breaker trip)				
	Earth Fault (Breaker trip)				
	Excitation Failure (Engine should be stop with breaker trip)				
	Reverse Power (Breaker trip)				
	Over speed (Breaker will trip with engine stop command)				
	Low Lube Oil pressure (Breaker will trip with engine stop command)				
	High Water Temperature (Breaker will trip with engine stop command				
	Over / Under Voltage (Breaker trip)				
	Bearing Temperature high (breaker will trip with engine stop command)				
	Under / Over Frequency (Breaker trip)				
	Winding Temperature High Breaker with trip with engine stop command)				
	Differential Fault (Engine / Alternator field shall cut off)				
	Battery charger with voltmeter of range 0-50 volts and ammeter of range 0-50 amps for trickle and boost charging.				
	Temperature scanner (Messi Bus/Procon)				
	24 V DC Shunt trip coil. - 1 Set				

	240 V AC under voltage release. - 1 Set				
	Auto-manual / test selector / switch - 1 Set				
	Breaker control switch - 1 Set				
	Phase indicating light shall be protected by 2 amps MCB's. 1 Set				
	Breaker ON / OFF / TRIP/ TCH/ spring charge indicating lights with control MCB's. 1 Set				
c	**Bus Bar comprising of :**				
	4P aluminium bus bars of minimum 1600 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min. 50 kA for 1 sec.				
d	**Bus Coupler comprising of:**				
	1250 amps 4 pole (Icu=Ics=Icw-50 kA/ Second) electrically operated manually draw out type air circuit breaker with microprocessor release unit with RS-485 connectivity port having following protection: • Over current(L), Short Circuit (S), Ground Fault (G), Current Unbalance, Voltage Unbalance, Under and over Voltage, Trip Circuit supervision, Phase sequence reversal. Maximum demand, Fault History records, Event records facilities, LED display, % loading with adjustable setting.				
	24 V DC Shunt trip coil. - 1 Set				
	240 V AC under voltage release. - 1 Set				
	Auto-manual / test selector / switch - 1 Set				
	Breaker control switch - 1 Set				
	Phase indicating light shall be protected by 2 amps MCB's. 1 Set				
	Breaker ON / OFF / TRIP/ TCH/ spring charge indicating lights with control MCB's. 1 Set				
e	**Outgoing comprising of :**				
i.	8 Nos. 630 Amp 4 Pole MCCB (Ics = Icu = 35 KA) microprocessor based release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's, Dual Energy Meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port and 3 Nos. 630/5 amps CTs, burden-15VA, Accuracy Class-1.0.				

ii.	6 Nos. 400 Amp 4 Pole MCCB (Ics = Icu = 35 KA) microprocessor based release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's, Dual Energy Meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port and 3 Nos. 400/5 amps CTs, burden-15VA, Accuracy Class-1.0.				
ii.	3 Nos. 250 Amp 4 Pole MCCB (Ics = Icu = 35 KA) microprocessor based release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's, Dual Energy Meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port and 3 Nos. 250/5 amps CTs, burden-15VA, Accuracy Class-1.0.				
iii.	5 Nos. 200 Amp 4 Pole MCCB (Ics = Icu = 25 KA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's, Dual Energy Meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port and 3 Nos. 200/5 amps CTs, burden-15VA, Accuracy Class-1.0.				
iv.	3 Nos. 160 Amp 4 Pole MCCB (Ics = Icu = 25 KA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's, Dual Energy Meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port and 3 Nos. 160/5 amps CTs, burden-15VA, Accuracy Class-1.0.				
v.	7 Nos. 125 Amp 4 Pole MCCB (Ics = Icu = 25 KA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's, Dual Energy Meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port and 3 Nos. 125/5 amps CTs, burden-15VA, Accuracy Class-1.0.				
vi.	7 Nos. 100 Amp 4 Pole MCCB (Ics = Icu = 25 KA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's, Dual Energy Meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port and 3 Nos. 125/5 amps CTs, burden-15VA, Accuracy Class-1.0.				
	Notes:-				
a	All Outgoing feeders shall be provided with Energy Meter for VAF, PF, Power & eneregy with RS - 485 port equivalent to Schneider make EM6438H and all meters wired at one point for BMS compatibility.				
b	All ACB, MCCB RS 485 ports and meters shall be wired at one point for BMS				

	compatibility.				
c	All Outgoing feeders shall be provided with Three phase indicating lamps protected by 2 amps SP MCBs.				
d	All Outgoing feeders shall be provided with ON/OFF/TRIP Indications and shall be protected by 2 amps SP MCBs.				
e	All incoming and outgoing breakers shall be electrically/ mechanically interlocked through a **breaker management PLC** comprising suitable nos. digital inputs (24 VDC) and output (Relay) for auto operation as per load requirement. PLC bypass shall also be provided.				
f	All incoming, outgoing and buscoupler breakers shall be minimum 50 kA rating with Icu = Ics.				
g	Each section of the panel shall be provided with LED light & limit switch, space heater and thermostat etc.				
h	Suitable Quantity Novec 1230 gas based suppression system with gas bank, Linear Pneumatic heat trace tubing system along with associated automatic valves, connectors, brackets, mounting accessories, Low pressure switch for monitoring system activation, Audio Visual alarm shall be provided for all vertical & horizontal compartments in Panel.				
i	Transformer & DG Section shall be in Blue & Orange Colour. Bus Coupler shall be in Green Colour.				
j	All outgoing breakers shall have Z CT & EF relay.				
k	1250/5, 15 VA dual ratio CT's shall be provided for APFCR on each transformer incomer.				
	MAIN LT PANEL (LT Panel Room) described as above	No.	1		
1.2	**300 kVAR Capacitor Panel - 1 & 2**				
	Incomer comprising of :				
a.	630 amps 4 pole (Icu=Ics=Icw-65 kA/ Second) electrically operated manually draw out type air circuit breaker with microprocessor release unit with RS-485 connectivity port having following protection: • Over current(L), Short Circuit (S), Ground Fault (G), Current Unbalance, Voltage Unbalance, Under and over Voltage, Trip Circuit supervision, Phase sequence reversal. Maximum demand, Fault History records,				

	Event records facilities, LED display, % loading with adjustable setting.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 630/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
	800 Amps 4 Pole Aluminium Bus Bar with colour coded heat shrinkable steeve - 1 set				
	Outgoing comprising of :				
a.	100 kVAR Capacitor Bank - 1 Set each comprising of following:				
	250 Amps TP MCCB - 1 Set				
	250 amps or capacitor heavy duty 525 volts 50Hz contactors. - 1 Set				
	“ON” /”OFF” push buttons and indicating lamps. - 1 Set				
	100 kVAR, 525 volts capacitor unit as specified - 1 Set				
b.	50 kVAR Capacitor Bank - 3 Set each comprising of following:				
	125 Amps TP MCCB - 1 Set				
	125 amps or capacitor heavy duty 525 volts 50Hz contactors. - 1 Set				
	“ON” /”OFF” push buttons and indicating lamps. - 1 Set				
	50 kVAR, 525 volts capacitor unit as specified - 1 Set				
c.	25 kVAR Capacitor Bank - 1 Set each comprising of following:				
	63 Amps TP MCCB - 1 Set				
	63 amps or capacitor duty 525 volts 50Hz contactors. - 1 Set				
	“ON” /”OFF” push buttons and indicating lamps. - 1 Set				
	25 kVAR, 525 volts capacitor unit as specified - 1 Set				
d.	15 kVAR Capacitor Bank - 1 Set each comprising of following:				
	40 Amps TP MCCB - 1 Set				

	40 amps or capacitor duty 525 volts 50Hz contactors. - 1 Set				
	"ON" /"OFF" push buttons and indicating lamps. - 1 Set				
	15 kVAR, 525 volts capacitor unit as specified - 1 Set				
e.	10 kVAR Capacitor Bank - 1 Set each comprising of following:				
	40 Amps TP MCCB - 1 Set				
	40 amps or capacitor duty 525 volts 50Hz contactors. - 1 Set				
	"ON" /"OFF" push buttons and indicating lamps. - 1 Set				
	10 kVAR, 525 volts capacitor unit as specified - 1 Set				
	Notes:				
a.	All incoming and outgoing breakers shall be minimum 35 kA rating with Icu = Ics.				
b.	Heavy duty exhaust fans to be provided for cooling Capacitors & Filters.				
c.	LED indication for number of capacitor banks 'ON'.				
d.	LED indication of Power Factor lagging or leading.				
e.	APFC system shall comprise of following: i. Over Voltage ii. Voltage Imbalance iii. Earth Leakage				
f.	All MCBs shall be minimum 10 kA breaking capacity.				
	300 kVAR Capacitor Panel - 1 & 2 described as above	Set.	2		
2	Design, fabrication, assembling, wiring and supply, installation, testing and commissioning of LT Panel, Distribution Panels, fabricated out of (load bearing member of 2mm and non load bearing member 1.6 mm thick) CRCA sheet steel in cubicle compartmentised modular 3b construction, free standing floor mounted with bottom cable entry, dust and vermin proof with reinforcement of suitable size angle iron, channel, `T' sections and / or flats wherever necessary. 3 mm thick cable gland plates shall be provided on top as well as at the bottom of the panels. Panels shall be treated with all anticorrosive process before powder coating as per specifications and final approved shade. 2 Nos. earthing terminals shall be provided for all distrtibution panels. Panels shall be suitable for 415V, 3 phase, 4				

	wire, 50 HZ supply system. Lifting hooks shall also be provided in case of large panels. Approval shall be taken for each panel in the form of shop drawings before fabrication. Galvanised hardwares with zinc passivation shall be used in fabrication of panels.				
2.1	**MDB-VENTI-1 (LOC. :-ELECTRICAL ROOM) BASEMENT-1 FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 400 Amps 4 Pole MCCB with Microprocessor based releases for SC, OL & EF protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 400/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 500 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 35 kA for 1 sec.				
	Outgoing comprising of :				
i	1 Nos. 125 Amp TPN MCCB (Ics = Icu = 25 kA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
ii	1 Nos. 63 Amp TPN MCCB (Ics = Icu = 25 kA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
iii	25 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				

	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-VENTI-1 (LOC. :-ELECTRICAL ROOM) BASEMENT-1 FLOOR described as above	Set.	1		
2.2	**MDB-VENTI-2 (LOC. :-ELECTRICAL ROOM) SECOND FLOOR)**				
	Incomer comprising of :				
a.	1 Nos. 250 Amps 4 Pole MCCB with Microprocessor based releases for SC, OL & EF protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 250/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 300 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i	2 Nos. 125 Amp TPN MCCB (Ics = Icu = 25 kA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
ii	3 Nos. 63 Amp TPN MCCB (Ics = Icu = 25 kA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
iii	4 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
iv	8 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
v	5 Nos 32 Amps 4P 'C' curve, MCB, Ics-10 KA				

	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-VENTI-2 (LOC. :-ELECTRICAL ROOM) SECOND FLOOR) described as above	Set.	1		
2.3	**SDB-VENTI-1.1 (LOC. :-ELECTRICAL ROOM) GROUND FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 63 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 63/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 100 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i	4 Nos 32 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	8 Nos 25 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	SDB-VENTI-1.1 (LOC. :-ELECTRICAL ROOM) GROUND FLOOR described as above	Set.	1		
2.4	**SDB-VENTI-1.2 (LOC. :-ELECTRICAL**				

	ROOM) FIRST FLOOR				
	Incomer comprising of :				
a.	1 Nos. 125 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 125/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 150 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i	12 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	SDB-VENTI-1.2 (LOC. :-ELECTRICAL ROOM) FIRST FLOOR described as above	Set.	1		
2.5	**SDB-VENTI-2.1 LOC. :-ELECTRICAL ROOM TERRACE FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 125 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 125/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps				

	each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 150 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i	3 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	8 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
iii	3 Nos 25 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	SDB-VENTI-2.1 LOC. :-ELECTRICAL ROOM TERRACE FLOOR described as above	Set.	1		
2.6	**MDB-AHU-1 (LOC. :-ELECTRICAL ROOM) GROUND FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 125 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 125/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 150 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1				

	sec.				
	Outgoing comprising of :				
i	3 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	1 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
iii	5 Nos 32 Amps 4P 'C' curve, MCB, Ics-10 KA				
iv	16 Nos 25 Amps 4P 'C' curve, MCB, Ics-10 KA				
v	3 Nos 16 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-AHU-1 (LOC. :-ELECTRICAL ROOM) GROUND FLOOR described as above	Set.	1		
2.7	**MDB-AHU-2 (LOC. :-ELECTRICAL ROOM) SERVICE FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 125 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 125/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 150 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				

i	2 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	3 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
iii	5 Nos 32 Amps 4P 'C' curve, MCB, Ics-10 KA				
iv	10 Nos 25 Amps 4P 'C' curve, MCB, Ics-10 KA				
v	1 Nos 16 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-AHU-2 (LOC. :-ELECTRICAL ROOM) SERVICE FLOOR described as above	Set.	1		
2.8	**MDB-AHU-3 (LOC. :-ELECTRICAL ROOM) TERRACE FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i	3 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	2 Nos 32 Amps 4P 'C' curve, MCB, Ics-10 KA				

iii	7 Nos 25 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-AHU-3 (LOC. :-ELECTRICAL ROOM) TERRACE FLOOR described as above	Set.	1		
2.90	**MDB-5 UPS INPUT PANEL (LOC. :-UPS ROOM) GROUND FLOOR**				
	Incomer 1 & 2 (From Main LT Panel Section -1 & Main LT Panel Section - 2) Each comprising of following				
a.	1 Nos. 125 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 125/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
d.	SPD type-2 Spark gap technology, IMP Wave- 10/350 µs peak current waveform, Un/Uc- 400/440 V AC , Up - >1.5 kV, limp 15kA per pole, In- 15 kA , Surge Arrester with inbuilt fuse and indication for both the states (green for 'ok' and red for failure) on all modules - 1 Set				
	Bus Bar comprising of :				
a	4P copper bus bars of minimum 150 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i	2 Nos. 125 Amp 4 Pole MCCB (Ics = Icu = 25 KA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				

ii	3 Nos. 100 Amp 4 Pole MCCB (Ics = Icu = 25 KA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
iii	2 Nos. 63 Amp 4 Pole MCCB (Ics = Icu = 25 KA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-5 UPS INPUT PANEL (LOC. :-UPS ROOM) GROUND FLOOR described as above	Set.	1		
2.10	**MDB-U1 OUTPUT PANEL (EMER.LIGHTING PANEL) LOC. :-UPS ROOM GROUND FLOOR**				
	Incomer 1 & 2 Each comprising of following				
a.	1 Nos. 63 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 63/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P copper bus bars of minimum 100 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i	14 Nos 32 Amps DP 'C' curve, MCB, Ics-10 KA				
	Notes:-				

a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-U1 OUTPUT PANEL (EMER.LIGHTING PANEL) LOC. :-UPS ROOM GROUND FLOOR described as above	Set.	1		
2.11	**MDB-U2 OUTPUT PANEL (POWER PANEL) LOC. :-UPS ROOM GROUND FLOOR**				
	Incomer 1, 2 & 3 Each comprising of following				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P copper bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i	2 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	9 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-U2 OUTPUT PANEL (POWER PANEL) LOC. :-UPS ROOM GROUND FLOOR described as above	Set.	1		
2.12	**MDB-6 LIFT PANEL (LOC. :-LIFT MACHINE**				

	ROOM) R.H.S TERRACE FLOOR				
	Incomer comprising of :				
a.	1 No. 100 Amp 4P ATS & 1 Nos. 100 Amp 4 Pole MCCB (Ics = Icu = 35 KA) thermal magnetic based release for protection, ON/OFF indicating lamps protected by 2 amps MCB'sfor controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i	5 Nos. 63 Amp 4 Pole MCCB (Ics = Icu = 25 KA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
ii	2 Nos. 63 amps 4 Pole MCCB with Thermal magnetic release for SC & EFprotection etc.				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-6 LIFT PANEL (LOC. :-LIFT MACHINE ROOM) R.H.S TERRACE FLOOR described as above	Set.	1		
2.13	**MDB-K1 KITCHEN PANEL (LOC. :- KITCHEN AREA) GROUND FLOOR**				
	Incomer comprising of :				

a.	1 Nos. 125 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 125/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 150 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 15 kA for 1 sec.				
	Outgoing comprising of :				
i	1 Nos. 100 Amp 4 Pole MCCB, with earth leakage relay (ELR) (Ics = Icu = 35 KA) microprocessor based release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
ii	1 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
iii	2 Nos 63 Amps 4P MCB along with 63 Amps 4P RCCB of 30 mA leakage current				
iv	8 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
v	2 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
vi	3 Nos 25 Amps 4P MCB along with 25 Amps 4P RCCB of 30 mA leakage current				
vii	11 Nos 25 Amps DP MCB along with 25 Amps DP RCCB of 30 mA leakage current				
viii	18 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				

	MDB-K1 KITCHEN PANEL (LOC. :- KITCHEN AREA) GROUND FLOOR described as above	Set.	1		
2.14	**SDB-K1.1 KITCHEN PANEL LOC. :- KITCHEN AREA GROUND FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 15 kA for 1 sec.				
	Outgoing comprising of :				
i	1 Nos 63 Amps 4P MCB along with 63 Amps 4P RCCB of 30 mA leakage current				
ii	1 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iii	2 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
iv	1 Nos 32 Amps DP MCB along with 32 Amps DP RCCB of 30 mA leakage current				
v	20 Nos 25 Amps DP MCB along with 25 Amps DP RCCB of 30 mA leakage current				
vi	9 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				

a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	SDB-K1.1 KITCHEN PANEL LOC. :- KITCHEN AREA GROUND FLOOR described as above	Set.	1		
2.15	**MDB-1 LOC. :- BASEMENT ELECTRICAL ROOM POWER PANEL**				
	Incomer comprising of :				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
d.	SPD type-2 Spark gap technology, IMP Wave- 10/350 µs peak current waveform, Un/Uc- 400/440 V AC , Up - >1.5 kV, limp 15kA per pole, In- 15 kA , Surge Arrester with inbuilt fuse and indication for both the states (green for 'ok' and red for failure) on all modules - 1 Set				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i.	14 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 18 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-1 LOC. :- BASEMENT ELECTRICAL ROOM POWER PANEL as described as above	Set.	1		

2.16	**MDB-2 LOC. :- BASEMENT ELECTRICAL ROOM LIGHTING PANEL**				
	Incomer comprising of :				
a.	1 Nos. 125 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 125/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
d.	SPD type-2 Spark gap technology, IMP Wave- 10/350 µs peak current waveform, Un/Uc- 400/440 V AC , Up - >1.5 kV, limp 15kA per pole, In- 15 kA , Surge Arrester with inbuilt fuse and indication for both the states (green for 'ok' and red for failure) on all modules - 1 Set				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 150 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i.	15 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 18 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-2 LOC. :- BASEMENT ELECTRICAL ROOM LIGHTING PANEL as described as above	Set.	1		
2.17	**MDB-3 LOC. :- FIRST FLOOR ELECTRICAL ROOM POWER PANEL**				
	Incomer comprising of :				

a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
d.	SPD type-2 Spark gap technology, IMP Wave- 10/350 µs peak current waveform, Un/Uc- 400/440 V AC , Up - >1.5 kV, limp 15kA per pole, In- 15 kA , Surge Arrester with inbuilt fuse and indication for both the states (green for 'ok' and red for failure) on all modules - 1 Set				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i.	14 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 18 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-3 LOC. :- FIRST FLOOR ELECTRICAL ROOM POWER PANEL as described as above	Set.	1		
2.18	**MDB-4 LOC. :- FIRST FLOOR ELECTRICAL ROOM LIGHTING PANEL**				
	Incomer comprising of :				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				

b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
d.	SPD type-2 Spark gap technology, IMP Wave- 10/350 µs peak current waveform, Un/Uc- 400/440 V AC , Up - >1.5 kV, limp 15kA per pole, In- 15 kA , Surge Arrester with inbuilt fuse and indication for both the states (green for 'ok' and red for failure) on all modules - 1 Set				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i.	14 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 18 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-4 LOC. :- FIRST FLOOR ELECTRICAL ROOM LIGHTING PANEL as described as above	Set.	1		
2.19	**MDB-EVCH-1 (EV CHARGING PANEL) LOC. :-ELECTRCAL RM. BASEMENT**				
	Incomer comprising of :				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				

d.	SPD type-2 Spark gap technology, IMP Wave- 10/350 µs peak current waveform, Un/Uc- 400/440 V AC , Up - >1.5 kV, limp 15kA per pole, In- 15 kA , Surge Arrester with inbuilt fuse and indication for both the states (green for 'ok' and red for failure) on all modules - 1 Set				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 kA for 1 sec.				
	Outgoing comprising of :				
i.	29 Nos 40 Amps DP 'C' curve, MCB, Ics-10 KA				
	Notes:-				
a.	All breakers MCCB shall be minimum 18 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-EVCH-1 (EV CHARGING PANEL) LOC. :-ELECTRCAL RM. BASEMENT as described as above	Set.	1		
2.20	**MDB-K2 BANQUET KITCHEN (LOC. :- KITCHEN AREA) GROUND FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 400 Amp 4P MCCB (Ics = Icu = 25 KA) with Microprocessor based releases for SC, OL & EF protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 400/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				

a	4P aluminium bus bars of minimum 500 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 KA for 1 sec.				
	Outgoing comprising of :				
i	2 Nos. 100 Amp 4 Pole MCCB, with earth leakage relay (ELR) (Ics = Icu = 35 KA) microprocessor based release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
ii	8 Nos 63 Amps 4P MCB along with 63 Amps 4P RCCB of 30 mA leakage current				
iii	5 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iv	1 Nos 32 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
v	7 Nos 32 Amps DP MCB along with 32 Amps DP RCCB of 30 mA leakage current				
vi	17 Nos 25 Amps DP MCB along with 25 Amps DP RCCB of 30 mA leakage current				
vii	18 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-K2 BANQUET KITCHEN (LOC. :- KITCHEN AREA) GROUND FLOOR described as above	Set.	1		
2.21	**MDB-K3 MAIN KITCHEN (LOC. :- KITCHEN AREA) FIRST FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 200 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				

b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 200/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 250 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 KA for 1 sec.				
	Outgoing comprising of :				
i	2 Nos. 100 Amp 4 Pole MCCB, with earth leakage relay (ELR) (Ics = Icu = 35 KA) microprocessor based release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
ii	2 Nos 63 Amps 4P MCB along with 63 Amps 4P RCCB of 30 mA leakage current				
iii	7 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iv	2 Nos 25 Amps 4P MCB along with 25 Amps 4P RCCB of 30 mA leakage current				
v	1 Nos 40 Amps DP MCB along with 40 Amps DP RCCB of 30 mA leakage current				
vi	6 Nos 32 Amps DP MCB along with 32 Amps DP RCCB of 30 mA leakage current				
vii	14 Nos 25 Amps DP MCB along with 25 Amps DP RCCB of 30 mA leakage current				
viii	26 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-K3 MAIN KITCHEN (LOC. :- KITCHEN AREA) FIRST FLOOR described as above	Set.	1		

2.22	**MDB-K4 MAIN KITCHEN (LOC. :- KITCHEN AREA) FIRST FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 200 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 200/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 250 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 15 kA for 1 sec.				
	Outgoing comprising of :				
i	4 Nos. 63 Amp 4P MCCB (Ics = Icu = 25 KA) Thermal magnetic type release for protection, ON/OFF/TRIP & R/Y/B indicating lamps protected by 2 amps MCB's				
ii	3 Nos 63 Amps 4P MCB along with 63 Amps 4P RCCB of 30 mA leakage current				
iii	3 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iv	2 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
v	33 Nos 25 Amps DP MCB along with 25 Amps DP RCCB of 30 mA leakage current				
vi	18 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				

	MDB-K4 MAIN KITCHEN (LOC. :- KITCHEN AREA) FIRST FLOOR described as above	Set.	1		
2.23	**SDB-K4.1 POOL BAR (LOC. :- POOL BAR AREA) FIRST**				
	Incomer comprising of :				
a.	1 Nos. 63 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 63/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 100 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 15 kA for 1 sec.				
	Outgoing comprising of :				
i	2 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
ii	1 Nos 32 Amps DP MCB along with 32 Amps DP RCCB of 30 mA leakage current				
iii	2 Nos 25 Amps DP MCB along with 25 Amps DP RCCB of 30 mA leakage current				
iv	8 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	SDB-K4.1 POOL BAR (LOC. :- POOL BAR AREA) FIRST described as above	Set.	1		

2.24	**SDB-K4.2 FOOD PREP (LOC. :- FOOD PREP AREA) SECOND FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 63 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 63/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 100 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 15 kA for 1 sec.				
	Outgoing comprising of :				
i	2 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
ii	4 Nos 32 Amps DP MCB along with 32 Amps DP RCCB of 30 mA leakage current				
iii	3 Nos 25 Amps DP MCB along with 25 Amps DP RCCB of 30 mA leakage current				
iv	5 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	SDB-K4.2 FOOD PREP (LOC. :- FOOD PREP AREA) SECOND FLOOR described as above	Set.	1		
2.25	**SDB-K4.3 PRE-FUNCTION-01 (LOC. :- PRE-FUNCTION-01 AREA) SECOND FLOOR**				

	Incomer comprising of :				
a.	1 Nos. 63 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 63/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 100 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 15 kA for 1 sec.				
	Outgoing comprising of :				
i	12 Nos 25 Amps DP MCB along with 25 Amps DP RCCB of 30 mA leakage current				
ii	3 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	SDB-K4.3 PRE-FUNCTION-01 (LOC. :- PRE-FUNCTION-01 AREA) SECOND FLOOR described as above	Set.	1		
2.26	**MDB-K5 ROOF KITCHEN (LOC. :- ROOF KITCHEN AREA) 8TH FLOOR**				
	Incomer comprising of :				
a.	1 Nos. 125 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 125/5A , burden 10 VA,				

	Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 150 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 15 kA for 1 sec.				
	Outgoing comprising of :				
i	3 Nos 63 Amps 4P MCB along with 63 Amps 4P RCCB of 30 mA leakage current				
ii	3 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iii	2 Nos 40 Amps DP MCB along with 40 Amps DP RCCB of 30 mA leakage current				
iv	5 Nos 32 Amps DP MCB along with 32 Amps DP RCCB of 30 mA leakage current				
v	9 Nos 25 Amps DP MCB along with 25 Amps DP RCCB of 30 mA leakage current				
vi	11 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-K5 ROOF KITCHEN (LOC. :- ROOF KITCHEN AREA) 8TH FLOOR described as above	Set.	1		
2.27	**MDB-L-1 LOC. :- LAUNDRY AREA**				
	Incomer comprising of :				
a.	1 Nos. 200 Amp 4P MCCB (Ics = Icu = 25 KA) with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				

b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 200/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
a	4P aluminium bus bars of minimum 250 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 15 kA for 1 sec.				
	Outgoing comprising of :				
i	13 Nos 63 Amps 4P MCB along with 63 Amps 4P RCCB of 30 mA leakage current				
ii	1 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iii	1 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
iv	1 Nos 16 Amps 4P MCB along with 16 Amps 4P RCCB of 30 mA leakage current				
v	5 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-L-1 LOC. :- LAUNDRY AREA described as above	Set.	1		
2.28	**MDB-RM1.1 (LOC. :- ELECTRICAL ROOM) 3RD FLOOR**				
	Incomer 1 & 2 Each comprising of following				
a.	1 Nos. 125 Amp 4P MCCB (Ics = Icu = 25 KA) with 125 Amp 4P contactor with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				

b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 125/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
	4P aluminium bus bars of minimum 150 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 KA for 1 sec.				
	Outgoing comprising of :				
i	3 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	24 Nos 40 Amps DP RCBO, 30 mA sensitivity				
iii	2 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iv	1 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
v	1 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-RM1.1 (LOC. :- ELECTRICAL ROOM) 3RD FLOOR as described above	Set.	1		
2.29	**MDB-RM1.2 (LOC. :- ELECTRICAL ROOM) 4th FLOOR**				
	Incomer 1 & 2 Each comprising of following				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with 125 Amp 4P contactor with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				

b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 KA for 1 sec.				
	Outgoing comprising of :				
i	3 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	24 Nos 40 Amps DP RCBO, 30 mA sensitivity				
iii	2 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iv	1 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
v	1 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-RM1.2 (LOC. :- ELECTRICAL ROOM) 4th FLOOR as described above	Set.	1		
2.30	**MDB-RM1.3 (LOC. :- ELECTRICAL ROOM) 5th FLOOR**				
	Incomer 1 & 2 Each comprising of following				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with 100 Amp 4P contactor with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				

b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 KA for 1 sec.				
	Outgoing comprising of :				
i	3 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	24 Nos 40 Amps DP RCBO, 30 mA sensitivity				
iii	2 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iv	1 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
v	1 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-RM1.3 (LOC. :- ELECTRICAL ROOM) 5th FLOOR as described above	Set.	1		
2.31	**MDB-RM1.4 (LOC. :- ELECTRICAL ROOM) 6th FLOOR**				
	Incomer 1 & 2 Each comprising of following				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with 100 Amp 4P contactor with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				

b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 KA for 1 sec.				
	Outgoing comprising of :				
i	3 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	24 Nos 40 Amps DP RCBO, 30 mA sensitivity				
iii	2 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iv	1 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
v	1 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-RM1.4 (LOC. :- ELECTRICAL ROOM) 6th FLOOR as described above	Set.	1		
2.32	**MDB-RM1.5 (LOC. :- ELECTRICAL ROOM) 7th FLOOR**				
	Incomer 1 & 2 Each comprising of following				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with 100 Amp 4P contactor with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				

b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 KA for 1 sec.				
	Outgoing comprising of :				
i	3 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	24 Nos 40 Amps DP RCBO, 30 mA sensitivity				
iii	2 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
iv	1 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
v	1 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-RM1.5 (LOC. :- ELECTRICAL ROOM) 7th FLOOR as described above	Set.	1		
2.33	**MDB-RM1.6 (LOC. :- ELECTRICAL ROOM) 8th FLOOR**				
	Incomer 1 & 2 Each comprising of following				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with 100 Amp 4P contactor with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for controlling with following accessories.				

b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 KA for 1 sec.				
	Outgoing comprising of :				
i	7 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	1 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
iii	4 Nos 40 Amps DP RCBO, 30 mA sensitivity				
iv	2 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
v	1 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
vi	1 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-RM1.6 (LOC. :- ELECTRICAL ROOM) 8th FLOOR as described above	Set.	1		
2.34	**MDB-RM1.7 (LOC. :- ELECTRICAL ROOM) 9th FLOOR**				
	Incomer 1 & 2 Each comprising of following				
a.	1 Nos. 100 Amp 4P MCCB (Ics = Icu = 25 KA) with 100 Amp 4P contactor with Thermal magnetic type releases for SC & OL protection. 1 Set Indication Lamps, for breaker 'ON', 'OFF' with 2 Amp MCB for				

	controlling with following accessories.				
b.	1 set digital VAF meter (Equivalent to ABB M1M 10) accuracy class-1.0 and one set of 3 nos. CTs of ratio 100/5A , burden 10 VA, Accuracy class-I.0				
c.	1 Set 3 Nos.phase indicating LED lamps each with protected by 2 Amp MCB				
	Bus Bar comprising of :				
	4P aluminium bus bars of minimum 125 Amps capacity with heat shrinkable coloured sleeves and i/c, SMC bus bars supports at required intervals complete for cross section, size supports & their spacing etc. for withstanding fault level of min 10 KA for 1 sec.				
	Outgoing comprising of :				
i	6 Nos 63 Amps 4P 'C' curve, MCB, Ics-10 KA				
ii	2 Nos 40 Amps 4P 'C' curve, MCB, Ics-10 KA				
iii	1 Nos 40 Amps DP RCBO, 30 mA sensitivity				
iv	2 Nos 40 Amps 4P MCB along with 40 Amps 4P RCCB of 30 mA leakage current				
v	1 Nos 32 Amps 4P MCB along with 32 Amps 4P RCCB of 30 mA leakage current				
vi	1 Nos 16 Amps DP MCB along with 16 Amps DP RCCB of 30 mA leakage current				
	Notes:-				
a.	All breakers MCCB shall be minimum 25 kA rating & MCB 10 kA with Icu = Ics.				
	MDB-RM1.7 (LOC. :- ELECTRICAL ROOM) 9th FLOOR as described above	Set.	1		
3	**DISTRIBUTION BOARDS**				

3.1	Supply, installation, testing and commissioning of the following Vertical FDB's (IK 9) fabricated out of 1.6 mm thick CRCA sheet steel in cubicle compartmentalized, dust and vermin proof, double door construction, powder coated with approved shade and partitions to segregate phases. Approved lockable covers with padlocking arrangement for each phase, recessed in wall or surface mounted final distribution boards of the following description: *Notes: Degree of protection shall be IP-43 for indoor application.*				
a	**Lighting DB -** TPN DB, 24 No. 6-32 Amps SP MCB's as outgoing with 3 No. 25 A DP RCCB's of 100 mA leakage current and 1 No. 40 Amps 4 pole MCB as incomer with separate neutral link for each phase 1 no. withdrawable type surge arrester of 415V maximum discharge current of 25 kA P-N at 8/20 micro seconds with operation indicator as per specification shall be included at incomer	No.	20		
b	**General Power DB -** TPN DB, 36 No. 6-32 Amps SP MCB's as outgoing with 3 No. 32 A DP RCCB's of 30 mA leakage current and 1 No. 40 Amps 4 pole MCB as incomer with separate neutral link for each phase 1 no. withdrawable type surge arrester of 415V maximum discharge current of 25 kA P-N at 8/20 micro seconds with operation indicator as per specification shall be included at incomer	No.	20		
c	**General Lighting & Power DB -** TPN DB, 24 No. 6-32 Amps SP MCB's as outgoing with 3 No. 40 A DP RCCB's of 30 mA leakage current and 1 No. 63 Amps 4 pole MCB as incomer with separate neutral link for each phase 1 no. withdrawable type surge arrester of 415V maximum discharge current of 25 kA P-N at 8/20 micro seconds with operation indicator as per specification shall be included at incomer	No.	1		
c	**Dimmer DB -** TPN DB, 36 No. 6-32 Amps SP/DP MCB's as outgoing with 3 No. 25 A DP RCCB's of 100 mA leakage current and 1 No. 40 Amps 4 pole MCB as incomer with separate neutral link for each phase & suitable rating Junction Box with terminals and wiring connection for mounting Dimmer for lighting control with all accessories as	No.	8		

	required (for Dimmer)				
d	**VTPN DB -** VTPN DB, 12 No. 10/16 Amps SP/TP MCB's as outgoing with 1 No. 63 Amps 4 pole MCB as incomer with separate neutral link for each phase with 1 No. 63 A 4P RCCB's of 30 mA leakage current. (for kitchen)	No.	1		
e	**Guest Room DB -** SPN DB, 8 No. 6-32 Amps SP MCB as outgoing with 1 No. 32 Amps DP MCB including neutral link as incomer.	No.			
f	**Guest Room DB -** SPN DB, 12 No. 6-32 Amps SP MCB as outgoing with 1 No. 32 Amps DP MCB including neutral link as incomer.	No.	145		
g	**General Lighting & Power DB -** SPN DB, 10 No. 6-32 Amps SP MCB as outgoing with 1 No. 40 Amps DP RCBO of 30 mA leakage current including neutral link as incomer.	No.	7		
h	**UPS Power DB -** SPN DB, 12 No. 6-32 Amps SP MCB as outgoing with 1 No. 32 Amps DP RCBO of 30 mA leakage current including neutral link as incomer. (All MCB shall be D curve only)	No.	10		
i	**Emergency Lighting DB -** SPN DB, 12 No. 6-32 Amps SP MCB as outgoing with 1 No. 32 Amps DP RCBO of 30 mA leakage current including neutral link as incomer. (All MCB shall be D curve only)	No.	10		
4	**RISING MAINS**				
4.1	Design, manufacture, supply, assembling, installation in correct assigned position, making proper connections, testing and commissioning of construction Aluminium bus bar of following capcity, sandwich construction rising mains system for use on 4 Pole with 100% N, PE, 415 volts, 50 Hz, AC IP-54, min.class-F insulation (155 deg C),(min.50 KA for 1 Sec) made up with metal clad enclosure , fabricated out of extruded min 1.6 mm thick aluminium/GI sheet,, low impedance, non ventilated naturally cooled,				

	painted with approved paint shade, duly powder coated in convenient sections complete with 4 aluminium bus bars, necessary points, elbow joints & expansion joints and bends, fire barrier at each crossing, adopter box, and louvers for ventilation, 2 No. of 50 x 6 mm GI earthing conductor through out the length of the Rising Mains. (Phase sequence shall be matched at both ends).				
a	630 amps 4 Pole Rising Main including bends, provision for tap off connection at each floor, end caps, including MS support and spring etc as required to installed in electrical shaft as per specification.	RM	185		
4.2	**End feed unit:** Design, fabrication, assembling, wiring, supply, installation, testing and commissioning of following ACB Boxes fabricated out of extruded GI sheet duly painted in case of sandwich type Rising Mains in cubical formation, dust and vermin proof, coupled with rising mains. Boxes shall be fabricated as per specifications. 2 Nos. earthing terminals shall be provided.				
a	630 amps 4 Pole MCCB with Over current, and short circuit & earth fault protection microprocessor adjustable releases etc. (35 kA Isc) including earthing with Rising Mains along with ON / OFF / TRIP and RYB Phase indicating light protected by 2 amps MCB's as required to complete the work. (release in end feed unit shall be same as outgoing feeder at main LT Panel)	No.	2		
4.3	Supply, installation, testing and commissioning of following amps rating Tap offs boxes fabricated out of thick 1.6 mm CRCA sheet steel in cubicle compartmentalized, dust and vermin proof & shall be treated with all anticorrosive process before powder coating as per specifications complete with all accessaries as required.				
	Note: All tap off points shall be provided with adequate protection against carbonization.				
a	1 No. 200A, 4P, 415V, 35kA/sec, MCCB with Microprocessor release (equivalent to Micrologic 6E) earth fault, Over current, and short circuit settings, 1 set R,Y, B LED indicating lamps , ON, OFF, Trip Indications 3 No. 250 Amps/5 amps CTs with Dual	No.	R.O		

	Energy meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port inlcuding 1.6 mm thich CRCA sheet steel incuding all accessories required.				
b	1 No. 125A, 4P, 415V, 35kA/sec, MCCB with Thermal Magnetic Based release (equivalent to Micrologic 6E) earth fault, Over current, and short circuit settings, 1 set R,Y, B LED indicating lamps , ON, OFF, Trip Indications 3 No. 250 Amps/5 amps CTs with Dual Energy meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port inlcuding 1.6 mm thich CRCA sheet steel incuding all accessories required.	No.	2		
c	1 No. 100A, 4P, 415V, 35kA/sec, MCCB with Thermal Magnetic Based release (equivalent to Micrologic 6E) earth fault, Over current, and short circuit settings, 1 set R,Y, B LED indicating lamps , ON, OFF, Trip Indications 3 No. 250 Amps/5 amps CTs with Dual Energy meter with LED display (Equivalent to ABB M1M DS) with RS-485 connectivity port inlcuding 1.6 mm thich CRCA sheet steel incuding all accessories required.	No.	13		
5	Supply, installation, testing and commissioning of 160 Amps 4 Pole MCCB including powder coated MS enclosure 1.6 mm thick of approved make (IP 42).	No.	R.O		
6	Supply, installation, testing and commissioning of 125 Amps 4 Pole MCCB including powder coated MS enclosure 1.6 mm thick of approved make (IP 42).	No.	R.O		
7	Supply, installation, testing and commissioning of 100 Amps 4 Pole MCCB including powder coated MS enclosure 1.6 mm thick of approved make (IP 42).	No.	2		
8	Supply, installation, testing and commissioning of 63 Amps 4 Pole MCCB with 300 mA Earth Leakage Relay including enclosure 1.6 mm thick of approved make.	No.	6		
9	Supply, installation, testing and commissioning of 63 Amps 4 Pole MCB in polycarbonate enclosure etc as required.	No.	R.O		
	TOTAL CARRIED TO SUMMARY				
C.	**<u>LT CABLES & CABLE TRAYS:</u>**				

	The rate shall also include the following :				
1	Effecting adequate and proper connections at terminations.				
2	Providing all fixing accessories such as clamping devices nuts, bolts and screws.				
3	Excavation laying of cable filling of sand, brick protection, back filling of earth, watering, ramming and making good.				
4	Wherever the cables are of aluminium and bus bars of copper bimetallic lugs shall be used.				
5	All cable shall be laid with one diameter gap.				
6	All cables shall be IS approved.				
7	Fire retardent paint one meter on both side of wall penetration and at termination as per specifications.				
8	Buried LT cables to be laid atleast 750 mm below ground.				
9	All cutouts / Sleeves shall be sealed with fire redardant sealent as per specification.				
10	All cuts/perforations/folded sections where contact with wires/cables is expected shall be burr free.				
11	Zinc coating shall be 120 gm / square meter or more. The materials shall conform to relevant IS / BS standards for the category / application specified.				
12	The cable tray / ducts / trunking shall be factory built. Only cutting to achieve assembly system length shall be permitted at site.				
13	Accurate fabrication formed section with tolerances of $\pm$ 2 mm on width and $\pm$ 5 mm on length expected.				
14	Dimensional and general arrangement drawing of the system are expected to be provided by tenderer / cable tray / duct supplier.				

15	The system shall be designed for installation with a temperature classification of + 60 deg.C.				
16	The cable tray/duct systems shall be suitable for against corrosion.				
17	Details of fixing supports etc. shall be submitted for approval.				
C.	**LT CABLES & CABLE TRAYS:**				
1	Supplying & laying of following 1100 volt grade XLPE insulated PVC sheathed Aluminium/Copper conductor armoured/Unarmored cables as per specification **in existing cable trays** clamped to wall with suitable clamps including, saddles fixing bolts, connecting testing and commissioning complete in all respect as required as per site conditions.				
a	3.5 core 300 sq. mm Al arm.	RM	1065		
b	3.5 core 240 sq. mm Al arm.	RM	R.O		
c	3.5 core 185 sq. mm Al arm.	RM	R.O		
c	3.5 core 150 sq. mm Al arm.	RM	R.O		
d	3.5 core 120 sq. mm Al arm.	RM	R.O		
e	3.5 core 95 sq. mm Al arm.	RM	790		
f	3.5 core 70 sq. mm Al arm.	RM	180		
g	3.5 core 50 sq. mm Al arm.	RM	1390		
h	3.5 core 35 sq. mm Al arm.	RM	1305		
i	3.5 core 25 sq. mm Al arm.	RM	15		
j	4 core 35 sq. mm Al arm.	RM	R.O		
k	4 core 25 sq. mm Al arm.	RM	R.O		
l	4 core 16 sq. mm Cu arm.	RM	45		
m	4 core 10 sq.mm Cu arm.	RM	2120		
n	4 core 6 sq.mm Cu arm.	RM	7500		

o	4 core 4 sq.mm Cu arm.	RM	R.O		
p	4 core 2.5 sq.mm Cu arm.	RM	R.O		
q	3 core 16 sq.mm Cu arm.	RM	R.O		
r	3 core 10 sq.mm Cu arm.	RM	R.O		
s	3 core 6 sq.mm Cu arm.	RM	8760		
t	3 core 4 sq.mm Cu arm.	RM	R.O		
u	1 core 35 sq.mm Unarm Cu cable for UPS Connectivity	RM	R.O		
v	1 core 25 sq.mm Unarm Cu cable for UPS Connectivity	RM	R.O		
w	1 core 16 sq.mm Unarm Cu cable for UPS Connectivity	RM	195		
x	2 core 2.5 sq.mm flexible Unarm Cu cable Cable including terminations for Dual Energy Meter. *Note: (Cable shall be laid from Main LT Panel to all Dual Source Meters in Daisy chain as per manufacturer requirement)*	RM	100		
2	Supply, installation, testing & commissioning of following sizes of 600V/1000V Grade **Fire Survival** galvanised steel wire Armoured cable in the strandard aluminium/Copper conductor,constructed / designed as per BS 7846/IS17505-1. Cable shouldbe suitable to retain the circuit integrity as per BS 8519 and certified for CWZ for F 120 fire test as per BS 8491 Standard **on existing cables tray** etc as required complete in all respect as per site requirement.				
a	3.5 core 300 sq. mm Al arm.	RM	530		
b	3.5 core 240 sq. mm Al arm.	RM	180		
c	3.5 core 120 sq. mm Al arm.	RM	R.O		
d	3.5 core 70 sq. mm Al arm.	RM	30		
e	3.5 core 50 sq. mm Al arm.	RM	250		
f	3.5 core 35 sq. mm Al arm.	RM	30		

g	4 core 25 sq. mm Al arm.	RM	145		
h	4 core 16 sq.mm Cu arm.	RM	240		
i	4 core 10 sq.mm Cu arm.	RM	290		
j	4 core 6 sq.mm Cu arm.	RM	5270		
k	4 core 4 sq.mm Cu arm.	RM	1635		
l	1 core 16 sq.mm Unarm Cu cable for UPS Connectivity	RM	100		
3	Supplying and making Cable end termination of the following XLPE insulated PVC sheathed Aluminium / copper conductor armoured cables of 1100 volt grade including supplying and fixing of bimettalic crimping lugs, double compression glands with earthing testing and commissioning complete in all respect as required as per site conditions.				
a	3.5 core 300 sq. mm Al arm.	No.	44		
b	3.5 core 240 sq. mm Al arm.	No.	R.O		
c	3.5 core 185 sq. mm Al arm.	No.	R.O		
c	3.5 core 150 sq. mm Al arm.	No.	R.O		
d	3.5 core 120 sq. mm Al arm.	No.	R.O		
e	3.5 core 95 sq. mm Al arm.	No.	10		
f	3.5 core 70 sq. mm Al arm.	No.	2		
g	3.5 core 50 sq. mm Al arm.	No.	44		
h	3.5 core 35 sq. mm Al arm.	No.	22		
i	3.5 core 25 sq. mm Al arm.	No.	2		
j	4 core 25 sq. mm Al arm.	No.	R.O		
k	4 core 16 sq. mm Cu arm.	No.	2		
l	4 core 10 sq. mm Cu arm.	No.	70		
m	4 core 35 sq. mm Al arm.	No.	R.O		

n	4 core 6 sq.mm Cu arm.	No.	168		
o	4 core 4 sq.mm Cu arm.	No.	R.O		
o	4 core 2.5 sq.mm Cu arm.	No.	R.O		
p	3 core 16 sq.mm Cu arm.	No.	R.O		
q	3 core 10 sq.mm Cu arm.	No.	R.O		
r	3 core 6 sq.mm Cu arm.	No.	274		
s	3 core 4 sq.mm Cu arm.	No.	R.O		
t	1 core 35 sq.mm Unarm Cu cable for UPS Connectivity	No.	R.O		
u	1 core 25 sq.mm Unarm Cu cable for UPS Connectivity	No.	R.O		
v	1 core 16 sq.mm Unarm Cu cable for UPS Connectivity	No.	32		
4	Supplying and making Cable end termination of the following XLPE insulated PVC sheathed Aluminium / copper conductor armoured fire returant cables of 1100 volt grade including supplying and fixing of bimettalic crimping **flame proof lugs**, double compression glands with earthing testing and commissioning complete in all respect as required as per site conditions.				
a	3.5 core 300 sq. mm Al arm.	No.	6		
b	3.5 core 240 sq. mm Al arm.	No.	2		
c	3.5 core 120 sq. mm Al arm.	No.	R.O		
d	3.5 core 70 sq. mm Al arm.	No.	2		
e	3.5 core 50 sq. mm Al arm.	No.	6		
f	3.5 core 35 sq. mm Al arm.	No.	2		
g	4 core 25 sq. mm Al arm.	No.	10		
h	4 core 16 sq.mm Cu arm.	No.	4		
i	4 core 10 sq.mm Cu arm.	No.	8		

j	4 core 6 sq.mm Cu arm.	No.	108		
k	4 core 4 sq.mm Cu arm.	No.	22		
l	1 core 16 sq.mm Unarm Cu cable for UPS Connectivity	No.	16		
5	Supply and laying of following size 63 mm dia HDPE pipe ISI marked along with all accessories like sockets, bend, couplers etc. conforming to IS-14930, Part-II complete with fitting and cutting jointing etc. direct in ground (750mm deep below ground) including excavation refilling the trench but excluding sand cushioning and protective covering etc. complete as required and making good as approved.	RM	200		
6	Supply and fixing of **Hot Dip galvanized** perforated type Bolted Construction GI cable trays of the following sizes as per specification. All supporting arrangement shall be included in the quoted price.				
a.	600 mm x 40 x 40 x 2 mm thick	RM	20		
b.	450 mm x 40 x 40 x 2 mm thick	RM	15		
c.	150 mm x 40 x 40 x 2 mm thick	RM	110		
7	Supply and fixing of factory fabricated Pregalvanized GI Ladder type bolted construction cable trays, with radial bends, suspenders and supports as per specification and of the following sizes.				
a.	1500 mm wide Runners 25 x 100 x 25 x 3 mm Rungs 20 x 40 x 20 x 3 mm 250 mm C/C 3 Nos. suspenders 40 x 40 x 5 mm GI angle 1000 mm C/C	RM	55		
b.	1000 mm wide Runners 25 x 100 x 25 x 3 mm Rungs 20 x 40 x 20 x 3 mm 250 mm C/C 3 Nos. suspenders 40 x 40 x 5 mm GI angle 1000 mm C/C	RM	240		
c.	750 mm wide Runners 25 x 75 x 25 x 2.5 mm Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C 3 Nos. suspenders 32 x 32 x 4 mm GI angle 1000 mm C/C	RM	140		

d.	600 mm wide Runners 25 x 75 x 25 x 2.5 mm Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C 3 Nos. suspenders 32 x 32 x 4 mm GI angle 1000 mm C/C	RM	150		
8	Supply and fixing of Pregalvanized perforated type Bolted Construction GI cable trays of the following sizes as per specification. All supporting arrangement shall be included in the quoted price.				
a.	450 mm x 40 x 40 x 2 mm thick	RM	330		
b.	300 mm x 40 x 40 x 2 mm thick	RM	495		
c.	150 mm x 40 x 40 x 2 mm thick	RM	915		
d.	50 mm x 40 x 40 x 2 mm thick	RM	120		
9	Supply & Laying of submain wiring along with earth wire with the following sizes of HFFRLS PVC insulated copper conductor, single core flexible cable in surface / recessed MS conduit complete in all respect as required.				
a	4 X 16 sq. mm + 2 X 16 sq. mm earth wire in 40 mm dia MS conduit	RM	R.O		
b	4 X 10 sq. mm + 2 X 6 sq. mm earth wire in 40 mm dia MS conduit	RM	60		
c	4 X 6 sq. mm + 2 X 4 sq. mm earth wire in 32 mm dia MS conduit	RM	130		
d	4 X 4 sq. mm + 2 X 2.5 sq. mm earth wire in 25 mm dia MS conduit	RM	25		
e	2 X 10 sq. mm + 1 X 10 sq. mm earth wire in 32 mm dia MS conduit	RM	R.O		
f	2 X 6 sq. mm + 1 X 4 sq. mm earth wire in 25 mm dia MS conduit	RM	10		
g	2 X 4 sq. mm + 1 X 2.5 sq. mm earth wire in 25 mm dia MS conduit	RM	600		
h	2 X 4 sq. mm + 1 X 1.5 sq. mm earth wire in 25 mm dia MS conduit	RM	40		
i	2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire in 25 mm dia MS conduit	RM	R.O		
j	2 X 2.5 sq. mm + 1 X 1.5 sq. mm earth wire in 25 mm dia MS conduit	RM	505		
	TOTAL CARRIED TO SUMMARY				
D.	**<u>EARTHING & LIGHTNING PROTECTION SYSTEM</u>**				
	Rates shall also include the following :				

1	All fixing accessories such as brass saddles, brass screws rawl plugs etc.				
2	Jointing by rivetting and brazing after rivetting in case of copper and welding / bolting in case of GI earthing.				
3	Cutting chases holes and making good the same wherever required.				
4	Effecting adequate and proper interconnections.				
5	Use of copper thimbles.				
6	Earthing system shall comply to IS:3043-2018.				
7	All earthing pits shall be interconnected.				
8	All equipment motors, DB's, panels to be connected on either ends (double earthing) with suitable strip / wires.				
9	Copper earthing shall be provided for UPS & equipment / LV system only.				
10	GI earthing shall be provided for Main LT panel, etc.				
D.	**EARTHING & LIGHTNING PROTECTION SYSTEM**				
D.1	**Earthing System**				
1	Supply, Testing & Commissioning, fixing of following bare Copper / GI tapes / wires including all necessary fixing accessories, insulators and effecting connections as per specifications.				
1.1	40 x 6 mm thick Copper tape with heat shrinkable sleeves	R M	200		
1.2	50 x 6 mm thick Copper tape with heat shrinkable sleeves	R M	0		
1.3	75 x 10 mm thick GI tape	R M	0		
1.4	75 x 6 mm thick GI tape	R M	0		
1.5	65 x 10 mm thick GI tape	R M	200		

1.6	50 x 6 mm thick GI tape	RM	1400		
1.7	40 x 6 mm thick GI tape	RM	300		
1.8	25 x 6 mm thick GI tape	RM	4900		
1.9	25 x 3 mm thick GI tape	RM	3500		
1.10	8 SWG GI wire	RM	7000		
2	Providing, laying, testing and commissioning of following 1100 volts grade PVC insulated PVC sheathed copper conductor flexible cable as required.				
2.1	Single core 25 sq.mm Green colour cable	RM	550		
2.2	Single core 16 sq.mm Green colour cable	RM	2800		
2.3	Single core 10 sq.mm Green colour cable	RM	1650		
2.4	Single core 6 sq.mm Green colour cable	RM	300		
3	Supplying and making Cable end termination of the following copper conductor green color cables of 1100 volt grade including supplying and fixing of bimettalic crimping lugs, double compression glands with earthing testing and commissioning complete in all respect as required as per site conditions.				
3.1	Single core 25 sq.mm Green colour cable	No.	26		
3.2	Single core 16 sq.mm Green colour cable	No.	48		
3.3	Single core 10 sq.mm Green colour cable	No.	62		
3.4	Single core 6 sq.mm Green colour cable	No.	26		

4	Supply, installation, testing and commissioning of lockable terminal box in 1.6mm thick with MS enclosure with transperant cover with 1 no. (300 mm length) 50 x 6 mm copper strip on epoxy insulators with 20 no. 8mm dia holes with 8mm x 25mm dia brass nut bolt with double washer.	No.	20		
5	Providing and laying of advance maintanence free earthing consisting of 14.35 mm dia and 3 meter length copper bonded earth rod in 150 mm dia. in an augured hole in ground, surrounded by ground enhancement material as per specification. Inspection chamber shall be of 400 x 500 mm with concrete base CI manhole cover with frame painted with bitumastic paint. 2 Nos. of 50 x 6 mm cross section & 300 mm long copper strip to be clamped with copper claded rod electrode have sufficient nos (But not less than 4 Nos.) of 10 mm dia. GI nuts & bolts for connection to the equipment / interconnection to the other pits to form equi-potential bonding .The pH value of ground enhance material shall be 6.9 to 7.2 of 1000gm / lit @ 20 deg.c.The minimum 30 Kg of ground enhancement material shall provided for each electrode. The complete earthing system shall be in accordance with IS 3043 and be provided with required material complete in all respect as per site requirement. Note : Warranty of Minimum 20 years shall be provided for maintaining the resistance.	No.	38		
6	Supply, laying, testing and commissioning of GI pipe under road / paved area crossing etc. including excavation back filling ramming and making good.				
a	50 mm dia pipe.	RM	50		
b	100 mm dia pipe.	RM	50		
7	Supply and fixing position the approved single line diagram framed in 1000 x 100 mm size glass frame and installed in main LT Panel Room.	No.	2		
8	Supply of tool kit, first aid box with all accessories required for operation and maintainence for 415 volt equipment with 1 pair rubber hand gloves of approved make.	No.	2		
	Note: *All Earthing Pit jointing should be through strip clamp instead of U - clamp,*				
D.2	**Lightning Protection System**				

1	Supply, Installation, testing & Commissioning of interception Aluminium Rod of 3 mtr length including bi-metallic connection witth the strip with all accessories as required complet in all respects.	Sets	10		
2	Supply, Installation, testing & Commissioning of interception Aluminium Rod of 2 mtr length including bi-metallic connection witth the strip with all accessories as required complet in all respects.	Sets	10		
3	Supply, Installation, testing & Commissioning of minimum 8 mm Dia Al Bonded Steel round conductor on the parapet wall horizontally as per the layout including the neccessary connecting terminals, bridge cable, expansion/contraction joints & joints for connection with air termination network & downconductors complete in all respect as required as per the site condition.	RM	525		
4	Supply, Installation, testing & Commissioning of minimum 10 mm dia Cu Bonded Steel round conductor in the coloumn/ ground / existing GI pipe under road / paved area as per the layout including the neccessary connecting terminals, bridge cable, expansion/contraction joints & joints for connection with air termination network & downconductors complete in all respect as required as per the site condition.	RM	1515		
5	Supply, installation, testing and commissioning of testing joint on the existing down conductor having all neccessery accessories complete is all respect for connection to the earth pit as required.	Sets	15		
6	Providing and laying of advance maintanence free earthing consisting of 14.35 mm dia and 3 meter length copper bonded earth rod in 150 mm dia. in an augured hole in ground , surrounded by ground enhancement material as per specification. Inspection chamber shall be of 400 x 500 mm with concrete base CI manhole cover with frame painted with bitumastic paint. 2 Nos. of 50 x 6 mm cross section & 300 mm long copper strip to be clamped with copper claded rod electrode have sufficient nos (But not less than 4 Nos.) of 10 mm dia. GI nuts & bolts for connection to the equipment / interconnection to the other pits to form equi-potential bonding. The pH value of ground enhance material shall be 6.9 to 7.2 of 1000gm / lit @ 20 deg.c.The minimum 30 Kg of ground enhancement material shall provided for each electrode. The complete earthing system shall be in accordance with IS 3043 and be provided with required material complete in all respect as per site requirement. Note : Warranty of Minimum 20 years shall be provided for maintaining the resistance.	Sets	10		

7	Supply, laying, testing and commissioning of GI pipe under road / paved area crossing etc. including excavation back filling ramming and making good.				
a	100 mm dia pipe.	R M	10		
b	150 mm dia pipe.	R M	10		
8	Supply, Installation, testing & Commissioning of Lightnig counter - To count no of lightning strike & it can record the date and time of the lightning incident also tested as per IEC 62561-6 complete in all respect as required as per the site condition	No s	1		
	Note: *All Earthing Pit jointing should be through strip clamp instead of U - clamp,*				
	TOTAL CARRIED TO SUMMARY				
E.	**<u>WIRING & CONDUITING</u>**				
	The rates for all point wiring items shall also include supplying, fixing, testing and commissioning of the following:				
1	Conduits, conduit specials, brass bushes (bends, pull boxes, junction boxes) and other fittings.				
2	Approved saddles and grouting the same for exposed conduit work.				
3	1.6 mm thick Outlet boxes and junction box.				
4	All fixing accessories such as clips, brass screws pull boxes etc. complete in all respect.				
5	All work necessary for wiring a point circuit of any length from the Final Distribution Board to connector via switch and shall include the circuit wiring also except where identified.				
6	Embedding conduits and accessories in walls and floors etc. during construction and / or cutting chases (with chase cutting machine) and making good the same as necessary in the case of concealed conduit work.				
7	Switch, socket outlet and necessary blank plates wherever required.				

8	PVC insulated copper conductor stranded flexible PVC insulated FRLS wire of Green colour with yellow bands for earthing of fixtures, outlet boxes and third pin of socket outlet.				
9	All wires shall be IS approved, 1100 volt grade, stranded flexible PVC insulated HFFRLS.				
10	All sockets shall be shuttered type with earth terminal.				
11	Suitable rating of plugs top shall be provided for all Industrial type splash proof socket outlets.				
12	Separate neutral and earthing wire shall be provided for each circuit.				
13	Lighting and power circuit to be kept separate.				
14	Different colours plates / switch socket shall be provided for UPS and raw power supply.				
15	Expansion joints for conduiting etc. shall be provided in case of crossing of building expansion joint and as approved by engineer in-charge.				
16	Conduits shall be terminated in switch & socket boxes / DB's with good quality nuts & check nuts and brass bushes.				
17	All switch sockets shall be Anit bacterial type.				
E.	**<u>WIRING & CONDUITING</u>**				
I.	**FOR GUEST ROOM & CORRIDOR**				
	Note: *Supply of Switch socket including face plate of approved quality colour make & design shall be free supply by the client directly and scope of this work shall include receiving, storing, installation, testing & commissioning complete in all respect as required.*				
1	Wiring for the following light points with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wire of approved make in exposed / recessed 25 mm dia MS Conduit including supply & fixing of keypad switch of approved quality colour make & design in 1.2 mm thick GI box and earthing of fixtures and the outlet box with 2.5 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect as required as per site conditions.				
a	**<u>First light point</u>** controlled by one 6 Amps switch.	Pt	100		

			0		
b	**Secondary light point** looped with First Point without Switch	Pt	600		
2	Wiring for light point as in item No. 1 above but controlled by SP MCB provided in the DB. (Cost of MCB not to be included here).				
a	**First light point** controlled by one MCB	Pt.	R.O		
b	**Secondary light point** looped with First Point	Pt	R.O		
3	Wiring for 250 volts single phase and neutral 1 No. 6 Amps switch socket outlet with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit including fixing of one no. 5 pin 6 Amps socket outlet with 1 No. 6 Amps switch in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated FRLS wire in 25 mm dia conduit. (for FCU Units)	Pt	145		
4	Wiring for 250 volts single phase and neutral 2 Nos. 6/16 Amps switched socket outlet with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit including providing providing and fixing of 2 Nos. 6/16 Amps switched socket outlet of appoved make and design in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 4 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete (socket outlet shall be looped with nearsest power circuit), in all respect.	Pt	R.O		
5	Wiring for 250 volts single phase and neutral 6 / 16 Amps switched socket outlet with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including providing and fixing of one no. 6 / 16 Amps 6 pin switched shuttered socket outlet of approved make and design in 1.2 mm thick GI box with grid plates and earthing the fifth pin of each socket outlet with 4 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (Maximum of two socket outlet shall be connected on one circuit)				
a	First point for 6/16 amps switched socket outlet.	Pt	228		

b	**Secondary point** comprising of One No. 6/16 Amps switch socket outlet (looped with first point)	Pt	228		
6	Wiring for 250 volts single phase and neutral active 2A USB Charger outlet including 24 volt adaptor with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including providing and fixing of one no. USB Charger outlet of approved make and design in 1.2 mm thick GI box with grid plates and earthing the outlet with 2.5 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire (looped with nearest light/socket), complete in all respect.	Pt	R.O		
7	Wiring for Bell point with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit including supply and fixing of electronic Call bell switch and Buzzer (at different location) of approved make and earthing of GI box with 2.5 sq. mm. PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect as required as per site conditions. (Looping with nearest light point)	Pt	145		
8	Wiring for MMR Indicator, Do not disturb & Room number points with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit including supply and fixing of DND, Room number outlet inside room (as per interior designer), DND & Room number LED indicator on the suitable location outside room and earthing of GI box with 2.5 sq. mm. PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect as required as per site conditions. (Looping with nearest light point) Note: Control wiring shall be done to ensure bell will not operate when the DND switch is `ON', neon indicating lamps on the plate of bell push button etc as required.	Pt	145		
9	Wiring for 250 volts single phase and neutral 16 Amps Master switch with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including providing and fixing of one no. 16 Amps Master switch of approved make and design in 1.2 mm thick GI box with grid plates and earthing the outlet with 2.5 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect.	Pt	145		

10	Wiring for 250 volts single phase and neutral for Room control unit (RCU) with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including providing and fixing of Room control Unit including JB, conduiting and wiring for door contact switch of approved make and design in 1.2 mm thick GI box with grid plates and earthing the outlet with 4 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect.	Pt	R.O		
11	Wiring for 250 volts single phase and neutral 6 Amps switched socket Universal outlet with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit 2mm thick including providing and fixing of one no. 6 Amps Universal switch socket outlet of aprpoved make and design in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (All 6 amps switch socket outlet shall be looped with light circuit) Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit.	Pt	290		
12	Wiring for 250 volts single phase and neutral 1 No. 6 Amps switched socket outlet with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wire in concealed or surface mounted 25 mm dia MS Conduit 2mm thick including providing and fixing of 1 no. 6 Amps 3 pin switched sockets of approved make and design in 1.2 mm thick GI box with grid plates and earthing the third pin of each socket outlet with 2.5 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect.	Pt	895		
13	Wiring for 250 volts single phase and neutral Key card including relay outlet including relay with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible FRLS wires in 25 mm dia MS Conduit including providing and fixing of one no. key card outlet of approved make and design in 1.6 mm thick GI box with grid plates and earthing the outlet with 4 Sq mm PVC insulated copper conductor stranded flexible FRLS wire complete in all respect.	Pt	145		
II.	**FOR PUBLIC AREAS**				
	Note: *Supply of Switch socket including face plate of approved quality colour make & design shall be free supply by the client directly and scope of this work shall include receiving, storing, installation, testing &*				

	commissioning complete in all respect as required.				
1	Wiring for the following light points with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wire of approved make in exposed / recessed 25 mm dia MS Conduit including fixing of 6 Amps single pole rocker operated flush mounted switch socket in 1.6 mm thick GI box and earthing of fixtures and the outlet box with 1.5 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect as required as per site conditions. Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit and included in the item.				
a	**First light point** controlled by one 6 Amps switch.	Pt	455		
b	**Secondary light point** looped with First Point without Switch	Pt	260		
2	Wiring for light point as in item No. 1 above but controlled by SP MCB provided in the DB. (Cost of MCB not to be included here).				
a	**First light point** controlled by one MCB	Pt.	170		
b	**Secondary light point** looped with First Point	Pt.	465		
3	Wiring for 250 volts single phase and neutral 1 No. 6 Amps switch socket outlet with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit 2mm thick including fixing of one no. 5 pin 6 Amps socket outlet with 1 No. 6 Amps switch in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (maximum of 6 - 8 switch sockets shall be looped in one circuit) Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit. (for FCU Units, Fire Damper) (All Sockets are on UPS supply)	Pt.	140		

4	Wiring for 250 volts single phase and neutral 2 No. 6 Amps socket outlet contolled with 1 No. 6 Amps switch with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit including fixing of 2 no. 6 Amps 5 pin socket outlet with 1 No. 6 Amps switch in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (maximum of 3 switch sockets shall be looped in one circuit) Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit.	Pt			
5	Wiring for inline fan point with 3 x 2.5 sq. mm. insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires of approved make in exposed / recessed 25 mm dia MS Conduit including fixing of 6 Amps flush mounted switch at the normal switch level in 1.2 mm thick GI box and 6 Amps 3 pin flush mounted socket outlet near exhaust fan and earthing of exhaust fan through the third pin of the socket outlet and GI box with 1.5 sq. mm. PVC insulated copper conductor flexible HFFRLS wire, complete in all respect as required as per site conditions. (Looping with nearest light point)	Pt.	R.O		
6	Wiring for 250 volts single phase and neutral 6 Amps switched socket outlet with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit including fixing of one no. 6 Amps switch socket outlet in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (All 6 amps switch socket outlet shall be looped with light circuit) Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit.	Pt.	R.O		
7	Wiring for 250 volts single phase and neutral 2 No. 6 Amps socket outlet contolled with 1 No. 6 Amps switch with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit including fixing of 2 no. 6 Amps 5 pin socket outlet with 1 No. 6 Amps switch in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (maximum of 3 switch sockets shall be looped in one circuit) Note: Circuit wire shall be carried out with 3 x 2.5 sq	Pt.	R.O		

	mm PVC insulated HFFRLS wire in 25 mm dia conduit.				
8	Wiring for 250 volts single phase and neutral 6 / 16 Amps switched socket outlet with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including fixing of one no. 6 / 16 Amps 6 pin switched socket outlet in 1.2 mm thick GI box with grid plates and earthing the fifth pin of each socket outlet with 4 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire (maximum of two socket outlet shall be connected on one circuit), complete in all respect.				
a	First point for 6/16 amps switched socket outlet.	Pt	95		
b	**Secondary point** comprising of One No. 6/16 Amps switch socket outlet (looped with first point)	Pt	95		
9	Wiring for 250 volts single phase and neutral 6 / 16 Amps switched socket outlet with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including providing and fixing of one no. 6 / 16 Amps 6 pin switched socket outlet of approved make and design in 1.2 mm thick GI box with grid plates and earthing the fifth pin of each socket outlet with 4 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire (one socket outlet shall be connected on one circuit for hand dryer), complete in all respect.	Pt	R.O		
10	Wiring for 250 volts single phase and neutral 16 Amps polycarbonate plug top industrial 3 pin (IP 67) weather proof socket outlet with 16 Amps double pole MCB in a poly carbonate enclosure of approved size and design with 2 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 25 mm dia MS Conduit, including providing and fixing of 16 Amps socket in poly carbonate enclosure near equipment and 16 Amps DP MCB in poly carbonate enclosure at normal switch level within 10 m distance and earthing of third pin of the socket with 4 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	R.O		

11	Wiring for 250 volts single phase and neutral 40 Amps polycarbonate plug top industrial 3 pin (IP 65/66)socket outlet with 40 Amps double pole MCB in a poly carbonate enclosure of approved size and design with 2 x 10 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 32 Amps socket in poly carbonate enclosure and earthing of fifth pin of the socket with 10 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	30		
III.	**FOR BOH AREAS**				
	Note: *All kitchen switch socket outlet shall have stainless steel cover plate*				
1	Wiring for the following light points with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wire of approved make in exposed / recessed 25 mm dia MS Conduit including supply & fixing of 6 Amps single pole rocker operated flush mounted switch of approved quality colour make & design in 1.6 mm thick GI box and earthing of fixtures and the outlet box with 1.5 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect as required as per site conditions. Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit and included in the item.				
a	**First light point** controlled by one 6 Amps switch.	Pt	375		
b	**Secondary light point** looped with First Point without Switch	Pt	575		
2	Wiring for light point as in item No. 1 above but controlled by 2 No. two way switches.	Pt.			
3	Wiring for light point as in item No. 1 above but controlled by SP MCB provided in the DB. (Cost of MCB not to be included here).				
a	**First light point** controlled by one MCB	Pt.	45		
b	**Secondary light point** looped with First Point	Pt.	215		

4	Wiring for 250 volts single phase and neutral 2 No, 6 Amps socket outlet contolled with 1 No. 6 Amps switch with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit 2mm thick including providing and fixing of Two no. 6 Amps 5 pin socket outlet with 1 No. 6 Amps switch of aprpoved make and design in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (maximum of 3 switch sockets shall be looped in one circuit) Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit.	Pt	70		
5	Wiring for 250 volts single phase and neutral 1 No. 6 Amps switch socket outlet with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit 2mm thick including fixing of one no. 5 pin 6 Amps socket outlet with 1 No. 6 Amps switch in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (maximum of 6 - 8 switch sockets shall be looped in one circuit) Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit. (for FCU Units, Fire Damper) (All Sockets are on UPS supply)	Pt.	55		
6	Wiring for 250 volts single phase and neutral 1 No, 6 Amps socket outlet contolled with 1 No. 6 Amps switch with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit including fixing of 2 no. 6 Amps 5 pin socket outlet with 1 No. 6 Amps switch in 1.6 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (maximum of 3 switch sockets shall be looped in one circuit) Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit.	Pt.	135		

7	Wiring for 250 volts single phase and neutral 6 / 16 Amps switched socket outlet with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including providing and fixing of one no. 6 / 16 Amps 6 pin switched socket outlet of approved make and design in 1.6 mm thick GI box with grid plates and earthing the fifth pin of each socket outlet with 4 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire (one socket outlet shall be connected on one circuit for hand dryer), complete in all respect.	Pt.			
8	Wiring for 250 volts single phase and neutral 6 / 16 Amps switched socket outlet with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including providing and fixing of one no. 6 / 16 Amps 6 pin switched socket outlet of approved make and design in 1.2 mm thick GI box with grid plates and earthing the fifth pin of each socket outlet with 4 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire (one socket outlet shall be connected on one circuit for hand dryer), complete in all respect.	Pt.	155		
9	Wiring for 250 volts single phase and neutral 1 No, 6 Amps switch socket outlet with 3 x 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in exposed / recessed 25 mm dia MS Conduit including providing and fixing of one no. 5 pin 6 Amps socket outlet with 1 No. 6 Amps switch of aprpoved make and design in 1.2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible HFFRLS wire complete in all respect. (maximum of 6 - 8 switch sockets shall be looped in one circuit) Note: Circuit wire shall be carried out with 3 x 2.5 sq mm PVC insulated HFFRLS wire in 25 mm dia conduit. (for FCU Units & Fire Dampers) (All Sockets are on UPS supply)	Pt.	R.O		
10	Wiring for 250 volts single phase and neutral 2 No. 6 / 16 Amps socket outlet contolled with 1 No.6 Amps switch with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including providing and fixing of one no. 6 / 16 Amps 6 pin switched socket outlet of approved make and design in 1.6 mm thick GI box with grid plates and earthing the fifth pin of each socket outlet with 4 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire (one socket outlet shall be connected on one circuit), complete in all respect.	Pt.	10		

11	Wiring for 250 volts single phase and neutral 6 / 16 Amps switched socket outlet with 3 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in 25 mm dia MS Conduit including providing and fixing of one no. 6 / 16 Amps 6 pin switched socket outlet of approved make and design in 1.2 mm thick GI box with grid plates and earthing the fifth pin of each socket outlet with 4 Sq mm PVC insulated copper conductor stranded flexible HFFRLS wire (maximum of two socket outlet shall be connected on one circuit), complete in all respect.				
a	First point for 6/16 amps switched socket outlet.	Pt	20		
b	**Secondary point** comprising of One No. 6/16 Amps switch socket outlet (looped with first point)	Pt			
12	Wiring for inline fan point with 3 x 2.5 sq. mm. insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires of approved make in exposed / recessed 25 mm dia MS Conduit including supply and fixing of of 6 Amps flush mounted switch at the normal switch level in 1.2 mm thick GI box and 6 Amps 3 pin flush mounted socket outlet near exhaust fan and earthing of exhaust fan through the third pin of the socket outlet and GI box with 2.5 sq. mm. PVC insulated copper conductor flexible HFFRLS wire, complete in all respect as required as per site conditions. (Looping with nearest light point)	Pt	R.O		
13	Wiring for 250 volts single phase and neutral 16 Amps polycarbonate plug top industrial 3 pin (IP 65/66) socket outlet in a poly carbonate enclosure of approved size and design with 2 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 25 mm dia MS Conduit, including providing and fixing of 16 Amps socket in poly carbonate enclosure and earthing of third pin of the socket with 4 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	160		
14	Wiring for 250 volts single phase and neutral 20 Amps polycarbonate plug top industrial 3 pin (IP 55) socket outlet in a poly carbonate enclosure of approved size and design with 2 x 6 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 25 mm dia MS Conduit, including providing and fixing of 25 Amps socket, plug top & MCB in poly carbonate enclosure and earthing of third pin of the socket with 6 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	10		

15	Wiring for 250 volts single phase and neutral 25 Amps polycarbonate plug top industrial 3 pin (IP 55) socket outlet in a poly carbonate enclosure of approved size and design with 2 x 6 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 25 mm dia MS Conduit, including providing and fixing of 25 Amps socket, plug top & MCB in poly carbonate enclosure and earthing of third pin of the socket with 6 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	5		
16	Wiring for 250 volts single phase and neutral 32 Amps polycarbonate plug top industrial 3 pin (IP 65/66) socket outlet in a poly carbonate enclosure of approved size and design with 2 x 6 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 25 mm dia MS Conduit, including providing and fixing of 32 Amps socket in poly carbonate enclosure and earthing of third pin of the socket with 6 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	5		
17	Wiring for 250 volts single phase and neutral 16 Amps polycarbonate plug top industrial 3 pin (IP 65/66) socket outlet with 16 Amps double pole MCB in a poly carbonate enclosure of approved size and design with 2 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 25 mm dia MS Conduit, including providing and fixing of 16 Amps socket in poly carbonate enclosure and earthing of third pin of the socket with 4 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	120		
18	Wiring for 250 volts single phase and neutral 20 Amps polycarbonate plug top industrial 3 pin (IP 55) socket outlet with 20 Amps double pole MCB in a poly carbonate enclosure of approved size and design with 2 x 4 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 25 mm dia MS Conduit, including providing and fixing of 20 Amps socket, plug top & MCB in poly carbonate enclosure and earthing of third pin of the socket with 4 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	25		

19	Wiring for 250 volts single phase and neutral 25 Amps polycarbonate plug top industrial 3 pin (IP 65/66) socket outlet with 25 Amps double pole MCB in a poly carbonate enclosure of approved size and design with 2 x 6 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 25 mm dia MS Conduit, including providing and fixing of 25 Amps socket in poly carbonate enclosure and earthing of third pin of the socket with 6 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	15		
20	Wiring for 250 volts single phase and neutral 32 Amps polycarbonate plug top industrial 3 pin (IP 65/66)socket outlet with 32 Amps double pole MCB in a poly carbonate enclosure of approved size and design with 2 x 10 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 32 Amps socket in poly carbonate enclosure and earthing of fifth pin of the socket with 10 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	25		
21	Wiring for 250 volts single phase and neutral 40 Amps polycarbonate plug top industrial 3 pin (IP 65/66)socket outlet with 40 Amps double pole MCB in a poly carbonate enclosure of approved size and design with 2 x 10 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 32 Amps socket in poly carbonate enclosure and earthing of fifth pin of the socket with 10 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt			
22	Wiring for 415 volts Three phase and neutral 16 Amps polycarbonate plug top industrial 5 pin (IP 65/66)socket outlet with 16 Amps 4 Pole MCB in a poly carbonate enclosure of approved size and design with 4 x 4 sq.,mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 25 Amps socket in poly carbonate enclosure and earthing of the socket with 2 x 4 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	5		

23	Wiring for 415 volts Three phase and neutral 25 Amps polycarbonate plug top industrial 5 pin (IP 65/66)socket outlet with 25 Amps 4 Pole MCB in a poly carbonate enclosure of approved size and design with 4 x 10 sq.,mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 32 Amps socket in poly carbonate enclosure and earthing of the socket with 2 x 10 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	10		
24	Wiring for 415 volts Three phase and neutral 32 Amps polycarbonate plug top industrial 5 pin (IP 65/66)socket outlet with 32 Amps 4 Pole MCB in a poly carbonate enclosure of approved size and design with 4 x 10 sq.,mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 32 Amps socket in poly carbonate enclosure and earthing of the socket with 2 x 10 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	15		
25	Wiring for 415 volts Three phase and neutral 40 Amps polycarbonate plug top industrial 5 pin (IP 55)socket outlet with 40 Amps 4 Pole MCB in a poly carbonate enclosure of approved size and design with 4 x 6 sq.,mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 40 Amps socket in poly carbonate enclosure and earthing of the socket with 2 x 6 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	15		
26	Wiring for 415 volts Three phase and neutral 63 Amps polycarbonate plug top industrial 5 pin (IP 55)socket outlet with 63 Amps 4 Pole MCB in a poly carbonate enclosure of approved size and design with 4 x 10 sq.,mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 63 Amps socket in poly carbonate enclosure and earthing of the socket with 2 x 10 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	10		

27	Wiring for 415 volts Three phase and neutral 25 Amps polycarbonate plug top industrial 5 pin (IP 65/66)socket outlet in a poly carbonate enclosure of approved size and design with 4 x 4 sq.,mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 25 Amps socket in poly carbonate enclosure and earthing of the socket with 2 x 4 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	R.O		
28	Wiring for 415 volts Three phase and neutral 40 Amps polycarbonate plug top industrial 5 pin (IP 55)socket outlet in a poly carbonate enclosure of approved size and design with 4 x 6 sq.,mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 40 Amps socket in poly carbonate enclosure and earthing of the socket with 2 x 6 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	10		
29	Wiring for 415 volts Three phase and neutral 63 Amps polycarbonate plug top industrial 5 pin (IP 55)socket outlet in a poly carbonate enclosure of approved size and design with 4 x 10 sq.,mm PVC insulated copper conductor 1100 volts grade stranded flexible HFFRLS wires in concealed or surface mounted 32 mm dia MS Conduit, including providing and fixing of 63 Amps socket in poly carbonate enclosure and earthing of the socket with 2 x 10 sq.mm PVC insulated copper conductor stranded flexible HFFRLS wire, complete in all respect.	Pt	15		
	TOTAL CARRIED TO SUMMARY				
F.	**<u>INTERNAL LIGHTING FIXTURES</u>**				
1	The rates shall include all components that may be required to make the installation complete in all respects such as :				
	* Suitable length connecting wires where called for.				
	* Internal wiring between accessories.				
	* Bonding with earth wires.				
2	Drilling holes in supports wherever require.				

3	Lighting fixtures shall be hanged from celing with 2 No of GI chains and required accessories				
4	PVC adopter at fittings end shall be provided				
5	Connections should be done with end ferrules				
6	Additional 5 No. spare lamps, control gear, wiring etc of each type of light fixture shall be provided upon handover.				
F.	**INTERNAL LIGHTING FIXTURES**				
1	Receiving, storing, installation, testing and commissioning of the following lighting fixtures with required lamps, low loss electronic ballast, control gear etc with all suspension, fixing termination, cables, accessories etc. complete in all respect as required as per site conditions.				
1.1	Surface / Reccess Mounted light fixture with driver, ballast, lamp, accessories wiring etc	No.	2400		
1.2	Cove light fixture with driver, ballast, lamp, accessories wiring etc	RM	1000		
2	Supply of the following lighting fixtures with required lamps, electronic ballast, Constant current, multistage control gear etc having CRI > 80, driver efficiency > 85%, EMI & surge protection in driver, SELV < 60 Vdc, LM80, LM79 compliant, separate Phase, Neutral & earth conductor in driver/light, luminaire system efficacy ~ 100 lm/w and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, Class A circuit with all suspension, fixing termination, cables, accessories etc. complete in all respect as required as per site conditions. All luminaires, drivers and control gear etc shall be designed to operate at 40 deg C and voltage range from 140 - 270V AC, 50Hz in a continuous operation mode with no change in performance parameters i.e. light output. The luminaire should be inbuilt with highly efficient optics to limit the UGR to be under 19. Note: All Lights shall be Flicker free.				
2.1	40 Watt Surface / Suspended / Wall Mounted LED Battern with minimum luminaire system efficacy of 100 lm/w having a color temperature of 5700K and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, PF>0.9, THD<10%, accessories wiring etc equivalent to **Philips Cat Ref : BN308C LED40S-6500 L120 PSU WH**	No.	R.O		

2.2	40 Watt Surface / Suspended / Wall Mounted LED Battern with in-built PIR Sensor minimum luminaire system efficacy of 100 lm/w having a color temperature of 5700K and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, PF>0.9, THD<10%, accessories wiring etc equivalent to **Philips Cat Ref : BN308C LED40S-6500 L120 PSU WH**	No.	65		
2.3	20 Watt Surface / Suspended / Wall Mounted LED Battern **in-built PIR Sensor** with minimum luminaire system efficacy of 100 lm/w having a color temperature of 6500K and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, PF>0.9, THD<10%, accessories wiring etc equivalent to **Philips make: BN308C LED20S-4000 L120 PIR WH**	No.	340		
2.4	20 Watt Surface / Suspended / Wall Mounted LED Battern with minimum luminaire system efficacy of 100 lm/w having a color temperature of 5700K and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, PF>0.9, THD<10%, accessories wiring etc equivalent to **Philips Cat ref : BN308C LED20S-6500 L120 PSU WH**	No.	85		
2.5	10 Watt Surface mounted LED Downlighter, minimum luminaire system efficacy of 100 lm/w having a color temperature of 5700K and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, PF>0.9, THD<10%, accessories wiring etc. complete as required.	No.	180		
2.6	15 Watt Recessed LED Downlighter with minimum luminaire system efficacy of 100 lm/w having a color temperature of 4000K and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, accessories wiring etc equivalent to **Wipro Cat. Ref. CRDL11R023HP57**	No.	180		
2.7	Supply of LED Bulkhead with a nominal system lumen output of 1100 lumens and a minimum system efficacy >100 lm/W. The luminaire shall have a rated system lifetime of 50,000 burning hours at L70. The luminaire should have a color temperature of 6500K and CRI > 80. The luminaire shall meet IP66 rating and IK 09 rating with THD < 10% and PF > 0.9. The luminaire housing should made of High pressure die cast Aluminium with polycarbonate front diffuser. The total power consumption should	No.	445		

	not exceed 10W (including driver). **Similar to Philips Make WT202W LED10S NW PSU S3 PC**				
2.8	Supply installation and testing commissioning of Passive Infrared(PIR) technology based Occupancy sensor having high preformance, non regulating programmable type, suitable for connected load upto 10 A, for mounting height up to 3 meter and for 5 meter diameter coverage area along with necessary fixing arrangements i/c programming at site etc. complete as required .It also has LED indicator on the sensor which indicates occupancy level / problem with the wiring and including junction box etc.	No.	R.O		
2.9	15 Watt Surface mounted LED Downlighter with minimum luminaire system efficacy of 100 lm/w having a color temperature of 4000K and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, PF>0.9, THD<10%, accessories wiring etc equivalent to **Wipro LD06-171-XXX-57-WSM**	No.			
2.10	36 Watt Recessed Clean Room LED 2 x 2 panel with minimum luminaire system efficacy of 100 lm/w having a color temperature of 4000K and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, PF>0.9, THD<10%, accessories wiring etc equivalent to **Wipro LC20-551XXX-57-XX**	No.	145		
2.11	36 Watt Recessed LED 2 x 2 panel with minimum luminaire system efficacy of 100 lm/w having a color temperature of 4000K and housing should made up of pressure die cast aluminium with high efficiency diffuser with driver, PF>0.9, THD<10%, accessories wiring etc equivalent to **Wipro CRCO10R038HP57GL1**	No.	225		
2.12	Supply of 10 W 2 feet Mirror Light with nominal system lumen o/p of 1000lm with extruded aluminium housing , System efficacy @ 100 Lm/W , & colour Temp. 5700 K , THD <20 % & P.F> 0.9 with all accessories etc. wiring etc equivalent to **Philips Cat Ref : BN 021 LED10S- 6500 PSU GR S1**	No.	R.O		
3	Supply, installation, testing and commissioning of Aviation LED light fixture equivalent to Bajaj BGAV 302 LED including lamp, control etc;.	No.	1		

Note	Driver safety requirement stabdards IS-15885-2-13, Test Report to be submitted, photobiological norms, IS-16108, test certificate to be submitted, Certificate, LM 79 for luminaire and LM-80 for LED source.				
	TOTAL CARRIED TO SUMMARY				
G.	**<u>INFRASTRUCTURE FOR IT, VOICE & TV SYSTEM</u>**				
1	Providing and laying 1.6 mm thick pregalvanized **Ceiling/Wall hung** GI factory fabricated raceways of the following sizes including 1.2 mm thick GI covers, providing knock out holes, end caps and all required fixing accessories including 6 SWG GI earth wire complete as required including Ceiling /wall supports, bends, access boxes and tap off boxes as per specification and cross over as per site requirement. *Note: The item shall include the cost of ceiling/wall supports complete as required as per site requirement.*				
a	100 mm wide x 40 mm deep raceway	R M	810		
b	150 mm wide x 40 mm deep raceway	R M	R.O		
c	200 mm wide x 40 mm deep raceway	R M	40		
d	300 mm wide x 40 mm deep raceway	R M	50		
2	Providing and laying 1.6 mm thick pregalvanized **Floor / screed installation** GI factory fabricated raceways of the following sizes including 2 mm thick GI covers, providing knock out holes, end caps and all required fixing accessories including 6 SWG GI earth wire complete as required including floor /wall supports, bends, access boxes and tap off boxes as per specification and cross over as per site requirement. *Note: The item shall include the cost of chipping, cutting the floor for laying the raceway and making good the finish including chicken mesh complete as required as per site requirement.*				
		R M	50		
a	150 mm wide x 40 mm deep raceway				
		R M	50		
a	200 mm wide x 40 mm deep raceway				

3	Providing and fixing of 150 x 150 x 50 mm deep (Nominal size) floor junction box including providing 3 mm thick MS Powder coated cover, SS screws, knockout holes required as per specification. *Note:- Blue colour shall be considered for Power.*	No.	10		
4	Providing and fixing of 250 x 250 x 50 mm deep (Nominal size) floor junction box including providing 3 mm thick MS Powder coated cover, SS screws, knockout holes required as per specification. *Note:- Blue colour shall be considered for Power.*	No.	5		
5	Providing and fixing of 350 x 350 x 50 mm deep (Nominal size) floor junction box including providing 3 mm thick MS Powder coated cover, SS screws, knockout holes required as per specification. Note:- Blue & Orange colour shall be considered for Power & Data respectively.	No.	5		
6	Supply & Fixing in position of the following sizes of exposed / recessed 1.6 mm dia MS Conduit including all accessories complete as required and as per specifications.				
a	25 mm dia MS conduit	RM	15000		
b	32 mm dia MS conduit	RM	2000		
7	Receving & fixing of one no. TV outlet of approved make and design in 1.2 mm thick GI box with grid plates with earthing complete in all respect.	Pt	155		
8	Supply, laying, including termination testing & commissioning of RG-6 co-axial cable of approved make for TV in 25 mm dia MS conduit complete in all respect as required.	RM	17700		
9	Supply, laying, including termination testing & commissioning of RG-11 co-axial cable of approved make for TV in existing conduit complete in all respect as required.	RM	9800		
10	Receving & fixing of one no. RJ 45 jack for Data / Voice / IPTV outlet of approved make and design in 1.2 mm thick GI box with grid plates complete in all respect.				
a	Simplex oulet for 1 no. Data / Voice with information outlet for cable termination	No.	400		
b	Duplex outlet for 2 No. Data / Voice with information outlet for cable termination	No.	55		

11	Supply, laying, including termination testing & commissioning of CAT-6A cable of approved make for Data system in existing conduit complete in all respect as required including termination upto Jack Panel.	RM	10000		
12	Supply and laying of following size HDPE pipe ISI marked along with all accessories like sockets, bend, couplers etc. conforming to IS-14930, Part-II complete with fitting and cutting jointing etc. direct in ground (750mm deep below ground) including excavation refilling the trench but excluding sand cushioning and protective covering etc. complete as required and making good as approved.				
13.1	32 mm dia	RM	150		
13.2	100 mm dia	RM	80		
	TOTAL CARRIED TO SUMMARY				
H.	**<u>UPS</u>**				
1	Supply, installation, testing and commissioning of 15 **kVA** UPS, 3 phase (415 V) Volts input & 3 phase output (415 V), 50 Hz, Input harmonic Current THD 5% typical at 100% load, 6% maximum at 50% load and **90 min battery backup** for UPS along with battery cabinet complete in all respect including supporting steel structure for UPS and Battery as required. Quoted price shall be inclusive of approved rating single core copper conductor cable connecting UPS and batteries. (For Emergency Lighting)	Set	1		
2	Supply, installation, testing and commissioning of 25 **kVA** UPS, 3 phase (415 V) Volts input & 3 phase output (230 V), 50 Hz, Input harmonic Current THD 5% typical at 100% load, 6% maximum at 50% load and **15 min battery backup** for UPS along with battery cabinet complete in all respect including supporting steel structure for UPS and Battery as required. Quoted price shall be inclusive of approved rating single core copper conductor cable connecting UPS and batteries. (For Power)	Set	2		
	TOTAL CARRIED TO SUMMARY				
I.	**<u>INFRASTRUCTURE FOR EXTERNAL LIGHTING SYSTEM</u>**				
	Rate for installation of fixtures shall also include the following:				

1	This schedule of Quantities shall be read in conjuction with the technical specification, General & Special conditions as well as all tender drawings.				
2	All component that may be required to make the installation complete in all respects.				
	a. Suitable length of connecting wires.				
	b. Connecting wires to the point through connection block.				
	c. Bonding to earth wires.				
3	Drilling holes in supports wherever required.				
4	Fixing clamps, GI bolts and nuts / brass screws, saddles, rawl bolts and other fixing accessories as required.				
5	Painting with enamel paint of clamps and other fixing accessories.				
6	Suitable size junction boxes with connector block for loop in loop out where ever applicable.				
7	Testing of all fixture and after installation.				
I.	**<u>INFRASTRUCTURE FOR EXTERNAL LIGHTING SYSTEM</u>**				
1	Receiving, storing, installation, testing and commissioning of the following lighting fixtures with required lamps, low loss electronic ballast, control gear etc with all suspension, fixing termination, cables, accessories etc. complete in all respect as required as per site conditions.				
a	Ground burial / uplighter / Brick light fixture	No.	30		
b	Pole Mounted Lights including earth work, foundation & installation of Poles.	No.	50		
c	Boundary / Façade / Flood lights	No.	15		
d	Cove light fixture with driver, ballast, lamp, accessories wiring etc	RM	300		
e	Reccess Mounted Underwater light fixture	No.	10		

2	Supplying & laying of following 1100 volt grade FRLS XLPE insulated PVC sheathed Aluminium/Copper conductor armoured/Unarmored cables as per specification **laid in ground** including cost of digging upto required depth, over a bed of sand, brick protection, route marker, back filling etc with suitable clamps including, saddles fixing bolts, connecting testing and commissioning complete in all respect as required as per site conditions.				
a	4 core 6 sq.mm Cu arm. Cable including termination	RM	800		
b	3 core 6 sq.mm Cu arm. Cable including termination	RM	800		
c	3 core 4 sq.mm Cu arm. Cable including termination	RM	1200		
d	3 core 2.5 sq.mm Cu arm. Cable including termination	RM	1500		
3	Supply and laying of following size HDPE pipe ISI marked along with all accessories like sockets, bend, couplers etc. conforming to IS-14930, Part-II complete with fitting and cutting jointing etc. direct in ground (750mm deep below ground) including excavation refilling the trench but excluding sand cushioning and protective covering etc. complete as required and making good as approved.				
a	63 mm dia(OD 90 mm and ID 50 mm nominal)	RM	50		
4	Supply, installation, testing and commissioning of following polycarbonate weather proof (IP-68) junction box suitable for pole mounting / underground complete as rerequired.				
a	One Way	No	5		
b	Two Way	No	5		
c	Three Way	No	10		

5	Design, fabrication, assembling, wiring and supply, installation, testing and commissioning of Distribution Panels fabricated out of (load bearing member of 2mm and non load bearing member 1.6 mm thick) CRCA sheet steel in cubicle compartmentised modular 3b construction, free standing floor mounted with bottom cable entry, dust and vermin proof with reinforcement of suitable size angle iron, channel, `T' sections and / or flats wherever necessary. 3 mm thick cable gland plates shall be provided at the bottom of the panels with appropriate stand etc. Panels shall be treated with all anticorrosive process before powder coating as per specifications and final approved shade. 2 Nos. earthing terminals shall be provided for all distrtibution panels. Panels shall be suitable for 415V, 3 phase, 4 wire, 50 HZ supply system. Lifting hooks shall also be provided in case of large panels. Approval shall be taken for each panel in the form of shop drawings before fabrication. Galvanised hardwares with zinc passivation shall be used in fabrication of panels.				
a	Feeder Pillar (For External Landscape lighting) **IP 66 for outdoor Protection**				
	Incomer				
	63 Amps 4 pole MCB, Photocell Sensor				
	Bus Bars				
	100 Amps TPN Aluminium bus bars with heat shrinkable insulation sleeve. - 1 Set				
	Outgoing				
	40 Amps 4 pole MCB incomer with 40 Amps TP contactor 0-24 hours timer auto / manual and outgoings including 18 No. 10/16/20 Amps SP MCB with 3 Nos. 32 Amps DP RCCB's of 30 mA leakage current with separate neutral link of each phase- 1 set (50%)				
	40 Amps 4 pole MCB incomer with 40 Amps TP contactor 0-24 hours timer auto / manual and outgoings including 18 No. 10/16/20 Amps SP MCB with 3 Nos. 32 Amps DP RCCB's of 30 mA leakage current with separate neutral link of each phase- 1 set (50%)				
	32 Amps DP MCB - 4 set				
	40 Amps DP MCB - 4 set				
	63 Amps 4 Pole MCB - 4 set				

	Feeder Pillar for external / landscape lighting as described above	No.	1		
8	Supply, installation, testing and commissioning of 63 Amps 4 Pole Industrial plug top socket outlet with MCB including Outdoor duty Polycarbonate enclosure of approved make (IP 68).	No.	2		
9	Supply, installation, testing and commissioning of 40 Amps DP Industrial plug top socket outlet with MCB including Outdoor duty Polycarbonate enclosure of approved make (IP 68).	No.	2		
	TOTAL CARRIED TO SUMMARY				

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 External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) &Allied Servics on a Item Rate Contract Basis
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	Services for "External & Internal Electrical Infrastructure Works (LT Panels, Boards, Cable Trays, Earthings, Lightning Protection, Wiring with Conduiting and Fixtures) &Allied Services
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., 9 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

Clause	Description
	extra as applicable
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