

DEENDAYAL PORT AUTHORITY



TENDER DOCUMENTS FOR

Construction of Center of Excellence (CoE) for Green Hydrogen at Gandhidham

**EXECUTIVE ENGINEER (C-I)
CONSTRUCTION -I DIVISION
DEENDAYAL PORT AUTHORITY
ROOM NO. 303, 2nd FLOOR,
NEW ANNEX BUILDING
GANDHIDHAM- KACHCHH-
370201 MOBILE – 8758659669
E-MAIL: constdiv1@gmail.com**

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DEENDAYAL PORT AUTHORITY

DC : 1

COMPETITIVE BIDDING

BID NO : C-I : 0 3 /2025

Name of work: "Construction of Center of Excellence (CoE) for Green Hydrogen at Gandhidham

PERIOD OF DOWNLOADING OF BID DOCUMENTS

FROM	: 15.04.2025
TO	: 14.05.2025 @16:00 HRS.
LAST DATE AND TIME FOR RECEIPT OF BIDS	: 14.05.2025 @16:00 HRS
TIME AND DATE OF OPENING OF BIDS	: 14.05.2025 @16:15 HRS.
PLACE OF OPENING OF BIDS	: Office of Executive Engineer (C-I) Construction-I DIVISION DEENDAYAL PORT AUTHORITY ROOM NO.303, 2 nd FLOOR, New Annexe BUILDING, Gandhidham- KACHCHH-370201

OFFICER INVITING BIDS :

**EXECUTIVE ENGINEER (C-I)
DEENDAYAL PORT AUTHORITY**

DEENDAYAL PORT AUTHORITY

NOTICE INVITING TENDER

Tender No. C-I:03/2025

ONLINE TENDERING (E- Tendering)

Name of Work: Construction of Center of Excellence (CoE) for Green Hydrogen at Gandhidham

E/Online Tenders are invited by Executive Engineer (C-I) for the above work as per the details given in the table below.

Work Description	Tender Fee (In Rs.)	Estimated cost (In Rs.)	EMD (In Rs.)	Date of Pre-Bid Meeting	Last Date and time of online Submission of bid documents	Date and time of online opening
Construction of Center of Excellence (CoE) for Green Hydrogen at Gandhidham	5900/- (Including GST @ 18 %) to be paid in digital mode (UPI/RTGS/NEFT /etc.) in Port account. Details are mentioned below: - Account no.: - 10080100022427 IFSC Code: - BARBOGANKUT Bank of Baroda, Gandhidham Branch	Rs.75,07,63,130/-	Rs. 50 lakhs in the form of Bank Guarantee issued in favor of "Board of Deendayal Port Authority" by any nationalized/ scheduled bank except co-operative bank having its branch at Gandhidham as per format in the tender documents.	Nil	Up to 16:00 hours on 14.05.2025	14.05.2025 @16:15 Hrs.

Detailed tender notice along with complete tender documents can be downloaded from website <https://tender.nprocure.com> from **15.04.2025 to 14.05.2025 @ 16:00 Hrs.** Tender Notice is also available on www.deendayalport.gov.in. Technical Bid will be opened on **14.05.2025 @ 16:15 Hrs.** Date of opening of price bid shall be notified after scrutiny & evaluation of Technical Bid. For further details and general enquiries prospective bidders may contact **Executive Engineer (C-I) Construction-I Division DEENDAYAL PORT AUTHORITY ROOM NO.303, 2nd FLOOR, New Annexe BUILDING, Gandhidham- KACHCHH-370201** during working hours before the last date and time of downloading of tender documents.

**EXECUTIVE ENGINEER (C-I)
DEENDAYAL PORT AUTHORITY**

DEENDAYAL PORT AUTHORITY
NOTICE INVITING ONLINE TENDER

Details about E/Online tender:

Department Name	Civil Engineering Department
Circle/ Division	CONSTRUCTION-I DIVISION
Tender Notice No.	: C-I:03/2025
Name of Work	CONSTRUCTION OF CENTER OF EXCELLENCE (COE) FOR GREEN HYDROGEN AT GANDHIDHAM
Estimated Contract Value (INR)	Rs.75,07,63,130/-
Period of Completion (in Months)	10 Months
Bidding Type	Open
Bid Call (Nos.)	One
Tender Currency Type	Single
Tender Currency Settings	Indian Rupee (INR)
Minimum Pre-Qualifying / Eligibility Criteria :	<ol style="list-style-type: none">1. Average annual financial turnover during the last three years ending 31st March 2024, should be at least Rs.2252 Lakhs. Average annual Turnover based on CA certificate duly stamp, signed with UDIN/Membership number is to be submitted failing which bid will be stand non-responsive.2. Experience of having successfully completed similar works during last 7 years ending last day of month previous to the one in which applications are invited should be either of the following: Three similar completed works, each work costing not less than Rs. 3003 Lakhs. (Excl. GST) Or Two similar completed works, each work costing not less than Rs. 3754 Lakhs. (Excl. GST) Or One similar completed work, costing not less than Rs.6006 Lakhs. (Excl. GST)

“Similar Work” means Civil & PEB Structure in single Building project in Commercial/Institutional/Industrial sector which includes PUF Panels, Glass and GRC Facades, Dry wall construction, Interiors & finishes, MEP etc. all complete work of a building.

Additionally, the bidder should possess its own or associated with any two of the following, state of the art manufacturing facilities. Bidders are required to submit valid certificates issued by a govt in case of ownership as documentary proof. In case of association, notarized undertaking confirming association along with proof of ownership of associated member.

- a. Glass Fiber Reinforced concrete (GFRC)
- b. Glass Fiber Reinforced Polymer (GFRP)
- c. Aluminum Glass Façade and window fabrication
- d. Modular Furniture

The Subcontract experience shall be considered for pre-qualification only if same is carried out in Govt./Semi Govt./Public Limited companies subject to submission of sub contract permission issued by the respective authority prior to the execution of the work. Further, if sub contract permission is not authenticated, the respective party shall be considered non-responsive. The decision taken by DPA shall be final.

If the Bidder has completed works in a private organization as stipulated in the Minimum Qualification Criteria (work experience), the following documents must be enclosed with the BID for consideration:

- TDS Certificates: The Bidder must provide TDS certificates issued by the competent authority with respect to the work experience submitted.
- CA Certificate: The Bidder must submit certificate issued by Chartered Accountant (CA) stating that the amount shown in the TDS certificate has been received with respect to the work experience submitted by the Bidder. This document must be certified by the CA with stamp, signature and UDIN number, failing which the bid will stand non-responsive.

3. Joint Venture

- I. In case of JV, to qualify experience in similar works, merging of work order value executed by two or more of its members of JV either as a whole or as member of JV shall not be permitted to qualify eligible works in terms of similar completed works. Only No. of work orders of completed works by member of JV shall be merged to evaluate the experience.
- II. Lead partner should have executed at least one similar work costing **Rs. 3003 lakhs** (40% of estimated cost) (excl. GST) as per Minimum Eligibility Criteria.

- III. The works reckoned for the above purpose are those executed by the tenderer as prime contractor or proportionately as member of joint venture or as a sub-contractor, authorized and approved by the Employer of the work(s) against which the tenderer has claimed his experience.
- IV. In case of Bid submitted by JV/Consortium, the lead partner of the JV shall meet the minimum Eligibility criteria of Financial Turnover.
- V. Bid Security required shall be furnished by lead member of JV.

4. Bidders who meet the minimum qualification criteria will be qualified only if their available bid capacity is more than the total bid value. The available bid capacity will be calculated as under:

Assessed Available Bid capacity= $A \times N \times 2 - B$, Where, "N" = Number of years prescribed for completion of the subject contract.

"A" = Maximum value of works executed in any one year during last seven years (at current price level)

"B" = Value at current price level of existing commitments and ongoing works to be completed in the next 'N' years. The Bidder shall furnish statements showing the value of existing commitments and ongoing works as well as the stipulated period of completion remaining for each of the works preferably countersigned by the Nodal Office or his nominee-in-charge.

5. Integrity Pact Agreement (**Annexure I**).

- I. The potential bidders shall download and print the IP Agreement signed by the Employer and their witness and affix his/her signature on the IP Agreement in the presence of a witness from his/her side, who shall also affix his/her signature thereof. Having completed the signing procedure, the potential Bidder shall upload the duly filled and signed IP Agreement on n-procure portal.
- II. The procedure mentioned above regarding signing of Integrity Pact Agreement by both the parties (Employer and Potential bidders) shall be completed online. However, in case of any technical glitch due to which if any potential bidder is unable to upload the IP Agreement, then he/ she shall submit the Hard Copy of the duly filled, signed IP Agreement, to the Department concerned of DPA within a period of seven days and prior to opening of the Technical Bid, failing which Bid of potential Bidder shall be treated as disqualified.
- III. In case of JV firm, IP agreement is to be filled and submitted in the name of the JV firm only otherwise the bid will not be considered for further evaluation.

Joint Venture	Applicable
Rebate	Applicable (Unconditional rebate submitted online before due date of submission of bid)
Bid Document Fee :	Rs.5900/- (including GST) to be paid through digital mode of payment. The details are as under; Account no.: - 10080100022427 IFSC Code: - BARBOGANKUT Bank of Baroda, Gandhidham Branch
BID Security	Rs. 50 lakhs Bank Guarantee issued in favor of "Board of Deendayal Port Authority" by any Nationalized/scheduled (except co-operative) bank having branch at Gandhidham as per format provided in the tender documents.
Bid Document Downloading Start Date	15.04.2025
Bid Document Downloading End Date	14.05.2025
Date & Place of Pre-Bid Meeting	Nil
Last Date and Time for Receipt of Online Bids	14.05.2025 @16:00 Hrs.
Bid Validity Period	120 Days
Condition	<ol style="list-style-type: none"> 1. Tender Fees by digital mode of payment in Account no 10080100022427, IFSC code: BARBOGANKUT, Bank of Baroda, Gandhidham branch. The proof for transfer of funds to be submitted in preliminary bid stage. 2. The bid shall be accompanied by Payment through Bank Guarantee, issued in favor of "Board of Deendayal Port Authority" by any Nationalized/scheduled (except co-operative) bank having branch at Gandhidham as per format provided in the tender documents towards Bid Security (EMD). 3. The bid/Tender not accompanied with Tender fee and EMD in Preliminary Bid shall not be considered responsive, and their technical and price bid will not be opened. 4. The bid/tender shall also be accompanied by Integrity Pact Agreement (Annexure I). <ol style="list-style-type: none"> I. The potential bidders shall download and print the IP Agreement signed by the Employer and their witness and affix his/her signature on the IP Agreement in the presence of a witness from his/her side, who shall also affix his/her signature thereof. Having completed the signing procedure, the potential Bidder shall upload the duly filled and signed IP Agreement on n-procure portal.

- II. The procedure mentioned above regarding signing of Integrity Pact Agreement by both the parties (Employer and Potential bidders) shall be completed online. However, in case of any technical glitch due to which if any potential bidder is unable to upload the IP Agreement, then he/ she shall submit the Hard Copy of the duly filled, signed IP Agreement, to the Department concerned of DPA within a period of seven days and prior to opening of the Technical Bid, failing which Bid of potential Bidder shall be treated as disqualified.
 - III. In case of JV firm, IP agreement is to be filled and submitted in the name of the JV firm only otherwise the bid will not be considered for further evaluation.
5. In case of Micro and Small Enterprise (MSEs) holding valid certificate issued by any agencies/organization under,

SECTION F	CONSTRUCTION
Division 41	Construction of buildings
Group 410	Construction of buildings
Class 4100	Construction of buildings
Sub-Class 41001	Construction of buildings carried out on own-account basis or on a fee or contract basis
Division 43	Specialized construction activities
Group 433	Building completion and finishing
Class 4330	Building completion and finishing
In addition to above list of activities (Subclass 41001 and Class 4330), bidder must have the below mentioned list of activities (Sub-class 43211 & Sub-Class 43221) to claim relaxation under MSME's criteria.	
Division 43	Specialized construction activities
Group 432	Electrical, plumbing and other construction installation activities
Class 4321	Electrical installation
Sub-Class 43211	Installation of electrical wiring and fittings
Class 4322	Plumbing, heat and air-conditioning installation
Sub-Class 43221	Installation of plumbing for water, gas and sanitation equipment.

The Ministry of Micro, Small and Medium Enterprises indicating the list of activity related to the subject tender as per National Industrial Classification-2008 mentioned in the table below only shall become eligible for exemption from payment of Tender fee & EMD. Such bidder shall upload the scanned copy of valid certificate in preliminary bid. Such bidder shall upload in technical proposal a scanned copy of valid certificate, as well as duly filled in and signed '**Bid Securing Declaration**' as per format provided in the tender document (**Annexure II**), failing which the bid shall be disqualified.

Remarks

The above shall be submitted in electronic format through on line (by scanning) while uploading the bid. This submission shall mean that EMD, Tender Fee & Agreement are received. Accordingly offer of only

those shall be opened whose EMD, Tender Fee, are received electronically. However, for the purpose of realization, bidder shall send the same in original along with hard copy of tender (sealed & signed of authorized person), and other PQ documents through R.P.A.D./speed post or in person so as to reach to **Executive Engineer (C-I) Construction- I DIVISION DEENDAYAL PORT AUTHORITY ROOM NO.303, 2nd FLOOR, New Annexe BUILDING, Gandhidham-KACHCHH-370201**, within 7 days from the last date of opening.

Bid Opening Date

Technical Bid will be opened on **14.05.2025 @ 16:15 Hrs. Date of** of Price Bid shall be notified after scrutiny & evaluation of Technical Bid to qualified bidders.

Documents required to be submitted by scanning through online

Documents in support of fulfilling qualifying criteria as indicated above.

- a. Tender fee to be paid through digital mode of Payment through Digital Mode in Account no 10080100022427 IFSC code: BARBOGANKUT, Bank of Baroda, Gandhidham branch
- b. EMD to be paid through Bank Guarantee issued in favor of "Board of Deendayal Port Authority" by any Nationalized/scheduled (except co-operative) bank having branch at Gandhidham as per format provided in the tender documents.
- c. Average annual turnover on CA certificate duly stamp signed by UDIN number is to be submitted failing which bid will be stand non-responsive.
- d. As indicated in clause 1.4 of section 1 – Instructions to bidders.
- e. Integrity Pact agreement (**Annexure -I**)
 - I. The potential bidders shall download and print the IP Agreement signed by the Employer and their witness and affix his/her signature on the IP Agreement in the presence of a witness from his/her side, who shall also affix his/her signature thereof. Having completed the signing procedure, the potential Bidder shall upload the duly filled and signed IP Agreement on n-procure portal.
 - II. The procedure mentioned above regarding signing of Integrity Pact Agreement by both the parties (Employer and Potential bidders) shall be completed online. However, in case of any technical glitch due to which if any potential bidder is unable to upload the IP Agreement, then he/ she shall submit the Hard Copy of the dully filled, signed IP Agreement, to the Department concerned of DPA within a period of seven days and prior to opening of the Technical Bid, failing which Bid of potential Bidder shall be treated as disqualified.
 - III. In case of JV firm, IP agreement is to be filled and submitted in the name of the JV firm only otherwise the bid will not be considered for further evaluation.

Officer Inviting Bids:	EXECUTIVE ENGINEER (C-I), DEENDAYAL PORT AUTHORITY
Bid Opening Authority:	EXECUTIVE ENGINEER (C-I), DEENDAYAL PORT AUTHORITY
Address:	EXECUTIVE ENGINEER (C-I), CONSTRUCTION-I DIVISION, DEENDAYAL PORT AUTHORITY, ROOM NO.303, 2nd FLOOR, NEW ANNEXE BUILDING, GANDHIDHAM, KACHCHH-370201
Contract Details:	Mobile – 8758659669

**EXECUTIVE ENGINEER (C-I),
DEENDAYAL PORT AUTHORITY**

Note:

In case bidders need any clarifications or if training is required to participate in online tenders, they can contact (n)Procure Support team at following address: -

(n)code Solutions – A division of GNFC Ltd.,
(n)Procure Cell,
403, GNFC Infotower, S.G. Road,
Bodakdev, Ahmedabad – 380054 (Gujarat).

Contact Details :

Airtel : +91-79-40007501, 40007512, 40007516, 40007517, 40007525

BSNL : +91-79-2684511, 26854512, 26854513 (EXT: 501, 512, 516, 517, 525)

Reliance : +91-79-30181689

Fax : +91-79-26857321, 40007533

E-mail : nprocure@gnvfc.net

TOLL FREE NUMBER : 1-800-233-1010 (EXT: 501, 512, 516, 517, 525)

For further details, amendments or extension of time , if any, please visit

<https://tender.nprocure.com> OR www.deendayalport.gov.in

INFORMATION AND INSTRUCTIONS FOR CONTRACTORS FOR E-TENDERING FORMING PART OF NIT AND TO BE POSTED ON WEBSITE.

1. Information and instructions for Contractors will form part of NIT and to be uploaded on website.
2. The intending bidder must have class-III digital signature to submit the bid.
3. The Bid Document as uploaded can be viewed and downloaded free of cost by anyone including intending bidder. But the bid can only be submitted after uploading the mandatory scanned documents such as a Receipt of EMD in form of Bank Guarantee, Tender Fee in form of online Digital mode of Payment.
4. Bidders may modify or withdraw their bids before last date and time of submission of bid as notified.
5. While submitting the modified bid, contractor can revise the rate of one or more item(s) any number of times (he need not re-enter rate of all the items) but before last time and date of submission of bid as notified.
6. On opening date, the contractor can login and see the bid opening process. After opening of bids, he will receive the competitor bid sheets.
7. Contractor can upload documents in the form of JPG format and PDF format.
8. It is mandatory to upload scanned copies of all the documents including GST registration as stipulated in the bid document. If such document is not uploaded his bid will become invalid and cost of bid document shall not be refunded.
9. If the contractor is found ineligible after opening of bids, his bid shall become invalid and cost of bid document shall not be refunded.
10. If any discrepancy is noticed between the documents as uploaded at the time of submission of bid and hard copies as submitted physically by the contractor the bid shall become invalid and cost of bid document shall not be refunded.
11. Certificate of Financial Turn Over: At the time of submission of bid, contractor may upload Affidavit/ Certificate from CA mentioning Financial Turnover of last 3 (three) years or for the period as specified in the bid document and further details if required may be asked from the contractor after opening of technical bids. There is no need to upload entire voluminous balance sheet.
12. Contractor must ensure to quote rate of each item. If any cell is left blank and no rate is quoted by the bidder, rate of such item shall be treated as "0" (ZERO).
13. The Draft information and instructions to Contractors may be modified suitably by NIT approving authority as per requirement
14. All the mandatory document required/prescribed for Pre-qualification have to be enclosed by the bidder failing which his offer shall be rejected and treated as non-responsive. However, additional documents required if any for verification of the original documents shall be submitted by the bidder if required by DPA.

List of Documents to be scanned and uploaded within the period of bid submission:

- I. EMD in form of Bank Guarantee Drawn in favour of Board of Deendayal Port Authority, issued by any Nationalized /scheduled bank (Except Co-op bank) having branch at Gandhidham as per enclosed format.
- II. Tender Fee form of online Digital mode of Payment.

Bid Document.

- I. Certificates of Work Experience of successfully completed works issued by the client.
- II. Certificate of Financial Turnover from CA
- III. Any other Document as specified in the Section I.
- IV. Affidavit as per provisions of NIT.
- V. Certificate of Registration for GST and acknowledgement of up to date filed return if required.
- VI. Bid capacity calculations along with balance financial liability of works in hand.

**Executive Engineer (C-I)
Deendayal Port Authority**

SECTION -1

INSTRUCTIONS TO BIDDERS

a. GENERAL

1.1 Scope of Bid

The Executive Engineer, Construction-I Division, Deendayal Port Authority, invites bids by E- Tendering for the work of **“Construction of Center of Excellence (CoE) for Green hydrogen at Gandhidham”** detailed in the table given in NIT. The bidders shall submit on-line bids for the work detailed in the table given in NIT.

The successful bidder will be expected to complete the works by the intended completion date specified in the contract data.

1.2 Source of Funds

1.2.1 The employer has arranged the funds from internal resources and will have sufficient funds in Indian currency for execution of the works.

1.3 Eligible bidder.

1.3.1 The invitation for Bids is open to all eligible bidders meeting the eligibility criteria as defined in clause no 1.4.3.

1.3.2. All bidders shall provide in Section-2 form of Bid and Qualification Information, a statement that the Bidder is not associated, nor has been associated in the past, directly or indirectly, with the consultant or any other entity that has prepared the design, specifications, and other documents for the Project Manager for the Contract. A firm that has been engaged by the Employer to provide consulting services for the preparation or supervision of the works, and any of its affiliates, shall not be eligible to bid.

1.3.3. Government-owned enterprises may only participate if they are legally and financially autonomous, operate under commercial law and are not a dependent agency of the Employer subject to fulfillment of Minimum Qualifying criteria.

1.3.4. Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the employer in accordance with clause 1.36.

1.4 Eligibility Criteria

- 1.4.1.
- a. Experience of similar works executed during the last seven years, and details like monetary value, clients, and proof of satisfactory completion.
 - b. Documentary evidence of adequate financial standing and proof from client for satisfactory completion of works.
 - c. Deleted. **(Refer Clause 'A' of Sec-5)**
 - d. Equipment requirement/schedule. **(Refer Clause 'A' of Sec-5)**
 - e. Managerial/Manpower requirement. **(Refer Clause 'A' of Sec-5)**
 - f. Project Planning and Quality Control procedure to be adopted.
 - g. Information regarding projects in hand, current litigation, orders regarding exclusion, expulsion or black listing, if any.
 - h. Trained & Certified workmen proposed to be employed at the work site of the project. The Contractor must undertake to employ of certified worker to the extent of 20% of total strength. Valid certificates by a recognized University, technical Board, or Ministry of Government of India would only be taken cognizance of. **(Refer Clause 'A' of Sec-5)**
- 1.4.2. If the Employer has not undertaken pre-qualification of potential bidders, all bidders shall include the following information and documents with their bids.
- a. Copies of original documents defining the constitution or legal status, place of registration, and principal place of business, written power of attorney of the signatory of the Bid to commit the Bidder.
 - b. Total monetary value of construction work performed for each of the last five years.
 - c. Experience in works of a similar nature and size for each of the last five years, and details of works underway or contractually committed, and Employers who may be contacted for further information on those contracts.
 - d. Major items of construction equipment proposed to carry out to the contract.
 - e. Qualifications and experience of key technical site management and technical personal proposed for the contract.
 - f. Reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past five years.

- g. Evidence of adequacy of working capital for this contract (access to line(s) of credit and availability of other financial resources).
- h. Authority to seek references from the Bidder's bankers.
- i. Information regarding any litigation, current or during the last five years, in which the Bidder is involved, the parties concerned, and disputed amount.
- j. Proposal for subcontracting components of the works amounting to more than 10 percent of the Bid Price (for each qualification should attached); and **(Refer Clause 'A' of Sec-5)**
- k. The methodology and program of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures and completion of the work as per technical specifications within the stipulated period of completion as per milestones.
- l. PAN, Registration with Service Tax (GST), Provident Fund Authorities, etc.
- m. Bid Security in approved form as prescribed under Clause No. 1.16.

1.4.3 To qualify for award of the contract, bidders are advised to note the minimum qualification criteria specified below.

- i. Average annual financial turnover during the last three years ending 31st March 2024 should be at least **Rs. 2252 Lakhs.**

Average annual Turnover based on CA certificate duly stamp, signed with UDIN/Membership number is to be submitted failing which bid will be stand non-responsive.

- ii. Experience of having successfully completed similar works during last 7 years ending last day of month previous to the one in which applications are invited should be either of the following.
 - a. Three similar completed works each work costing not less than **Rs.3003 Lakhs.** (Excl. GST)
 - or**
 - b. Two similar completed works each work costing not less than **Rs. 3754 Lakhs.** (Excl. GST)
 - or**
 - c. One similar completed work costing not less than **Rs. 6006 Lakhs.** (Excl. GST)

"Similar Work" means Civil & PEB Structure in single Building project in Commercial/Institutional/Industrial sector which includes PUF Panels, Glass and GRC Facades, Dry wall construction, Interiors & finishes, MEP etc. all complete work of a building.

Additionally, the bidder should possess its own or associated with any two of the following, state of the art manufacturing facilities. Bidders are required to submit valid certificates issued by a govt in case of ownership as documentary proof. In case of association, notarized undertaking confirming association along with proof of ownership of associated member.

- a. Glass Fiber Reinforced concrete (GFRC)
- b. Glass Fiber Reinforced Polymer (GFRP)
- c. Aluminum Glass Façade and window fabrication
- d. Modular Furniture

If the Bidder has completed works in a private organization as stipulated in the Minimum Qualification Criteria (work experience), the following documents must be enclosed with the BID for consideration:

- TDS Certificates: The Bidder must provide TDS certificates issued by the competent authority with respect to the work experience submitted.
- CA Certificate: The Bidder must submit certificate issued by Chartered Accountant (CA) stating that the amount shown in the TDS certificate has been received with respect to the work experience submitted by the Bidder. This document must be certified by the CA with stamp, signature and UDIN number, failing which the bid will stand non-responsive.

1.4.4. In addition to above, the criteria regarding satisfactory performance of the work, Personnel, establishment, plant, equipment, etc. may be incorporated according to the requirement of the project. To qualify for a package of contracts made up of this and other contracts for which bids are invited in the NIT, the bidder must demonstrate having experience and resources sufficient to meet the aggregate of the qualifying criteria for the individual contracts. **(Refer Clause 'A' of Sec-5)**

1.4.5. The Subcontract experience shall be considered for pre-qualification only if same is carried out in Govt./Semi Govt./Public Limited companies subject to submission of sub contract permission issued by the respective authority prior to the execution of the work. Further, if sub contract permission is not authenticated, the respective party shall be considered non-responsive. The decision taken by DPA shall be final.

1.4.6 Bidders who meet the minimum qualification criteria will be qualified only if their available bid capacity is more than the total bid value. The available bid capacity will be calculated as under:

Assessed Available Bid capacity = $A \times N \times 2 - B$, Where

"N" = Number of years prescribed for completion of the subject contract. "A"

= Maximum value of works executed in any one year during last seven

years (at current price level)

"B" = Value at current price level of existing commitments and ongoing

works to be completed in the next 'N' years.

Note: To calculate the value of works to current level, following multiplying factors shall be applicable with reference to escalation based on WPI. This is only for arriving the Bid Capacity and not for work experience & turnover.

Financial Year	2023-24	2022-23	2021-22	2020-21	2019-20	2018-19	2017-18
Index	151.4	152.5	139.4	123.4	121.8	119.8	114.9
Multiplying factor	1.00	0.99	1.09	1.23	1.24	1.26	1.32

The Bidder shall furnish statements showing the value of existing commitments and on going works as well as the stipulated period of completion remaining for each of the works preferably countersigned by the Nodal Officer or his nominee – in – charge.

1.4.7 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

- Made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
- Record or poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc., and/or

1.5 One Bid per Bidder

- 1.5.1.** Each bidder shall submit only one bid for one package. A bidder who submits or participates in more than one bid (other than as a subcontractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the Bidder's participation to be disqualified.

1.5.2 Joint Venture

Companies/Contractors may jointly undertake contract/contracts. The number of Partners in JV/Consortium shall be limited to maximum of three. Each entity would be jointly and severally responsible for completing the task as per the contract, however declaration of the Lead member to be indicated by bidders, however JV has to designate in their MOU. The firms with at least 26% equity holding each be allowed to jointly meet the eligibility criteria.

Note: JVs/ Consortia be allowed in all contracts of estimated cost of more than Rs. 5 crores. However, there shall a maximum of 3 nos. of partners.

- 1.5.3** The works reckoned for the above purpose are those executed by tenderer as prime contractor or proportionately as member of Joint venture or as a sub-contractor, authorized and approved by the Employer of the work(s) against the tenderer has claimed his experience.

1.6 Cost of Bidding

- 1.6.1.** The bidder shall bear all costs associated with preparation and submission of his bid, and the Employers will in no case be responsible and liable for those costs.

1.7 Site Visit

- 1.7.1** The bidder, at the Bidder's own responsibility and risk is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidders' own expense.

b. Bidding Documents

1.8 Content of Bidding Documents

- 1.8.1** The set of bidding documents comprises the documents listed in the table below and addendum issued in accordance with Clause 1.10:

- DC 1 : Bid Reference
- NIT : Invitation for Bids
- SECTION 1 : Instruction to Bidders
- SECTION 2 : Forms of Bid, Qualification Information
- SECTION 3 : Conditions of Contract
- SECTION 4 : Contract Data
- SECTION 5 : Specifications and Special Conditions for Civil Works

- SECTION 6 : Specifications And Special Conditions for Electrical Works, Fire Fighting, Fire Alarm, HVAC ELV Systems.
- SECTION 7 : Special Conditions of The Contract with Respect To Achieving GRIHA 5- Star Rating Green Rating For Integrated Habitat Assessment (GRIHA)
- SECTION 8 : Drawing
- SECTION 9 : Bill of Quantities
- SECTION 10 : Forms of Securities and other Formats
- SECTION 11 : Guidelines on Banning of Business Dealings

1.8.2 One set of the bidding documents will be issued to the bidder. The document should be completed and returned with the bid.

1.8.2.1 Bidding documents shall be downloaded. The documents should be complied filled and submitted through on-line tendering process on website <http://tender.nprocure.com>

1.8.3 The bidder is expected to examine carefully all instructions, conditions of contract, contract data, forms, terms, technical specifications, bill of quantities, forms, drawings, annexure in the bid document. Failure to comply with the requirements of the bid document shall be at the bidder's own risk. Pursuant to clause 1.26 hereof, bids which are not substantially responsive to the requirements of the bid documents shall be rejected.

1.9 Clarifications of the Bidding Documents

1.9.1 A prospective bidder requiring any clarification of the bidding documents may notify the employer in writing or by electronic form and be confirmed by hard copy at the Employer's address indicated in the invitation to bid. The employer will respond to any request for clarification which he received earlier than days (Suggested 7 days) prior to the deadline for submission of bids. Copies of the Employer's response will be forwarded to all purchasers of the bidding documents, including's a description of the enquiry but without identifying its source.

1.9.2 Pre – bid meeting

1.9.2.1 The bidder or his official representative is invited to attend a pre-bid meeting, which will take place on **/2025 @ 16:00 Hrs.** at Old Board Room, A.O. Building, Deendayal Port Authority, Gandhidham - Kutch, Gujarat.

1.9.2.2 The purpose of the meeting will be to clarify issues and to answer question on any matter that may be clarified at that stage. But written comments/ reply is prevail. Quarries raised after Pre-Bid meeting shall not be entertained.

1.9.2.3 The bidder is requested to submit any questions in writing or by cable to reach the Employer on or before the meeting.

1.9.2.4 Minutes of the meeting, including the text of the questions raised (without identifying the source of enquiry) and the responses given will be uploaded on website <http://tender.nprocure.com> without delay. Any modification of the bidding documents listed in Sub-Clause 1.8.1 which may become necessary as a result of the pre-bid meeting

shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause 1.10 and not through the minutes of the pre-bid meeting.

1.9.2.5 Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

1.10. Amendment of Bidding Documents

1.10.1 Before the deadline for submission of bids, the Employer may modify the bidding documents by using addendum.

1.10.2 Any addendum thus issued shall be part of the bidding documents and shall be communicated by uploading online on <http://tender.nprocure.com> Prospective bidders shall acknowledge receipt of each addendum by cable to the Employer.

1.10.3 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend as necessary the deadline for submission of bids, in accordance with Sub-Clause 1.20.2 below.

c. Preparation of Bid

1.11 Language of the Bid

1.11.1 All documents relating to the bid shall be in the English language.

1.12 Documents comprising the Bid

1.12.1 The bid submitted by the bidder shall comprise the following:

A) Technical Bid

- i) Bid Security and tender fee.
- ii) Qualification Information Form and Document (Pursuant to clause 1.4 hereof) and any other materials required to be furnished and submitted by the bidder in accordance with these instructions. The documents listed under Sections 2, 4 and 7 of Sub-Clause 1.8.1 shall be filled in without exception.

B) Financial Bid

- i) Contractor's Bid
- ii) Bill of Quantity duly filled and digitally signed by the Bidder.

1.13 Bid Prices

1.13.1 The contract shall be for the whole works as described in Sub-Clause 1.1 based on the priced Bill of Quantities submitted by the Bidder.

1.13.2 The bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items for which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.

1.13.3 All duties, (except GST) taxes, and other levies payable by the contractor under the contract, or for any other cause shall be included in the rates, prices and total Bid price submitted by the Bidder.

1.13.4 The rates and prices quoted by the bidder are subject to adjustment during the performance of the contract. In accordance with the provisions of clause 3.47 of the conditions of contract.

1.14 Currencies of Bid and payment

The Unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees.

1.15 Bid Validity

1.15.1 Bids shall remain valid for a period not less than **120 days** after the deadline date for bid submission specified in clauses 1.20. A bid valid for a shorter period shall be rejected by the Employer as non-responsive.

1.15.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the bidders may extend the period of bid validity for a specified additional period. The request and the bidders' responses shall be made in writing or by cable. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be permitted to modify his bid. If bidder accept the request to extend the period of bid validity, he should accordingly extend the validity of the BG submitted for EMD without any claims.

1.16 Bid Security

1.16.1 Earnest money Deposit (EMD) shall be 1% of the Estimate cost put to tender, subject to maximum Rs. 50 Lakhs.

1.16.2 The EMD up to Rs. 5 Lakhs shall be payable via digital mode of payment in **Bank of Baroda, Gandhidham Branch Account No. 10080100022427 IFSC Code: - BARBOGANKUT**. The proof for transfer of funds to be submitted in preliminary bid stage. EMD beyond Rs. 5 lakhs be payable in form of Bank Guarantee for the entire amount from any Nationalized/Scheduled Bank (except Co-operative Banks) having its branch at Gandhidham. Bank Guarantee submitted as Earnest Money shall be valid for 28 days beyond the validity of the bid/tender. Bank Guarantee shall be verified independently by the Port with the bank before finalization of technical offer. In the event of lack of confirmation of issue of the Bank Guarantee by the Bank, the bid shall stands disqualified.

1.16.3 EMD of unsuccessful bidders other than L1 will be refunded immediately after ranking of price bids.

1.16.4 EMD is refunded suo-motto with/without any application from the bidders.

1.16.5 The bid security of the successful bidder will be discharged (refunded after he has signed the Agreement and furnished the required Performance security.

1.16.6 The Bid security may be forfeited, if

- a) The bidder withdraws the bid after bid opening during the period of bid validity.
- b) The bidder does not accept the correction of the Bid price, pursuant to any arithmetic errors or
- c) The successful bidder fails within the specified time limit to
 - (i) Sign the Agreement or
 - (ii) Furnish the required Performances security.

(iii) In case the contractor fails to commence the work within stipulated time.

The forfeiture of the bid security is entirely discretion of employer. No any claims in this regards shall be entertained.

“In case of Micro and Small Enterprise (MSEs) holding valid certificate issued by any agencies/organization under The Ministry of Micro, Small and Medium Enterprises indicating the list of activity related to the subject tender ONLY shall become eligible for exemption from payment of Tender fee & EMD. Such bidder shall upload in preliminary bid a scanned copy of valid certificate. Such bidder shall upload in technical proposal a scanned copy of valid certificate, as well as duly filled in and signed ‘**Bid Securing Declaration**’ as per format provided in the tender document (Annexure II), failing which the bid shall be disqualified: -

NIC codes regarding similar work is mentioned below: -

SECTION F	CONSTRUCTION
Division 41	Construction of buildings
Group 410	Construction of buildings
Class 4100	Construction of buildings
Sub-Class 41001	Construction of buildings carried out on own-account basis or on a fee or contract basis
Division 43	Specialized construction activities
Group 433	Building completion and finishing
Class 4330	Building completion and finishing
In addition to above list of activities (Subclass 41001 and Class 4330), bidder must have the below mentioned list of activities (Subclass 43211 & Sub-Class 43221) to claim relaxation under MSME's criteria.	
Division 43	Specialized construction activities
Group 432	Electrical, plumbing and other construction installation activities
Class 4321	Electrical installation
Sub-Class 43211	Installation of electrical wiring and fittings.
Class 4322	Plumbing, heat and air-conditioning installation
Sub-Class 43221	Installation of plumbing for water, gas and sanitation equipment.

1.17 Alternative proposals by bidders

1.17.1 Conditional offer or Alternative offers will not be considered further in the process of tender evaluation.

1.18 Format and signing of bid

1.18.1 The Price Bid to be submitted on-line shall be signed digitally by a person or persons duly authorized to sign on behalf of the Bidder.

1.18.2 The Bid shall contain no alterations or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the bidder in which case such corrections shall be initialed by the person or persons signing the bid.

D Submission of bids

1.19 Sealing and marking of bids.

1.19.1 (A) The bidder shall put Bid security document as per clause No.1.16, hereof in one envelope and properly seal and mark as “Bid Security”. The bidder shall put documents mentioned in clause No: 1.12.1.A (ii) in separate envelope and properly seal and mark as “Technical Bid”.

The bidder shall seal "Financial Bid" as per Clause No: 1.12.1. (B) Here of, in separate envelope duly marking the envelope as "Financial Bid". These envelopes than be put inside one outer envelope and sealed, duly marking the outer envelope as "Technical Bid and Financial Bid".

(B) Bidders who wish to participate will have to procure/ should have legally valid Digital Certificate, as per Information Technology Act-2000, using which they can sign their electronic bids. The bidders can procure the Digital Certificate from (n) code solutions a division of GNFC Ltd, who are licensed certifying authority by Government of India. All bids should be digitally signed. For details regarding Digital signature certificate and related matters, the below mentioned address should be contacted: (n) code Solutions, A Division of GNFC, 304 GNFC Info tower, Bodakdev, Ahmedabad. Tel. +91 79 26857316/17/18 Fax: +91 79 26857321 E-mail: nprocure@ncode.in Toll Free Number: 1-800-233-1010

The accompaniments to the tender documents as described under Clause 1.22 shall be Scanned and submitted On-Line along with Tender documents. However, the originals/ attested hard copies shall have to be forwarded subsequently so as to reach the office of Executive Engineer (C-I) within 07 days of opening of the tenders,

1.19.2 The envelopes shall

(a) Be addressed to Nodal Officer/Employer at the following address.

{Insert address of office for bid submission}, and

(b) bear the following identification:

Bid for **"Construction of Center of Excellence (CoE) for Green hydrogen at Gandhidham"**

Bid reference no C-I: 03/2025

DO NOT OPEN BEFORE (time and date for opening, per Clause 1.23)

Name and address of the bidder.

The tender complete in all respect should be put in the tender box (marked tender No C-I:0 3 /2025) in the office of The Executive Engineer (C-I) up to-_____p.m. On due date and open at_____on the same date in presence of such of the tenderers who may wish to be present.

1.19.3 In addition to the identification required in Sub-Clause 1.19.2, the inner envelopes shall indicate the name and address of the bidder of to enable the bid to be returned unopened in case it is declared late, pursuant to Clause 1.21, or the bid is declared non- responsive. If the outer envelopes are not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the technical bid and financial bid.

1.20 Deadline for submission of the Bids

1.20.1 Bids must be received by the Employer at the address specified above not later than in the event of the specified date for the submission of bids being declared a holiday by the Employer. The bids will be received up to the appointed time on the next working day.

1.20.2 The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 1.10, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

1.20.3 In case of tender document being downloaded from the web site, at the time of submission of (the hard copy of) the tender document. The tenderer shall give an undertaking that no change has been made in document. He shall be issued a printed set of document under acknowledgment with a condition that the printed version of the port tender document will be treated as authentic tender and if any discrepancy is noticed at any stage between the Port's tender document and the one submitted by the tenderer, the conditions mentioned in the Port's printed document Insert time and date; this should be the same as those given in the invitation for Bids Claus No.1.20.

1.21 Late Bids

1.21.1 Any bid received by the Employer after the deadline prescribed in Clause 1.20 will be considered as non-responsive.

1.22 Modification and Withdrawal of Bids

1.22.1 Bidders may modify or withdraw their bids before the deadline prescribed in Clause 1.20.

1.22.2 Each Bidder's modification or withdrawal notice shall be prepared, sealed, marked, and delivered in accordance with Clauses 1.18 & 1.19, with the outer and inner envelopes additionally marked "MODIFICATION" or "WITHDRAWAL" as appropriate.

1.22.3 No bid may be modified after the deadline for submission of bids.

1.22.4 Withdrawal or modification of a Bid between the deadline for submission of bids and the expiration of the original period of bid validity in Clause 1.15.1 above or as extended pursuant to Clause 1.15.2 may result in the forfeiture of the Bid security pursuant to Clause 1.16.

1.22.5 Tenders with any condition, including conditional rebate shall be rejected. However, tenders with unconditional rebate will be accepted.

E. BID OPENING AND EVALUATION**1.23 Bid opening**

1.23.1 On the due date and appointed time as specified in clause 1.20, the Employer will first open Technical bids (Online bid Opening) of all bids received (except those received late) including modifications made pursuant to clause 1.22 in presence of the bidders or their representative who choose to attend. In the event of the specified date for Bid opening being declared a holiday by the Employer, the bids will be opened at the appointed time and location on the next working day.

1.23.2 Envelopes marked "WITHDRAWAL" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause 1.22 shall not be opened. Bidder's name, withdrawals, modifications of technical bid, the presence of bid security and such other details, as the Employer may consider appropriate will be announced by the Employer at the opening.

1.23.3 If all Bidders have submitted unconditional Bids together with requisite bid security, then all bidders will be so informed then and there. If any Bid contains any deviation from the Bids documents and/or if the same does not contain Bid security in the manner prescribed in the Bid documents, then that Bid will be rejected and the Bidder informed accordingly. The sealed financial bid containing priced BOQ will be returned to him without opening. All valid financial bids whose technical bids have been determined to be substantially responsive in accordance with Clause 1.26 hereof, shall be opened on the specified date from declaring the results of the Technical Bid, in presence of the bidders or their representatives who choose to attend. The Bidder's name, the Bid prices, the total amount of each Bid and of any alternative Bid (if alternatives have been requested or permitted), any discounts, Bid modifications and withdrawals, and such other details as the Employer at the opening. Any bid price, discount, or alternative Bid price which is not read out and recorded at Bid opening, will not be taken into account in Bid evaluation.

1.23.4 The Employer shall prepare minutes of the Bid opening, including the information disclosed to those present in accordance with sub clause 23.3 and the minutes shall form part of the contract.

1.24 Process to be confidential.

Information relating to the examination, clarification, evaluation and comparison of the bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful bidder has been announced.

1.25 Clarification of Bids

To assist in the examination and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid, including breakdown of unit rates. The request for clarification and the response shall be writing or by cable, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to conform the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause 1.27.

Subject to above para, no Bidder shall contact the Employer on any matter relating to his bid from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, he should do so in writing.

Any effort by the Bidder to influence the Employer's bid evaluation, bid comparison or contract award decisions, may result in the rejection of his bid.

1.26 Examination of Bids and Determination of Responsiveness

1.26.1 Prior to detailed evaluation of Bids, the Employer will determine whether each Bid (a) meets the eligibility criteria defined in Clause 1.4 (b) has been properly signed by an authorized signatory (accredited representative) holding power of Attorney in his favor. The Power of Attorney shall inter alia include a provision to bind the Bidder to settlement of disputes clause; (c) is accompanied by the required Bid security and; (d) is responsive to the requirements of the Bidding documents

1.26.2 A substantially responsive Technical and Financial Bid is one which conforms to all the terms, conditions and specification of the Bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality or performance of the works; (b) which limits in any substantial way, the Employer's rights or the Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting responsive Bids.

1.26.3 If a Technical Bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

1.26.4 The envelop marked as financial bid of those bidders whose technical bid has been determined to be non-responsive shall not be opened and will be returned unopened.

1.27 Correction of Errors.

1.27.1 Bids determined to be responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:

- (a) Where there is a discrepancy between the rates in figures and in words, the rate in words will govern; and
- (b) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

1.27.2 The amount stated in the Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and, with the concurrence of the Bidder, shall be considered as binding up on the bidder. If the bidder does not accept the corrected amount the Bid will be rejected, and the Bid security may be forfeited in accordance with Sub-Clause 1.16. F. (B).

1.28 NIL

1.29 Evaluation and Comparison of Bids

1.29.1 The Employer will evaluate and compare only the bids determined to be responsive in accordance with Clause 1.26.

1.29.2 In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by

adjusting the Bid Price as follows:

- (a) Making any correction for errors pursuant to Clause 1.27;
- (b) Making appropriate adjustments to reflect discounts or other price modification offered in accordance with Sub Clause 1.22.5

1.29.3 The estimated effect of the price adjustment conditions under Clause 3.47 of the conditions of contract, during the period of implementation of the Contract, will not be taken into account in Bid evaluation.

1.29.4 If the Bid of the successful Bidder is seriously unbalanced in relation to the Nodal Officer or his nominee's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities.

1.30 Nil

F. AWARD OF CONTRACT

1.31 Award Criteria

1.31.1 The Employer will award the Contract to the Bidder whose Bid has been determined to be responsive to the Bidding documents and who has offered the lowest evaluated Bid Price, provided that such Bidder has been determined to be (a) eligible in accordance with the provisions of Clause 1.3, and (b) qualified in accordance with the provisions of Clause 1.4. The second bidder (i.e. L2) shall be kept in reserve and may be invited to match the bid submitted by the (L1) bidder in case such bidder withdraws or is not selected for any reason.

1.32 Employer's Right to accept any Bid and to reject any or all.

Notwithstanding clause 1.30, the Employer reserves the right to accept or reject any bid and to cancel the bidding process and reject all bids, at any time prior to the award of contract, without thereby incurring any liability to the affected bidder or bidders on the grounds for Employer's action.

1.33 Notification of Award and Signing of Agreement

1.33.1 The Bidder whose bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion and maintenance of the works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "contract Price").

1.33.2 The notification of award will constitute the formation of the Contract subject only to the furnishing of a performance security in accordance with the provision of Clause 1.34.

1.33.3 The Agreement will incorporate all correspondence between the Employer and the successful bidder. It will be signed by the employer and sent to the successful Bidder (within 28 days of award of work for global tender and within 14 days for domestic tender) following the notification of award along with the Letter of Acceptance. Within (28 days for global tender and within 21 days for domestic tender) of receipt, the successful Bidder will furnish the performance security and sign the Agreement with the Employer.

1.33.4 Upon the furnishing by the successful Bidder of the Performance Security, the Employer will promptly notify the other Bidders that their Bids have been unsuccessful.

1.34 Performance Security

Security deposit shall consist of two parts; a) Performance Guarantee to be submitted at award of work, and b) Retention money to be recovered from Running Bills.

Security Deposit/ Performance guarantee shall be 10% of Contract price of which 5% of contract price should be submitted as FDR or Bank Guarantee of Nationalized/scheduled bank (except Co-operative) Banks having its branch at Gandhidham, and BG should remain valid for 60 (Sixty) days beyond the date of completion of all contractual obligation of the concern contract including Defect liability period or Digital transfer within (21 days in case of domestics bid and within 28 days in case of global bids) of receipt of letter of acceptance and balance 5% recovered as Retention Money from Running Bills. Recovery of 5% of Retention Money to commence from the first bill onwards @ 5% of bill value from each bill. Retention Money be refunded within 14 days from the date of payment of final bill. Balance SD to be refunded immediately not later than 14 days from completion of defect liability period, (Subject to fulfilment of clause no 5.24), NOC from Geology and Mining Department, Bhuj/Anjar & Payment of welfare cess for final bill.

Failure of the successful Bidder to comply with the requirements above shall constitute sufficient grounds for cancellation of the award of work and forfeiture of the Bid security and/or the successful bidder may be disqualified from bidding for any contract with DPA for a period of three years from the date of notification Failure of the Successful Bidder to comply with the requirement as mentioned above shall constitute sufficient grounds for cancellation of the award of work and forfeiture of EMD.

The documentary evidence (copy of paid Challan in Govt. Treasury) of Welfare cess @1% of work done or as amended By Statutory Authority from time to time, paid on final bill shall be submitted before releasing the Performance Guarantee.

1.35 Advance Payment

1.35.1 The Employer will provide an Advance payment on the Contract Price as stipulated in the Conditions of Contract, subject to maximum amount, as stated in the Contract Clause 3.51.

1.36 Conciliator

1.36.1 The Employer proposes that CIDC – SIAC Arbitration Centre be appointed as Conciliator under the contract as provided in sub-clause 3.24.1 of condition of contract. If the bidder disagrees with this proposal, the bidder should so state in the bid.

1.37 Corrupt or Fraudulent Practices

1.37.1 The Employer requires that Bidders/Suppliers/Contractors under this contract, observe the highest standard of ethics during the procurement and execution of this contract. In pursuance of this policy, the Employer:

- a)** Defines, for the purpose of these provisions, the terms set forth below as follows:
 - (i) “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; and
 - (ii) “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 Employer, 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 Employer of the benefits of free and open competition.
- b)** Will reject a proposal for award of work if he determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.
- c)** Will declare a Bidder ineligible, either indefinitely for a stated period of time, to be awarded a contract/contracts if he at any time determines that the Bidder has engaged in corrupt or fraudulent practices in competing for or in executing, the contract.

1.37.2 Furthermore, Bidders shall be aware of the provision stated in sub-clause 3.59.2 of the conditions of Contract.

Contractor

**Executive Engineer (C-I)
Deendayal Port Authority**

SECTION: 2

FORMS OF BID, QUALIFICATION INFORMATION

TABLE OF FORMS

- 1. FORM OF BID**
- 2. CONTRACTOR'S BID**
- 3. PRE-QUALIFICATION OF BIDDERS**
- 4. LETTER OF ACCEPTANCE**
- 5. NOTICE TO PROCEED WITH THE WORK**
- 6. AGREEMENT FORM**

SPECIMEN FOR FORM OF BID

(To be executed on bidder's letter head)

Name of Work:" Construction of Center of Excellence (CoE) for Green hydrogen at Gandhidham"

To

The Executive Engineer (C-I),
Construction-I Division,
Deendayal Port Authority,
Room No.303, 2nd Floor,
New Annexe Building,
Gandhidham Kachchh-370201.

We, the undersigned, declare that:

- a) We have examined and have no reservations to the tender documents, including addenda and clarifications issued
- b) We offer to execute the work in conformity with the tendering documents and in accordance with the delivery schedules specified in the schedule of requirements in accordance with the tender document
- c) The total price of our tender, excluding any discounts offered in item(d) below, is [insert the total tender price in words and figures, indicating the various amounts and the respective currencies]; [in case of techno-commercial offer it shall be mentioned that 'as filled in the price bid'] **(Refer Clause 'A' of Sec-5)**
- d) The discounts offered and the methodology for their application are: **Discounts**. If our tender is accepted, the following discounts shall apply. **Methodology of application of the discounts**. The discounts shall be applied using the following method: **(Refer Clause 'A' of Sec-5)**
- e) our tender shall be valid for the period of time specified in **[ITB Sub-clause 1.15.1]**, from the date fixed for the tender submission deadline in accordance with **[ITB Sub-clause 1.20.1]**, and it shall remain binding upon us and may be accepted at any time before the expiration of that period or any extended period accordance with **[ITB Sub-clause 1.15.2]**;
- f) If our tender is accepted, we commit to submit a performance guarantee in accordance with [insert relevant clause no., ITB Sub-clause 1.34] for the due performance of the contract, as specified in specimen form for the purpose.

- g)** We, including any subcontractors or contractors for any part of the contract, (**Refer Clause 'A' of Sec-5**)
- h)** We have no conflict of interest in accordance with **[ITB Sub-clauseno1.3.2]**
- i)** Our firm, its affiliates or subsidiaries- including any subcontractors or contractors for any part of the contract – has not been declared ineligible by the port, under laws of India or official regulations in accordance with **[ITB Sub-clause no.1.3.4]**
- j)** We understand that this tender, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract agreement is prepared and executed in accordance with **[ITB Sub-clause 1.32]** and as per specimen from the purpose;
- k)** We understand that you are not bound to accept the lowest evaluated tender or any other tender that you may receive.
- l)** We also make specific note clauses of [ITB, NIT] under which the contract is governed.
- m)** In case of out station firms, having a branch in India for liaison purposes, please mention the name of the contact person and Tel. no., Fax. no., and Mail-Id and also the complete postal address of the firm.
- n)** We understand that the communication made with the firm at (m), by the port shall be deemed to have been done with us.

Signed: [insert signature of person whose name and capacity are shown]

In the capacity of [insert legal capacity of person signing the form of tender]

Name: [insert complete name of person signing the form of tender]

Duly authorized to sign the tender for and on behalf of: [insert complete name of tenderer]

Dated on ____ day of _____, _____ (insert date of signing)

CONTRACTOR'S BID

Description of the works: - **"Construction of Center of Excellence (CoE) for Green hydrogen at Gandhidham"**

BID

TO

----- (The employer)

Address

GENTLEMEN,

We offer to execute the works described above in accordance above with the conditions of Contract accompanying this bid for the contract price of _____ (in figures) _____ (in letters). The advance payment required / not required as per rule. We accept appointment of _____ as the conciliator's letter.

Or

This bid and your written acceptance of it shall constitute a binding contract between us. We understand that you are not bound to accept the lowest or any bid you receive. 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"

We hereby confirm that this bid complies with the bid validity and security required by the bidding documents.

We attach herewith our copy of permanent account number (PAN)

Yours faithfully,

Authorized Signature:

Name & title of signatory

Name of Bidder

Address

Notes:

To be filled in by the bidder, together with his particulars and date of submission at the bottom of the form of bid.

PRE-QUALIFICATION OF BIDDERS

The information to be filled in by the bidder in the following pages will be used for purposes of pre-qualification as provided for in the instructions to tenderers.

1. Only for individual bidders

Constitution or legal status of bidder (attach copy)

- Place of registration
- Principal place of business
- Power of attorney of signatory of bid (Attach)

2. Turnover of the firm/JV

YEAR	TURN OVER
2021-22	
2022-23	
2023-24	
Average	

Attachments: Financial reports for the last three years; balance sheets, profit and loss statement, auditors reports (in case of companies/ corporation) etc., list them below and attach copies.

3. Similar works

Particulars	Year	No. of works	Value
Total value completed similar work as defined in the tender document during last 7 years	2017-18		
	2018-19		
	2019-20		
	2020-21		
	2021-22		
	2022-23		
	2023-24		

Attachments: Supporting documents, viz., successful completion certificates from clients, other documentations to substantiate the similarity of work as per definition of “similar work” employers reserve the right to verify the information;

4. Information on bid capacity (works for which bids have been submitted and works which are yet to be completed) as on the date of this bid.

(A) Existing commitments and on-going works.

Description of work	Place & state	Contract no. & date	Name & address of port or Dept.	Value of contract Rs	Stipulated Period of completion	Value of remaining to be completed	Anticipated date of completion
1	2	3	4	5	6	7	8

(B) Works for which bids already submitted

Description of work	Place & state	Name & address of port or Dept.	Value of contract Rs	Stipulated Period of completion	Date when decision is expected	Remarks if any
1	2	3	4	5	6	7

Attach certificates from the nodal officer or his nominee(s)-in-charge.

5. The following contractor's equipment is essential for carrying out the works. The bidder should list all information requested below.

Item of equipment	Requirement no. capacity	Owned/leased/ to be procured	Nos./ capacity	Age/condition	Remarks
1	2	3	4	5	6

6. Qualification and experience of key personnel proposed for administration and execution of the contract. Attach biographical data. Refer also to sub. Clause 1.4.2(e) of instructions to bidders and sub. Clause 1.9.1 of the condition of contract.

Position	Name	Qualification	Years of experience (general)	Years of experience in the proposed position
Project manager				
Discipline specialist etc.,				

7. Proposed sub-contracts and firms involved. **(Refer Clause 'A' of Sec-5)**

Sections of the works	Value of sub-contract	Sub- contractor (name and address)	Experience in similar work

8. Information on litigation history in which the bidder is involved.

Other party(ies)	Port / Dept.	Cause of dispute	amount	Remarks involved showing present status

9. Additional information bidder may like to submit.

Duly authorized to sign this authorization on behalf of (insert complete name of tenderer)

Dated on _____ day of _____ [insert date of signing]

LETTER OF ACCEPTANCE

(On letterhead paper of the port)

_____(date)

TO: _____
(Name and address of the contractor)

Dear Sirs,

Tender no. C-I : 03/2025

Sub: **"Construction of Center of Excellence (CoE) for Green hydrogen at Gandhidham"**

Ref: Your bid dated and [list the correspondence with the bidder]

This is to notify you that your bid dated _____ for execution of the _____ (name of the contract and identification number, as given in the instructions to bidders) for the contract price of rupees _____ (amount in words and figures as corrected and modified) in accordance with the tender document is here by accepted by the employer/Board.

You are hereby requested to furnish performance security, in the form detailed in tender document for an amount of Rs. _____ within { _____ } days of the receipt of this letter of acceptance valid up to 28 days from the date of completion obligations expiry of taking over certificate subject to removal of defects period i.e up to and also sign the contract agreement within { _____ } days of the receipt of this letter of acceptance, failing which action as stated in the tender document will be taken.

Detailed letter of acceptance will follow. Please acknowledge receipt.

Yours faithfully

Authorized signature

ISSUE OF NOTICE TO PROCEED WITH THE WORKS
(Letterhead of the Port)

_____Dated

To
(Name and address of the contractors)

Dear Sirs,

Sub.: Tender for “**Construction of Center of Excellence (CoE) for Green hydrogen at Gandhidham**”

Ref: Letter of acceptance no. dated

Pursuant to your furnishing the requisite security as stipulated in [clause of general conditions of contract] and signing of the contract for execution of the _____ you are hereby instructed to precede with the execution of the said works in accordance with the contract documents. It is hereby notified that the [site] is being handed over to you for execution of work in accordance with the contract documents.

Yours faithfully,

(Signature, name and title of
Signatory authorized to sign on
Behalf of employer/board)

SPECIMEN CONTRACT AGREEMENT

(To be executed on Rs.300/- non-judicial Stamp)

[The successful Tenderer shall fill in this form in accordance with the instructions indicated]

THIS CONTRACT AGREEMENT is made

the *[insert: **number**]* day of *[insert: **month**]*, *[insert: **year**]*.

This agreement made this _____ day of _____

BETWEEN

- (1) *The Board of Port of Deendayal Port Authority, an Autonomous Body of the Ministry of Ports, Shipping & Waterways of the Government of INDIA, incorporated under the Major Port Authority Act, 2021 as Amended / replaced thereafter, under the Laws of India and having its principal place of business at [insert address of Port] (hereinafter called "the Port"), and (here in after called "Board"/ Port"),*
- (2) *[insert name of Contractor], [incorporated under the laws] [insert: country of Contractor] and having its principal place of business at [insert: address of Contractor] (hereinafter called "the Contractor").*

WHEREAS the Employer/ Board invited Tenders against tender no. **[(C-I: 03/2025).]** for execution of **[TENDER TITLE AND BRIEF DESCRIPTION]** viz., and has accepted a Tender by the Contractor in accordance with the supply/ delivery schedules, in the sum of *[insert Contract Price in words and figures, expressed in the Contract currency(ies)]* (hereinafter called "the Contract Price").

AND WHEREAS the contractor has agreed to deposit the Performance Security Deposit as follows for due fulfillment of all the conditions of the contract:

WHEREAS

1. The Contractor has deposited a sum of Rs. _____ (Rupees only) as security deposit in the form of BG / FDR / Digital Transfer for the due fulfilment of all the conditions of the contract.
2. Balance amount of Rs. _____ to be recovered from the work bills.

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.
2. The following documents shall constitute the Contract between the Employer/ Board and the Contractor, and each shall be read and construed as an integral part of the Contract:
 - (a) This Contract Agreement;
 - (b) Special Conditions of Contract
 - (c) General Conditions of Contract;
 - (d) Technical Requirements (including Schedule of Requirements and Technical Specifications, drawings);
 - (e) Notice Inviting Tender;
 - (f) Replies issued to the Pre-bid queries, addenda is any issued **[numbers and dates];**
 - (g) The Contractor's Bid and original Price and Delivery Schedules;
 - (h) The Employer/ Board's Notification of Award;
 - (i) **[Correspondence the Employer/ Board had exchanged with the bidder till and after award of contract [specific letters and dates]; and**

(j) **[Add here any other document(s)]**

AND WHEREAS

EMPLOYER/ BOARD accepted the Bid of CONTRACTOR for the provision and the execution of WORK at the CONTRACT PRICE as indicated in CONTRACT upon the terms and subject to the conditions of Contract. Now this CONTRACT AGREEMENT witnesses and it is hereby agreed and declared as follows:

All the disputes related to submit contract shall be resolved through a conciliation committee / council comprising Independent Subject Tender Expert".

3. In consideration of the payment to be made to CONTRACTOR for WORK to be executed by him. CONTRACTOR hereby Covenants with EMPLOYER/ BOARD that CONTRACTOR shall and will duly provide, execute and complete Work and things in CONTRACT, mentioned or described or which are to be implied there from or may be reasonably necessary for completion of Work and at the times and in the manner and subject to the terms and conditions or stipulations mentioned in CONTRACT.
4. In consideration of the due provision, execution and completion of WORK by the CONTRACTOR in accordance with the terms of the CONTRACT, the EMPLOYER/ BOARD does hereby agree with CONTRACTOR that EMPLOYER/ BOARD will pay to Contractor the respective amounts for the work actually done by him and approved by EMPLOYER/ BOARD as per Payment Terms accepted in CONTRACT and payable to CONTRACTOR under provision of Contract at such time and at such manner as provided for in the CONTRACT.
5. In consideration of the due provision, execution and completion of WORK, CONTRACTOR does hereby agree to pay such sums as may be due to EMPLOYER/ BOARD for the services rendered by EMPLOYER/ BOARD to Contractor as set forth in CONTRACT and such other sums as may become payable to EMPLOYER/ BOARD towards loss, damage to the EMPLOYER/ BOARD's equipment, materials etc. and such payments to be made at such time and in such manner as is provided in the CONTRACT.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of *[insert the name of the Contract governing law country]* on the day, month and year indicated above.

*For and behalf of the **Contractor***

WITNESS: (Name, Signature, address)

1. _____
2. _____

*Signes, Sealed and delivered by
Chief Engineer on behalf of the board in
Presence of:*

For and behalf of the employer/board

WITNESS: (Name, Signature, address)

1. _____
2. _____

The common seal of the Board of Deendayal Port Authority Affixed in the presence of:

SECTION 3

CONDITIONS OF CONTRACT

CONDITIONS OF CONTRACT

A. General

3.1 Definitions

- 3.1.1** Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings capital initials are used to identify defined terms.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.

Compensation Events are those defined in Clause 3.44

The Completion Date is the date of Completion of the Works as certified by the Nodal Officer or his nominee in accordance with Sub Clause 3.55.1

The Contract is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 3.2.2 below.

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 Employer.

The Contractor's Bid is the completed Bidding documents submitted by the Contractor to the Employer.

The Contract Price is the 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 Employer is the party who will employ the contractor to carry out the Works. **The Nodal Officer** or his nominee 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 Nodal Officer or his nominee) who is responsible for supervising the Contractor, Administering the Contract, certifying payments due to the Contractor, issuing and valuing Variations to the contract, awarding 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.

The Initial Contract Price is the Contract Price listed in the employer's Letter of Acceptance.

The 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 Nodal Officer or his nominee 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 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 subsurface 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 Nodal Officer or his nominee.

The Start Date 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 Date.

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 is an instruction given by the Nodal Officer or his nominee which varies the Works.

The Works are what the Contract requires the Contractor to construct, install and turn over to the Employer as defined in the Contract Data.

The Trained Work Person are those employed/proposed to be employed by the Contractor at the Project Site, who have participated and are in possession of a valid Competency Certificate through a program run under the auspices of a University, State Technical Board, Ministry of Government of India.

Board – Board of Authorities of the Deendayal Port, a body corporate under the Major Port Act, 1963 as amended from time to time.

Chairman means the Chairman of the Board of Authorities of Deendayal Port.

“Engineer-in-Charge” means the Chief Engineer/Superintending Engineer/Executive Engineer of the Deendayal Port Authority.

3.2 Interpretation

In interpreting this Condition of Contract, singular also means plural, male also means female or neuter and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract instructions clarifying queries about the Conditions of Contract.

3.2.1 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).

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

1. Agreement
2. Letter of Acceptance and notice to proceed with Works Contractor's Bid.
3. Contract Data
4. Conditions of Contract including Special Conditions of Contract
5. Specifications
6. Drawings
7. Bill of quantities
8. Any other documents listed in the Contract Data as forming part of the Contract.

3.3 Language and Law

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

3.4 Nodal Officer or his nominee's Decisions

3.4.1 Except where otherwise specifically stated, the nodal officer or his nominee will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

3.5 Delegation

3.5.1 The Nodal officer or his nominee may delegate any of the duties and responsibilities to other people except to the Conciliator after notifying the Contractor and may cancel any delegation after notifying the Contractor.

3.6 Communications

3.6.1 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 1872).

3.7 Joint Venture

Companies/Contractors may jointly undertake contract/contracts. Each only would be jointly and severally responsible for completing the task as per the contract, however declaration of the Lead member to be indicated by bidders, however JV has to designate in their MOU. The firms with at least 26% equity holding each be allowed to jointly meet the eligibility criteria.

Note: JVs/ Consortia be allowed in all contracts of estimated cost of more than Rs. 5 crores. However, there shall be a maximum of 3 number of partners.

3.8 Subcontracting (Refer Clause 'A' of Sec-5)

3.8.1 The Contractor may subcontract with the approval of the Nodal Officer or his nominee but may not assign the Contract without the approval of the Employer in writing. Subcontracting does not alter the Contractor's obligations.

3.8.2 Other Contractor (Refer Clause 'A' of Sec-5)

The Contractor shall co-operate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of other contractors. The Contractor shall as have referred to in the Contract Data, also provide facilities and services for them as described in the Schedule. The employer may modify the schedule of other contractors and shall notify the contractor of any such modification.

3.9 Personnel (Refer Clause 'A' of Sec-5)

3.9.1 The contractor shall employ the key personnel named in the schedule of key personnel as referred to in the contract Data to carry out the functions stated in the schedule or other personnel approved by the Nodal officer or his nominee. The Nodal Officer or his nominee will approve any proposed replacement of key personnel only if their qualifications, abilities, and relevant experience are substantially equal or better than those of the personnel listed in the schedule.

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

3.10 Employer's and Contractor's Risks

3.10.1 The Employer carries the risks which this contract states are Employer's risks and the Contractor carries the risks which this Contract states are Contractor's risks.

3.11 Employers Risks

3.11.1 The Employers risks are

(a) Insofar as they directly affect the execution of the Works in the country where the Permanent Works are to be executed:

(i) War and hostilities (whether war be declared or not), invasion, act of foreign enemies:

(ii) Rebellion, revolution, insurrection, or military or usurped power, or civil war,

(iii) Ionizing radiations, or contamination by radioactivity from any nuclear fuel, or from any nuclear waste, from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof:

(iv) Pressure waves caused by aircraft or other aerial device starveling at sonic or upper sonic speeds; and

(v) riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Subcontractors and arising from the conduct of the Works;

(vi) floods, tornadoes, earthquakes and landslides

(b) Loss or damage due to the use or occupation by the Employer of any Section or part of the Permanent Works, except as may be provided for in the Contract;

- (c) Loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible; and
- (d) Any operation of the forces of nature (in so far as it occurs on the Site) which an experienced contractor:
 - (i) could not have reasonably for seen, or
 - (ii) Could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures.
 - A. Prevent loss or damage to physical property from occurring by taking appropriate measures, or
 - B. Insure against.

3.12 Contractor's risks

3.12.1 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.

3.13 Insurance

3.13.1 The Contractor shall provide in the joint names of the employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles state in the Contract Data for the following events which are due to the Contractors risks.

- (a) Loss of or damage to the Contractors risks.
- (b) Loss of or damage to Equipment;
- (c) Loss of or damage property (except the Works, Plant, Materials and Equipment in connection with the Contract, and
- (d) Personal injury of death.

3.13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Nodal Officer or his nominee for the Nodal Officer or his nominee's approval before Start Date. 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.

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

3.13.4 Alternate to the terms of insurance shall not be made without the approval of the Nodal Officer or his nominee.

3.13.5 Both parties shall comply with all conditions of the insurance policies.

3.14 Site Investigation Reports

3.14.1 The Contractor, in preparing the Bid, shall rely on the Investigation Report referred to in the Contract Data, supplemented by any information available to the Bidder.

3.15 Queries about the Contract Data

3.15.1 The Nodal Officer or his nominee will clarify queries on the Contract Data.

3.16 Contractor to Construct the Works

3.16.1 The Contractor shall construct and install the Works in accordance with the Specification and Drawings.

3.17 The Works to Be Completed by the Intended Completion Date

3.17.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the program submitted by the Contractor as updated with the approval of the Nodal Officer or his nominee, and complete them by the Intended Completion Date.

3.18 Approval by the Nodal Officer or his nominee

3.18.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Nodal Officer or his nominee, who is to approve them if they comply with the specifications and Drawings.

3.18.2 The Contractor shall be responsible for design of Temporary Works.

3.18.3 The Nodal Officer or his nominee's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

3.18.4 NIL

3.18.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Nodal Officer or his nominee before their use.

3.19 Safety

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

3.20 Discoveries

3.20.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The contractor is to notify the Nodal Officer or

his nominee of such discoveries and carry out the Nodal Officer or his nominee's instructions for dealing with them.

3.21 Possession of the Site

3.21.1 The Employer shall give possession of all parts of the Site to the Contractor, free from encumbrances. If possession of a part is not given by the date stated in the Contract Data, the Employer is deemed to have delayed the start of the relevant activities and this will be a Compensation Event. **(Refer Clause 'A' of Sec-5)**

3.22 Access to the Site

3.22.1 The Contractor shall allow the Nodal Officer or his nominee and any person authorized by the Nodal Officer or his nominee 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 and/or assembled for the works.

3.23 Instructions

3.23.1 The Contractor shall carry out all instructions of the Nodal Officer or his nominees who comply with the applicable laws where the Site is located.

3.24 Disputes

3.24.1 If the Contractor believes that a decision taken by the Nodal Officer or his nominee was either outside the authority given to the Nodal Officer or his nominee by the Contract or that the decision was wrongly taken, the decision shall be referred to the conciliator within 28 days of the notification of the Nodal Officer or his nominee's decision. **(Refer Clause 'A' of Sec-5)**

3.25 Settlement of Disputes (Refer Clause 'A' of Sec-5)

3.25.1 If a dispute of any kind whatsoever arises between the Employer and the Contractor in connection with, or arising out of the Contract or the execution of the Works, whether during the execution of the Works or after their completion and whether before or after repudiation or after termination of the Contract, including any disagreement by either party with any action, inaction, opinion, instruction, determination, certificate or valuation of the Nodal Officer or his nominee, the matter in dispute shall, in the first place be referred to the Disputes Review Board [DRD] in case of contracts valuing more than Rs.5 crores and above, and for contracts valuing less than Rs. 5 crores, the disputes will firstly be settled by the Conciliator, failing which any party may invoke arbitration clause. Unless the Contract has already been repudiated or terminated or frustrated the Contractor shall in every case, continue to proceed with the Works with all due diligence and the Contractor and the Employer shall give effect forthwith to every decision of the

Nodal Officer or his nominee unless and until the same shall be revised, as hereinafter provided, by the conciliator or in a Dispute Review Board recommendation / Arbitral Award.

3.25.2 Decision by Conciliator

- (i) The Conciliator shall give a decision in writing within 28 days of receipt of a notification of a dispute.
- (ii) Conciliator shall be paid daily at the rate specified in the contract Data together with reimbursable expenses of the types specified in the contract data and the cost shall be divided equally between the Employer and the contractor, whatever decision is reached by the conciliator, either party may refer a decision of the conciliator within 28 days of the conciliator's written decision. If neither party refers the disputes to arbitration within 28 days, the conciliator's decision will be final and binding.

3.25.3 Arbitration

Any dispute in respect of contracts where party is dissatisfied by the Conciliator's decision shall be decided by arbitration as set forth below:

- (i) A dispute with Dispute review expert shall be finally settled by arbitration in accordance with the Indian Arbitration and Conciliation Act, 1996, or any statutory amendment thereof. The arbitral tribunal shall consist of 3 arbitrators, one each to be appointed by the Employer and the Contractor, and the third to be appointed by the mutual consent of both the arbitrators, failing which by making a reference to CIDC- SIAC Arbitration Centre from their panel.
- (ii) Neither party shall be limited in the proceeding before such arbitrations to the evidence nor did arguments already put before the Nodal Officer or his nominee or the Board, as the case may be, for the purpose of obtaining said recommendations/decision. No such recommendations/decision shall disqualify the Nodal Officer or his nominee or any of the members of the Board, as the case may be, from being called as a witness and giving evidence before the arbitrators or any matter whatsoever relevant to the dispute.
- (iii) The reference to arbitration shall proceed notwithstanding that the works shall not then be or be alleged to be complete, provided always that the obligations of the Employer, the Nodal Officer or his nominee and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the works. Neither party shall have been titled to suspend the works to which the dispute relates, and payment to the contractor shall be continued to be made as provided by the contract.
- (iv) If one of the parties fails to appoint its arbitrator in pursuance of sub-clause [i], within 14 days after receipt of the notice of the appointment of its arbitrator by the other party, then chairman of the nominated Institution shall appoint arbitrator within 14 days of

the receipt of the request by the nominated institution. A certified copy of the chairman's order, making such an appointment shall be furnished to both the parties.

- (v) Arbitration proceedings shall be held at, and the language of the arbitration proceeding and that of all documents and communications between the parties shall be 'English'
- (vi) The decision of the majority of arbitrators shall be final and binding upon both parties. The expenses of the arbitrators as determined by the arbitrators shall be shared equally by the Employer and the Contractor. However, the expenses incurred by each party in connection with the preparation, presentation, etc. of its case prior to, during and after the arbitration proceedings shall be borne by each party itself.
- (vii) All arbitration awards shall be in writing and shall state the reasons for the award.
- (viii) Performance under the contract shall continue during the arbitration proceedings and payments due to the contractor by the employer shall not be withheld, unless they are subject matter of the arbitration proceedings.

3.26 Replacement of Conciliator (Refer Clause 'A' of Sec-5)

3.26.1 Should the Conciliator resign or die, or should the Employer and the Contractor agree that the conciliator is not fulfilling his functions in accordance with the provisions of the Contract, a new Conciliator will be jointly appointed by the Employer and the Contractor.

In case of disagreement between the Employer and the Contractor, within 30 days the Conciliator shall be appointed by the Appointing Authorities designated in the Contract Data at the request of either party within 14 days of receipt of such request.

B. TIME CONTROL

3.27 Program

3.27.1 Within the time stated in the contract data the contractor shall submit to the Nodal officer or his nominee for approval a program showing the general methods arrangements, order, and timing for all the activities in the works along with monthly cash flow forecast.

3.27.2 An update of the program shall be a program showing the actual progress achieved on the timing of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

3.27.3 The contractor shall submit to the Nodal Officer or his nominees, for approval an updated program at intervals no longer than the period stated in the contract data. If the contractor does not submit an updates program within this period, the Nodal Officer or his nominee 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 program has been submitted.

3.27.4 The nodal officer or his nominee's approval of the program shall not alter the contractor's

obligations. The contractor may revise the program and submit it to the nodal officer or his nominee again at any time. A revise program is to show the effect of variations and compensation events.

3.28 Extension of the intended completion date

The nodal officer or his nominee 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 nodal officer or his nominee shall decide whether and by how much to extend the intended completion date within 21 days of the contractor asking the Nodal Officer or his nominee for a decision up on 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 assessing the new intended completion date.

3.29 The Early Warning Provisions shall be as per clause 3.32

3.30 Delays Ordered by the Nodal Officer or his nominee

3.30.1 The Nodal Officer or his nominee may instruct the contractor to the start or Progress of any activity within the works.

3.31 Management Meeting

3.31.1 Either the Nodal Officer or his nominee 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.

3.31.2 The Nodal Officer or his nominee shall record the business of management meetings and is to provide copies of his record to those attending the meeting and to the employer. The responsibility of the parties for actions to be taken is to be decided by the Nodal Officer or his nominee either at the management meeting or after the management meeting and state in writing to all attended the meeting.

3.32 Early warning

3.32.1 The contractor is to warn the Nodal Officer or his nominee at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the contract price or delay the execution of works. The Nodal Officer or his nominee may require the contractor to provide an estimate of the expected effect of the event or circumstances on the contract price and completion date. The estimates are to be provided by the contractor as soon as reasonably possible.

3.32.2 The contractor shall cooperate with the Nodal Officer or his nominee 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 Nodal Officer or his nominee.

3.32.3 The Defect Liability period for the contract shall be **24 months** from the date issue of completion certificate.

C. QUALITY CONTROL

3.33 Identify Defects

3.33.1 The Nodal Officer or his nominee shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Nodal Officer or his nominee may instruct the Contractor to search for a Defect and to uncover and test any work that the Nodal Officer or his nominee considers may have a Defect.

3.34 Tests

3.34.1 If the Nodal Officer or his nominee 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.

3.35 Correction of Defects

3.35.1 The Nodal Officer or his nominee 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.

3.35.2 Every time notice of a Defect is given the Contractor shall correct the notified Defect within the length of time specified by the Nodal Officer or his nominee's notice.

3.36 Uncorrected Defects

3.36.1 If the Contractor has not corrected a Defect within the time specified in the Nodal Officer or his nominee's notice the Nodal Officer or his nominee will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

D. COST CONTROL

3.37 Bill of Quantities

3.37.1 The Bill of Quantities shall contain items for the construction, supply, installation, testing and commissioning work to be done by the Contractor.

3.37.2 The bill of quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item as jointly measured by both the representatives.

3.38 Changes in the Quantities

3.38.1 If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than +25 percent provided the change exceeds + 10%

of initial Contract Price, the Nodal Officer or his nominee shall adjust the rate (s), to allow for the change, in accordance with Clause 3.40.

3.38.2 The Nodal Officer or his nominee shall not adjust rates from changes in quantities if thereby the initial Contract Price is exceeded by more than 15 percent except with prior approval of the Employer.

3.38.3 If requested by the Nodal Officer or his nominee where the quoted rate (s) of any item(s) is/are abnormally high, the Contractor shall provide the Nodal Officer or his nominee with a detailed cost breakdown of such rate in the Bill of Quantities.

3.39 Variations

3.39.1 All Variations shall be included in updated programs produced by the Contractor.

3.40 Payment for Variations

3.40.1 Variation permitted shall not exceed +25% in quantity of each individual item, and +10% of the total contract price, within 14 days of the date of instruction for executing varied work, extra work or substitution, and before the commencement of such work, notice shall be given either (a) by the contractor to the Employer of his intention to claim the extra payment or a varied rate or price, or (b) by the Employer to the contractor of his intention to vary rate or price.

3.40.2 For items not existing in the Bill of Quantities or substitution to items in the Bill of Quantities, rate payable should be determined by methods given below and in the order given below:

- 1) Rates and prices in Contract, if applicable plus escalation as per contract.
- 2) Rates and prices in the schedule of rates applicable to the contract plus ruling percentage.
- 3) Market rates of materials and labour, hire charges of plant and machinery used, plus 10% for overheads and profits of Contractors.

3.40.3 For items in the Bill of quantities but where quantities have increased beyond the variation limits, the rate payable for quantity in excess of the quantity in the Bill of Quantity plus the permissible variation should be:

- 1) Rates and prices in contract, if reasonable plus escalation, failing Which (ii) and (iii) below will apply?
- 2) Rates and prices in the schedule of Rates applicable to the contract plus ruling percentage,
- 3) Market rates of material and labour, hire charges of plant and machinery used plus 15% for overheads and profits of contractor.

3.40.4 If there is delay in the Employer and the contractor coming to an agreement on the rate of an extra item, rates as proposed by the employer shall be payable provisionally till such time as the rates are finally determined or till date mutually agreed.

3.40.5. If the Nodal officer or his nominee decides that the urgency of varying the work prevent a quotation being given and considers not delaying the work, no quotation shall be given and the variation shall be treated as a Compensation Event.

3.41 Cash flow forecasts

3.41.1 When the program is updated, the contractor is to provide the Nodal Officer or his nominee with an updated cash flow forecast.

3.42 Payment Certificates

3.42.1 The contractors shall submit to the Nodal Officer or his nominee monthly statements of the estimated value of the work completed less the cumulative amount certified previously.

3.42.2 The Nodal Officer or his nominee shall check the Contractors' monthly statement within 14 days and certify the amount to be paid to the Contractor after taking into account any credit or debit for the month in question in respect of materials for the works in the relevant amount and under conditions set forth in sub clause 3.51.6 of the Contract Data (Secured Advance).

3.42.3 The value of work executed shall be determined by the Nodal Officer or his nominee.

3.42.4 The value of work executed shall comprise the value of quantities of the items in the Bill of quantities completed.

3.42.5 The value of work executed shall include the valuation of variations and Compensation Events.

3.42.6 The Nodal Officer or his nominee 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.

3.43 Payments

3.43.1 Bills shall be prepared and submitted by the Contractor, joint measurements shall be taken continuously and need to be connected with billing stage. System of 4 copies of measurements, one each for Contractor, Employer and Nodal Officer or his nominee, and signed by both Contractor and Employer shall be followed.

3.43.2 75% of bill amount shall be paid within 14 days of submission of the bill. Balance amount of the verified bill should be paid within 28 days of the submission. **(Refer Clause 'A' of Sec-5)**

3.43.3 For delay in payment beyond the periods specified in 3.43.2 above, interest at a pre-specified rate (suggested rate **SBI PLR + 2%**) p.a as on due date of payment) should be paid. **(Refer Clause 'A' of Sec-5)**

3.43.4 Contractor shall submit final Bill within 60 days of issue of defects liability certificate. Client's Nodal Officer or his nominee shall check the bill within 60 days after its receipt and return the bill to Contractor for corrections, if any 50% of undisputed amount shall be paid to the contractor at the stage of returning the bill. **(Refer Clause 'A' of Sec-5)**

3.43.5 The Contractor should re-submit the bill, with corrections within 30 days of its return by the Nodal Officer or his nominee. The re-submitted bill shall be checked and paid within 60 days of its receipt. **(Refer Clause 'A' of Sec-5)**

3.43.6 Interest at a pre-specified rate (suggested rate SBI PLR+ 2% p.a. as on due date of payment) shall be paid if the bills is not paid within the time limit specified above. **(Refer Clause 'A' of Sec-5)**

3.43.7 If an amount certified is increased in later certificates as a result of an award by the Conciliator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute. **(Refer Clause 'A' of Sec-5)**

3.43.8 Items of the Works for which no rate or price has been entered in will not be paid for by the employer and shall be deemed covered by other rates and prices in the Contract.

3.44 Compensation Events (Refer Clause 'A' of Sec-5)

3.44.1 The following mutually agreed Compensation Events unless they are caused by the Contractor would be applicable.

- (a) The Employer does not give access to a part of the Site by the site. Possession Date stated in the Contract Date.
- (b) The Employer modifies the schedule of other contractors in a way which affects the work of the contractor under the contract.
- (c) The Nodal Officer or his nominee orders a delay or does not issue drawings, specifications or instructions required for execution of works on time.
- (d) The Nodal Officer or his nominee instructs the Contractor to uncover to carry out additional tests work which is then found to have no Defects.
- (e) The Nodal Officer or his nominee unreasonably does not approve for a subcontract to be let.
- (f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and form a visual inspection of the site.
- (g) The Nodal Officer or his nominee gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.
- (h) Other contractors, public authorities, utilities or the Employer does not work within the dates and other constraints stated in the Contract that cause delay or extra cost to the Contractor.
- (i) The advance payment is delayed.
- (j) The effect on the Contractor of any of the Employer's Risks.

(k) The Nodal Officer or his nominee unreasonably delays issuing a Certificate of Completion.

(l) Other Compensation Events listed in the Contract Data or mentioned in the contract.

(m) Whenever any compensation event occurs, the contractor will notify the employer, within 14 days and provide a forecast cost of the compensation event.

3.44.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the intended Completion Date, the Contract Price shall be increased and/or the intended Completion Date shall be extended. The Nodal Officer or his nominee shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

3.44.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast has been provided by Contractor, it is to be assessed by the Nodal Officer or his nominee and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable the Nodal officer or his nominee shall adjust the Contract Price based on Nodal Officer or his nominee's own forecast. The Nodal Officer or his nominee will assume that the Contractor will react competently and promptly to the event.

3.45 Tax (Refer Clause 'A' of Sec-5)

3.45.1 The rates quoted by the Contractor shall be deemed to be inclusive of the sales and other taxes that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at sources as per applicable law. Any new Taxes, levies, duties imposed after signing the Contract shall be reimbursed by the employer on production of documentary evidence.

3.46 Currencies

3.46.1 All payments shall be made in Indian Rupees unless specifically mentioned.

3.47 Price Adjustment (Refer Clause 'A' of Sec-5)

3.47.1 Contract price shall be adjusted for increase or decrease in rates and prices of labour, materials, fuels and lubricants in accordance with the following principles and procedures and as per formula given. The price adjustment shall apply for the work done from the start date given in the Contract data up to end of the initial intended completion date or extensions granted by the Nodal Officer or his nominee and shall not apply to the work carried beyond the stipulated time for reason attributable to the contractor.

(i) Price adjustment for increase or decrease in the cost shall be paid in accordance with the following formula:

$$V = 0.85 \times Q \times R \times [(P - P_o) / P_o]$$

Where,

V = Variation in price on account of Labour/ Diesel/ Cement/ Steel/ All Commodities during the month under consideration.

Po = Market rate of Diesel/ Cement/ Steel/ All Commodities on the date of opening of Technical bid. (Consumer Price Index for Labour).

P = Market rate of Diesel/ Cement/ Steel/ All Commodities during the month under consideration. (Consumer Price Index for Labour).

Q = Percentage of Labour/ Diesel/ Cement/ Steel/ All Commodities.

	Labour	Diesel	Cement (OPC)	Mild Steel- Long Product	All Commodities
Q (%)	0 %	0 %	0 %	0%	0 %
P	All India Consumer Price Index for Industrial Workers for the month under consideration as published in the RBI Bulletin /Indian Labour Journal. (Base 2016=100)	Retail Price of HSD received at Kandla by M/s. IOCL for the month under consideration	Wholesale Price Index for Cement for the month under consideration as published in RBI Bulletin/Indian Labour Journal	Wholesale Price Index for Steel for the month under consideration as published in RBI Bulletin/Indian Labour Journal	Wholesale Price Index for All Commodities for the month under consideration as published in RBI Bulletin/Indian Labour Journal (Base 2011-12 =

			(Base 2011-12 = 100)	(Base 2011-12 = 100)	100)
Po	All India Consumer Price Index for Industrial Workers as prevalent in the month in which bids are opened & as published in the RBI Bulletin /Indian Labour Journal. (Base 2016=100)	Retail Price of HSD received at Kandla by M/s. IOCL as on the date of opening of Bids.	Wholesale Price Index for Cement ruling in the month in which the Bids are opened and as published in RBI Bulletin/Indian Labour Journal (Base 2011-12 = 100)	Wholesale Price Index for Steel ruling in the month in which the Bids are opened and as published in RBI Bulletin/Indian Labour Journal (Base 2011-12 = 100)	Wholesale Price Index for All Commodities ruling in the month in which the Bids are opened and as published in RBI Bulletin/ Indian Labour Journal (Base 2011-12 = 100)

R = Value of work done during the month under consideration.

Note: i) Escalation to be computed for relevant items. Percentage that shall govern the escalation under Q shall be predetermined and indicated in tender document for each component i.e. Labour, Fuel, Cement, Steel, All commodities etc.

3.47.2 NIL

3.47.3 To the extent that full compensation for any rise or fall in costs to the contractor is not covered by the provisions of this or other clauses in the contract, the unit rates and prices included in the contract shall be deemed to include amount to cover the contingency of such other rise or fall in costs.

SUBSEQUENT LEGISLATION

If, after the date 28 (Twenty eight) prior to the date for submission of tenders for the contract there occur changes to any National or Statute Statute, Ordinance or Decree or other law or any regulation or bye law of any local or other duly constituted authority or introduction of any such statute, ordinance, decree, law, regulation or bye law which causes additional or reduced cost to the contractor in execution of the contract, such additional or reduced cost shall, after due consultation with the employer and the contractor be determined by the nodal officer or his nominee and shall be added to or deducted from the contract price and the nodal officer or his nominee shall notify the contractor accordingly with a copy to the employer.

3.48 Retention

3.48.1 The employer shall retain from each payment due to the contractor the proportion stated in the contract data until completion of the whole of the works.

3.48.2 Retention money shall be deducted at 5% from each running bill, subject to a max. of 5 percent of the contract price. Retention money shall be refunded within 14 days from the date of payment of final bill.

3.49 Liquidated damages

(A) In case of delay in completion of the contract, liquidated damages (L.D) may be levied at the rate of $\frac{1}{2}$ % of the contract value per week of delay or part thereof, subject to a maximum of 10 percent of the contract price.

(i) The owner if satisfied, that the works can be completed by the contractor within a reasonable time after the specified time for completion, may allow further extension of time at its discretion with or without the levy of L.D. In the event of extension of time at its discretion with L.D, the owner will be entitled without prejudice to any other right or remedy available in that behalf per cent (1/2%) of the contract value of the works for

each week or part of the week subject to the ceiling defined in sub-clause 3.49.A.

- (ii) The owner, if not satisfied that the works can be completed by the contractor, and in the event of failure on the part of the contractor to complete work within further extension of time allowed as aforesaid, shall be entitled, without prejudice to any other right, or remedy available in that behalf, to rescind the contract.
- (iii) The owner, if not satisfied with the progress of the contract and in the event of failure of the contractor to recoup the delays in the mutually agreed time frame, shall be entitled to terminate the contract. In the event of such termination of the contract as described in clauses 3.49A (ii) or 3.49A (iii) or both the owner shall be entitled to recover L.D. up to ten per cent (10%) of the contract value and forfeit the security deposit made by the contractor besides getting the work completed by other means at the risk and cost of the contractor.
- (iv) The ceiling of LD shall be 10% of the cost of work.
- (v) In case part / portions of the work can be commissioned and port operates the portion for commercial purpose, the rate of LD will be restricted to the uncompleted value of work, the maximum LD being on the entire contract value.

Note: Contract price for LD shall be inclusive of tender price plus taxes and duties.

3.50 Incentives or Bonus (Refer Clause 'A' of Sec-5)

For early completion of the contract before the stipulated date of completion of work an incentive amount at the rate of 0.25 % contract price may be paid to the Contractor for every fortnight of early completion, subject to a maximum of cap of 5% of the contract price.

The Port, if satisfied, that the works can be completed by the contractor within a reasonable time after the specified time for completion, may allow extension of time at its discretion, by virtue of which the contractor make himself eligible for incentive, the extension shall be considered only till the actual date of completion and no incentive shall be payable. For calculation of incentive payment, contract price shall be exclusive of tender price plus taxes and duties.

3.51 Advance payment Mobilization Advance (Refer Clause 'A' of Sec-5)

- (a) The Mobilization advance shall not be sanctioned in less than two installments. The second installment is sanctioned only after proper utilization of advance disbursed in first phase and a certification to this effect by E-I-C.
- (b) The advance shall be limited to 10% of tendered amount.
- (c) NIL
- (d) The mobilization advance shall be released only after obtaining a bank Guarantee bond from a nationalized bank for 110% (as per latest CVC directions) of amount of advance to be released and valid for the contract period. This shall be kept renewed time to time to cover the balance amount and likely period to complete recovery together with interest.

- (e) The original bank guarantee should be received by DPA directly from the issuing authority by Registered Post [AD]. However, in exceptional cases, where the guarantee is handed over to the customer for any genuine reasons, the branch should immediately send by Registered Post [AD] an unstamped by the E-I-C.
- (f) NIL
- (g) It shall be ensured that at any point of time, Bank Guarantee is available for the amount of outstanding advance.
- (h) The recovery should be commenced after 10% of work is completed and the entire amount together with interest shall be recovered by the time 80% of the work is completed.
- (i) If the contractor fails to achieve the targeted progress at the end of 50% of time period the mobilization advance may be recovered by encashing the bank guarantee, provided no hindrance/delay was caused by the department.

3.52 Performance Securities (Refer Clause '1.34' of Sec-1 at Pages No. 27)

Security deposit shall consist of two parts; a) Performance Guarantee to be submitted at award of work, and b) Retention money to be recovered from Running Bills.

Security Deposit/ Performance guarantee shall be 10% of Contract price of which 5% of contract price should be submitted as FDR or Bank Guarantee of Nationalized/scheduled bank (except Co-operative) Banks having its branch at Gandhidham, or Digital transfer within (21 days in case of domestics bid and within 28 days in case of global bids) of receipt of letter of acceptance and balance 5% recovered as Retention Money from Running Bills. Recovery of 5% of Retention Money to commence from the first bill onwards @ 5% of bill value from each bill. Retention Money be refunded within 14 days from the date of payment of final bill. Balance SD to be refunded immediately not later than 14 days from completion of defect liability period, (Subject to fulfilment of clause no 5.24), NOC from Geology and Mining Department, Bhuj/Anjar & Payment of welfare cess for final bill.

Failure of the successful Bidder to comply with the requirements above shall constitute sufficient grounds for cancellation of the award of work and forfeiture of the Bid security and/or the successful bidder may be disqualified from bidding for any contract with DPA for a period of three years from the date of notification Failure of the Successful Bidder to comply with the requirement as mentioned above shall constitute sufficient grounds for cancellation of the award of work and forfeiture of EMD.

The documentary evidence (copy of paid Challan in Govt. Treasury) of Welfare cess @1% of work done or as amended By Statutory Authority from time to time, paid on final bill shall be submitted before releasing the Performance Guarantee.

3.53 NIL

3.54 Cost of Repairs

3.54.1 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 period shall be remedied by the Contractor at the Contractors cost if the loss or damage arises from the Contractors acts or omissions.

E. FINISHING THE CONTRACT

3.55 Completion

3.55.1 After completion of the work, the contractor will serve a written notice to the Nodal Officer or his Nominee/Employer to this effect. The Nodal officer or his Nominee/Employer upon receipt of this notice shall conduct a complete joint survey of the work within 7 days and prepare a defects list jointly. The defects pointed out by the Nodal Officer or his nominee/Employer would be rectified by the contractor within 14 days and thereafter acceptance report be signed jointly by the contractor and the employer. This joint acceptance report shall be treated as "completion Certificate".

3.56 Taking over

3.56.1 The employer shall take over the site and the works within seven days of the Nodal Officer or his nominee issuing a certificate of completion.

3.57 Final Account

3.57.1 The Contractor shall supply to the Nodal Officer or his nominee a detailed account of the total amount that the Contractor considers payable under the contract before the end of the Defects Liability period. The Nodal Officer or his nominee shall issue a defects liability certificate and certify any final payment that is due to the contractor within 60 days of receiving the contractor's account if it is correct and complete. If it is not, the Nodal Officer or his nominee shall issue within 15 days a schedule that states the scope of the corrections or additions that are necessary for the correction and certify payment of 50% of the undisputed amount to the contractor.

If the final account is still unsatisfactory after it has been resubmitted the Nodal Officer or his nominee shall decide on the amount payable to the contractor and issue a payment certificate, within 60 days of receiving the contractor's revised account.

3.58 Operating and Maintenance Manuals

3.58.1 If "as built" Drawings and /or operating and maintenance manuals are required, the

contractor shall supply them by the dates stated in the Contract Data.

3.58.2 If the contractor does not supply the drawings and /or manuals by the dates stated in the contract data, or they do not receive the Nodal Officer or his nominee's approval, the Nodal Officer or his nominee shall withhold the amount stated in the contract data from payments due to the contractor.

3.59 Termination

3.59.1 The employer or the Contractor may terminate the contract if the other party causes a fundamental breach of the contract.

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

- (a) The contractor stops work for 28 days when no stoppage of work is shown on the current program and the stoppage has not been authorized by the Nodal Officer or his nominee.
- (b) The Nodal Officer or his nominee instructs the contractor to delay the progress of the work and the instruction is not withdrawn within 28 days.
- (c) The employer or the contractor becomes bankrupt or goes into liquidation other than for a reconstruction restructure or amalgamation.
- (d) A payment certified by the Nodal Officer or his nominee is not paid by the employer to the contractor within 50 days of the date of the Nodal Officer or his nominee's certificate.
- (e) The Nodal Officer or his nominee gives Notice the 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 Nodal Officer or his nominee.
- (f) The contractor does not maintain a security which is required.
- (g) The contractor has delayed the completion of works by the number days for which the maximum number of liquidated damages can be paid as defined in the contract data and
- (h) If the contractor, in the judgment of the employer has engaged in corrupt or fraudulent practices in competing for or in the executing the contract.
- (i) If the contractor has contravened clause 1.37 and clause 3.9 of condition of 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 public officials 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 employer, and includes collusive practice. Bidders (prior to or after bid submission) designed to establish bid prices at artificial non- competitive levels and to deprive the employer of the benefits of free and open competition".

3.59.3 When either party to the contract gives notice of a breach of contract to the Nodal Officer or his nominee for a cause other than those listed under sub Clause. 3.59.2 Above, the Nodal Officer or his nominee shall decide whether the breach is fundamental or not.

3.59.4 Notwithstanding the above, the employer may terminate the contract for convenience subject to payment of compensation to the contractor including loss of profit on uncompleted works. Loss of profit shall be calculated on the same basis as adopted for calculation of extra/additional items.

3.59.5 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.

3.60 Payment upon Termination

3.60.1 If the contract is terminated because of a fundamental breach of contract by the contractor, the Nodal Officer or his nominee shall issue a certificate for the value of the work done less 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 damage shall not apply if the total amount due to the employers exceeds any payment due to the contractor, the difference shall be payable to the employer.

3.60.2 If the contract is terminated at the employer's convenience or because of a fundamental breach of contract by the employer, the Nodal Officer or his nominee shall issue a certificate for the value of the work done, the reasonable employed solely on the works, and the contractor's costs of protecting and securing the works and loss of profit on uncompleted works 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.

3.61 Property

3.61.1 All materials on the Site, Plant, Equipment, Temporary Works and Works for which payment has been made to the contractor by the Employer, are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor's default.

3.62 Release from Performance

3.62.1 If the Contract is frustrated by the outbreak of war or by other event entirely outside the control of either the Employer or the Contractor, the Nodal Officer or his nominee shall certify that Contract has been frustrated. The Contractor shall leave the Site 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.

3.63 NIL

F. SPECIAL CONDITIONS OF CONTRACT

1. 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 Nodal Officer or his nominee, deliver to the Nodal Officer or his nominee a return in detail, in such form and at such intervals as the Nodal Officer or his nominee may prescribe, showing the staff and numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Nodal Officer or his nominee may require.

2. COMPLIANCE WITH LABOUR REGULATIONS:

During continuance of the contract, the Contractor and his sub-contractors shall abide at all times by all existing labour enactment and rules made there under, regulations, Notifications and by 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 Central Government or the local authority. Salient features of some of the major labour laws that are applicable to construction industry are given below.

The Contractor shall keep the Employer indemnified in case any action is taken against the employer by 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 Employer 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 Nodal Officer or his nominee/Employer shall have the right to deduct any money due to the Contractor including his amount of performance security. The Employer/Nodal Officer or his nominee 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 Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

3.64 INTEGRITY PACT

INTEGRITY PACT IN DEENDAYAL PORT AUTHORITY

The Central Vigilance Commission (CVC) has been promoting integrity, transparency, equity and competitiveness in transactions by various organizations of the Government of India. Public procurement is an area of concern for the CVC, and many steps have been taken to put proper systems in place. In this context, Integrity Pact (IP), a tool conceptualized and promoted by Transparency International, an international NGO, aimed at preventing corruption in public contracting, has been found useful. It has been decided by Ministry of Shipping that all organizations under the Ministry will implement IP. IP should cover every tender / procurement above a specified threshold value. The threshold value of contracts / procurements / transactions incorporating IP would be such that it covers 90% by value of all contracts / procurements / transactions of the organization in the last 3 years. Presently the threshold is fixed as Rs. 50 Lakhs. IP essentially envisages an agreement between prospective vendors / bidders, and Deendayal Port Authority, committing the persons / officials of both sides not to resort to any corrupt practice in any aspect of the contract at any stage. Only those vendors / bidders, who commit themselves to IP with DPA, would be considered competent to participate in the bid process. Any violation would entail disqualification of the bidders and exclusion from future business dealings. IP, in respect of a particular contract should cover all phases of the contract, from the stage of Notice inviting Tender (NIT) / pre-bid stage, till the conclusion of the contract, i.e. final payment or the warranty / guarantee period. IP would be implemented through Independent External Monitor (IEM), who are eminent persons appointed by the organization, with approval of CVC. The term of appointment for an IEM would be 3 years. Name of the IEM will be mentioned in NIT. The IEM would review independently and objectively assess, as to whether and to what extent parties have complied with their obligations under the IP. IEM would have access to all contract documents, whenever required. The bidders may raise disputes / complaints if any, with the IEM. The IEM would examine complaints received by them and give their recommendations / views to the Chairman of Port Authority. Recommendations of IEM would be in the nature of advice and would not be legally binding.

Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization. Shri Amiya Kumar Mohapatra, IFoS (Retd.) and Dr. Gopal Dhawan, Ex-CMD, MECL, has been appointed IEM by DPA from 2024. Draft condition to be incorporated in the Draft Tender papers 1) Then bidder has to execute Integrity pact agreement with Deendayal Port Authority (As per Appendix) Shri Amiya Kumar Mohapatra, IFoS (Retd.) and Dr. Gopal Dhawan, Ex-CMD, MECL has been nominated as Independent External Monitor for Integrity Pact whose address is as under;

1. Shri Amiya Kumar Mohapatra, IFoS (Retd.)

Qrs. No. 5/9, Unit-9, Bhoi Nagar,
Bhubaneswar-751 022
Mobile no. 9437002530
Email: amiyaifs@gmail.com

2. Dr. Gopal Dhawan, Ex-CMD, MECL,

House no. 120, Jal Shakti Vihar (NHPC
Society) P4, Builders area, Greater
Noida Gautam Budh Nagar, **Uttar**
Pradesh – 201 315
Mobile no. – 8007771467
Email: gdhawangeologist@gmail.com

The potential bidders shall download and print the IP Agreement signed by the Employer and their witness and affix his/her signature on the IP Agreement in the presence of a witness from his/her side, who shall also affix his/her signature thereof. Having completed the signing procedure, the potential Bidder shall upload the duly filled and signed IP Agreement on n-procure portal.

The procedure mentioned above regarding signing of Integrity Pact Agreement by both the parties (Employer and Potential bidders) shall be completed online. However, in case of any technical glitch due to which if any potential bidder is unable to upload the IP Agreement, then he/ she shall submit the Hard Copy of the duly filled, signed IP Agreement, to the Department concerned of DPA within a period of seven days and prior to opening of the Technical Bid, failing which Bid of potential Bidder shall be treated as disqualified

SALIENT FEATURES OF SOME MAJOR 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 on death at the rate of 15 days' wages for every completed year of service. 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 contribution by the employer plus workers @ 12%/8.33%. the benefits payable under the Act are:
Pension to family pension 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 workmen/ 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 Employer by Law. The Principal Employer 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 Employer if they employ 20 or more contract labour.
- (f) Minimum Wages Act 1948: - The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment Construction of Buildings, Roads, Runways are scheduled employment.
- (g) Payment of Wages Act 1936: - It lays down as to by what date the wages are to be paid when it will be paid and what deductions can be made from the wages of the workers.

- (h) Equal Remuneration Act 1979: - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
- (i) Payment of Bonus Act 1965: - The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing Rs.3500/- per month or less. The bonus to be paid to employees getting Rs.2500/- per month or above up to 3500/- per month shall be worked out by taking wages as Rs.2500/- per month only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.
- (j) Industrial Disputes Act 1947: - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lockout becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.
- (k) Industrial Employment's (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 provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get same certified by the designated Authority.
- (l) Trade Unions Act 1926: - The Act lays down the procedure for registration of trade union of workmen and employers. The Trade Union registered under the Act have been certain immunities from civil and criminally abilities.
- (m) 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 Labor is prohibited in Building and Construction Industry.
- (n) 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 establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home upon the establishment and back, etc.
- (o) 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 Employer 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 Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

- (p) 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 occurrence to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 more persons without the aid of power engaged in manufacturing process.

Contractor

**Executive Engineer (C-I)
Deendayal Port Authority**

SECTION 4

CONTRACT DATA

CONTRACT DATA

Items marked "N/A does not apply in this contract.

The following documents are also part of the contract clause reference

The schedule of other contractors	(3.8)	N.A.
The schedule of key personnel	(3.9)	N.A.

The above insertions should correspond to the information provided in the invitation of bids.

The employer is
Chairman,
Deendayal Port Authority, Kandla

Address: A.O. Building, P.O. Box No. 50, Gandhidham - 370201, Gujarat State, India

Employer's authorized representative is Chief Engineer Deendayal Port Authority.

The nodal officer or his nominee is
EXECUTIVE ENGINEER (C-I),
DEENDAYAL PORT AUTHORITY,
2nd FLOOR, New Annexe BUILDING,
Gandhidham-370201, KUTCH
DISTRICT, GUJARAT STATE, INDIA,

Nodal officer's authorized representative is AXEN / AE

The conciliator appointed jointly by the employer and contractor is: **(Not Applicable)**

Name:- **Not Applicable**

Address:- **Not Applicable**

The name and identification number of the contract is **"Construction of Center of Excellence (CoE) for Green hydrogen at Gandhidham"**

The works consist of **"Construction of Center of Excellence (CoE) for Green hydrogen at Gandhidham"**

The start date shall be_____

The intended completion date for the whole of the work is **10 (Ten) Months.**

The following documents also form part of the contract

The contractor shall submit a program for the works immediately after delivery of the letter of acceptance.

The site possession dates shall be given after the award of work. The defect liability period is 24 Months (3.35). The minimum insurance cover for physical property, injury and death is **Rs.20.00 lakhs** per occurrence with the number of occurrences limited to four. After each occurrence, contractor will pay additional premium necessary to make insurance valid for four occurrences always.

Appointing authority for the Arbitrator is Chairman, DPA.

The following events shall also be Compensation Events. (3.44)

1. The Employer terminates the Contract from his convenience.
2. _____.
3. _____.
4. _____.

The period between programme updates shall be 15 days. (3.27)

The language of the contract documents is English (3.3)

The law, which applies to the contract, is law of Union of India (3.3)

The currency of the contract is Indian rupees (3.46)

Fees and types of reimbursable expenses to be paid to the
Dispute Review Expert (3.25)

Appointing authority for the Arbitrator is Chairman, DPA.

Escalation is Payable for contracts as per clause no. 47 of section – 3,

subjected to Special condition provision.

SECTION 5

SPECIFICATIONS AND SPECIAL CONDITIONS

FOR CIVIL WORKS

A. SPECIAL CONDITIONS

5.0 Special Condition

The conditions of contract of Section 1 to 4 (hereinafter called as the General conditions) modified or added to by the following part i.e. Section-5, conditions of particular application which shall be read and construed with the General Conditions as if they were incorporated therewith.

In so far as any of the conditions of particular application may conflict or be inconsistent with any of the General Conditions, particular Section-5 shall prevail.

5.01 The following clauses of the INSTRUCTION TO THE BIDDERS (Section- I) will not be applicable, which is superseded the earlier.

- (a) Clause 1.4.1 (c), (d), (e) & (h), 1.4.2 (j)
- (b) Clause 1.4.4
- (c) Clause 1.8.2 (Bidding documents)
- (d) Clause 1.19.1(A), 1.19.2, 1.19.3, 1.20.1 (sealing and marking of bids)
- (e) Clause 1.22.2 (Modification of withdrawal of Bid)
- (g) Clause 1.23.2, 1.23.3, 1.23.4
- (h) Clause 1.26.4
- (i) Clause 1.27.1, 1.27.2 (Correction of errors)
- (j) Clause 1.35 (Advance payment)
- (k) Clause 1.36.1 (Conciliator)

5.02 The following clauses of Section-II will not be applicable, which is superseded the earlier.

- (a) The clauses c, d, g of the Specimen for form of Bid.
- (b) Table at Sr.No.7 of Information required by the employer (Section-2)
- (c) Table at Sr.No.7 of Information required by the employer prequalification of bidder (Section-2)

5.03 The following clauses of the CONDITION OF CONTRACT (Section-III) will not be applicable, which is superseded the earlier.

- (a) Clause 3.8 (Sub-contracting), 3.9 (Personnel)
- (b) Clause 3.21.1 (Possession of site)
- (c) Clause 3.24.1 (Disputes)
- (d) Clause 3.25.1, 3.25.2, 3.25.3 (Settlement of disputes, decision by Conciliation, Arbitration)

- (e) Clause 3.26.1 (Replacement of Conciliator),
- (f) Clause 3.43.2, 3.43.3, 3.43.4, 3.43.5, 3.43.6, 3.43.7
- (g) Clause 3.44.1, 3.44.2, 3.44.3 (Compensation events)
- (h) Clause 3.45 (Tax), 3.47 (Price Adjustment)
- (i) Clause 3.50 (Incentive or Bonus)
- (j) Clause 3.51 (Advance Payment)
- (k) The schedule of key personnel (3.9)

5.04 The following clauses (Section-4 to 10) will not be applicable, which is superseded.

- (a) Conciliator is not applicable under contract date of (section-4)
- (b) The form for Dispute Review Board Agreement (section-10) & Exception & Deviations (Section-10).
- (c) The form for specimen Bank Guarantee for advance payment (Section -10).

5.05 The following Existing clauses are Modified as under;

5.05.1. Section-I; Clause No. 1.4.2 d; Major items of construction equipment available with the bidder

5.05.2. Section 2 Table 5 The list of Equipment available with bidder

5.05.3. Section 2 Table 6 Qualification and experience of key personnel available with the bidder. Attach biographical data.

5.05.4. Section-I; Clause No. 1.5.2; Section: Clause 3.7

Companies/Contractors may jointly undertake contract/contracts. The number of Partners in JV/Consortium shall be limited to maximum of three. Each entity would be jointly and severally responsible for completing the task as per the contract, however declaration of the Lead member to be indicated by bidders, however JV has to designate in their MOU. The firms with at least 26% equity holding each be allowed to jointly meet the eligibility criteria.

- i. A legally binding Joint venture / Consortium Agreement signed by authorized signatories of all the partners of the JV/Consortium, as per the proforma at section -8 shall be enclosed with the bid.
- ii. Power of attorney duly executed and signed by legally authorized signatories of all the partners, authorizing the Lead Partner (a) to submit bid, negotiate and conclude contract and incur all liabilities therewith on behalf of the partner(s) of the JV/Consortium during the bidding process; and (b) in the event of a successful bid, to incur liabilities and receive instructions for and on behalf of the partner(s) of the JV /Consortium and to carry out the entire execution of the contract including payment, exclusively through Lead Partner, as per the proforma of power- of- attorney for lead member of JV/ consortium at **Section -8**, which shall be duly authenticated by a notary public or equivalent certifying authority, shall be enclosed with the bid.
- iii. The bid and in the case of the successful bidder, the Agreement, shall be signed and / or executed in such a manner for making it legally binding on all partners (including operative parts of the ensuing Contract in respect of Agreement of Arbitration, etc.).
~~The Contract shall be signed by legally authorized signatories of all partners.~~

- iv. The Lead Partner shall be authorized to receive instructions for and on behalf of the partners of the Joint venture and entire execution of the Contract including payment shall be carried out exclusively through the Lead Partner. A Statement to this effect should be included in the Joint Venture Agreement.
- v. All partners of the Joint Venture shall be liable jointly and severally for the execution of the Contract in accordance with the Contract terms, and a Statement to this effect should be included in the Joint Venture Agreement.
- vi. Bid Security as required shall be furnished by Lead Member of Joint venture.
- vii. Performance Guarantee, as required, will be furnished by Lead Member of Joint venture.
- viii. Participation by a firm in more than one JV /Consortium is not permissible. A firm who submits bid on individual capacity is not eligible to be a partner of a JV/Consortium. In case a firm's name appears in more than one bid then both application may be rejected.
- ix. Each partner must submit the complete documentation, or portions applicable thereto, required qualifying the firm for bidding.
- x. All the partners of the JV/Consortium shall be jointly and severally liable for due performance, recourse/sanctions within the joint venture in the event of default of any partner and arrangements for providing the required indemnities.
- xi. Notwithstanding demarcation or allotment of work among the partners, each partner shall be liable for non-performance of the whole contract irrespective of their demarcation or share of work.
- xii. The Lead Partner shall be authorized to act on behalf of the JV/Consortium.
- xiii. All the correspondences between the Employer and the contractor shall be routed through the Lead Partner.
- xiv. In the event of default by the Lead Partner, it shall be construed as default of the Contractor; and Employer will take action under relevant clause(s) of the Bid Document and/or General Terms and Conditions of Contract.
- xv. An undertaking that all the partners are jointly and severally liable to the Employer for the performance of the contract shall be enclosed with the bid.
- xvi. In the event of any partner leaving the JV, it shall be intimated to the Employer within 30 days by other partner(s). Failure to do so shall be construed as default of the contractor and the Employer may take action under relevant clause(s) of the Bid Document and/or General Terms and Conditions of Contract.
- xvii. The contractor shall not alter its composition or legal status without the prior written permission of the Employer. Failure to do so shall be construed as default of the contractor and the Employer may take action under relevant clause(s) of the Bid Document and/or General Terms and Conditions of Contract.
- xviii. One of the partners of JV/Consortium should have downloaded the bid documents.

5.06 Bidders are advised to consider the below points while submitting the offer:

- i) If multiple bidders submit work experience showing the same/particular work, then such experience will be considered of Main Contractor.
- ii) If tendered/bidder completed the works in private organization as stipulated in Minimum Qualification Criteria (work experience) shall be considered only if CA certifying value of work done with TDS certificates (where applicable) / Bank statement will be required with respect to referred work is issued by Competent

Authority needs to be enclosed by the tenderer along with the offer.

- iii) The completed works only is considered for qualification. Partly completed works or works are in progress shall not be considered for qualification.
- iv) If the work is completed successfully and contract is under maintenance period, such works are considered as a completed works for evaluation purposes. In such cases, completion cost excluding AMC works shall be considered for evaluation purpose.
- v) In case of any contract having material and labour components are controlled at different heads, in such cases the value of work indicated in work order and respective completion certificates only considered for experience.
- vi) If the tenderer have successfully completed the work (date of completion of work i.e. physically/actually completion irrespective of maintenance period) during last 7 years ending last day of month previous to the one in which applications are invited irrespective of date of commencement / start of work. Such experience of work is also considered for evaluation in work experience.
- vii) If the tenderer has executed "Similar works" in any Contract/Project/BOT Project/Turnkey Project etc. In those particular Projects/Contracts, if the cost of building works (separately or combined) meets the requirement of MQC, such experience shall also be considered for evaluation.
- viii) If the similar work is executed as sub-contractor, it is mandatory to upload the sub-contract permission letter obtained from the Govt./Public Sector officer in case work belongs to the Govt./Public Sector, or from the owner of the project in case work belongs to private organization. Also the completion certificate/form 3A authenticated by concern Govt./Public Sector officer or owner of the project shall be uploaded along with TDS certificate deducted from that particular work issued by the competent authority shall be submitted along with bid submission.

5.07 GST REGISTRATION

The GST Registration No. should be invariably mentioned in the bid tender quotation failing which bid/ tender quotation will be considered as non – responsive and be liable for discharge.

5.08 GOODS & SERVICE (GST) CLAUSE

The quoted rate of the tenderer shall be inclusive of all taxes and duties excluding applicable GST. The Contractor may raise GST invoice as monthly running bills notwithstanding the payment from DPA. The Contractor has to comply the GST remittance and filing as per statutory requirements. GST will be reimbursed separately on confirmation of credit in DPA GST Portal. DPA shall deduct TDS from the claim bill as per the statutory provisions of prevailing laws

- (i) The contractor shall quote the price exclusive of GST. The contractor shall quote prevailing GST rate separately, which shall be reimbursed by DPA after ascertaining necessary compliance as per Goods & Service Tax Act, 2017.
- (ii) All other duties, taxes, cess, applicable if any, shall be borne by the contractor.
- (iii) TDS under GST Act is required to be deducted @2% (1% CGST and 1% SGST or 2% IGST) or as admissible from payment /credit given to the contractor.
- (iv) The element of GST will not be considered for evaluation of financial purpose.
- (v) Contractor/service provider/supplier etc. has to ensure timely & proper filling of GSTR 1 so that Deendayal Port Authority can avail input tax credit in timely manner. In case DPA not allowed input credit due to failure of part of the contractor/service provider/supplier etc., it will be a financial loss to DPA & therefore same shall be recovered from the payment/deposit of the contractor/service provider/supplier

Also change if any in the Government Policy or Amendment in Tax structure the same will be applicable from time to time.

5.08.1 TDS ON GST

TDS provision under GST Acts, 2017 are in force from 01.10.2018 and accordingly TDS under GST Act will be deducted @ 2 % (1% CGST and 1 % SGST or 2 % IGST) from payment/ credit give to contractor/ professional and other for work order / contract exceeding Rs.2,50,000/-

5.09 INCOME TAX DEDUCTIONS FROM BILLS

Income Tax deduction @ prevalent rate and surcharge/GST as applicable on the payments to the contractor will be deducted from the bills as directed by the central board of director taxes, Ministry of finance, Government of India.

5.10 POST TENDER MODIFICATION

The Tenderers are not expected to make any post tender modification. Hence, the tenderers should not make any correspondence regarding the tender after submission of the same on due date and time. No cognizance of any correspondence shall be taken and if Tenderers persists with the same necessary action will be initiated against him. All the tenders received on or before the due date and time shall be opened, if otherwise found in order.

- 5.11** Contractor has to make his own arrangement for electric supply. The charges for electric supply consumption will be borne by contractor as per prevailing rates. The contractor has also to install his own generator etc. (if required) at his own cost and risk to meet with his full requirement of electric power.

5.12 Drawings of Temporary Works

At least one month before the date when the Contractor intends to start erecting, any part of the Temporary works and staging required for carrying out the work, he shall furnish to the Engineer complete drawings of that part of the temporary works and staging for reference. The Contractor shall at the same time, if so required by the Nodal Officer, furnish calculation in respect of such temporary works. The Contractor shall also furnish to the Nodal Officer drawings showing the method proposed for the erection of the various parts of the works.

- A.** The furnishing to the Nodal Officer of any design for any of the temporary works and staging shall not relieve the contractor of any liability or obligation under the contract in respect of such temporary works and staging. "Approved" means, approved by the Nodal Officer in writing including subsequent confirmation of previous verbal approval.
- B.** Though the drawings to be supplied will be exhaustive the decision of the Nodal Officer or his nominee regarding any change in the drawings shall be final and binding to contractor and no dispute / claim regarding extra payment shall be allowed on account of such changes.
- C.** The contractor has to make his own arrangement for the storage of materials at site or work.

D. The Contractor shall at his own costs and expenses supply five complete sets of "As Made" drawings on polyester tracing film, set of three prints and soft copy (USB flash drive) showing details of all the works executed. The drawings and prints shall be delivered to the Employer within one month of completion of various sections of the work or at such other times as directed by the Employer. The drawings shall be fully dimensioned with the Employer's standard title block or as approved by the Employer.

5.13 Workmanship shall be the best possible quality and all work shall be carried out by skilled workmen except for those which normally require unskilled persons. If the laws of the local Government/Municipal or other authority require the employment of licensed or registered workmen for various trades, the contractor shall arrange to have the work done by such licensed/registered personnel.

5.14 All materials to be used in the works shall be subjected to inspection and test. Samples of all materials, proposed to be used, and in the permanent works shall be submitted to the Nodal officer or his nominee for approval before those are brought to site.

Samples provided to the Nodal officer or his nominee for their retention is to be in labeled boxes suitable for storage. Materials or workmanship not corresponding in character & quality with approved samples will be rejected by Nodal officer or his nominee.

Samples required for approval and testing must be supplied allowing sufficient time for testing and approval, due allowance being made for the fact that if the first samples are rejected further samples shall be required. Delay in the execution of work due to late submission of samples will not be acceptable as a reason for delay in the completion of the works. Materials shall be tested before dispatching to the site, where possible. Materials shall also be tested on the site and those may be rejected if found not suitable or not in accordance with the specifications notwithstanding the results of tests at the contractor's work or elsewhere or of test certificates or of any approval given earlier.

5.15 All materials required to be used in the work shall be got tested from Port Laboratory or government approved NABL lab under supervision of Nodal Officer, Nominee or consultant/Third party quality agency and the charges there of shall be borne by the Contractor.

5.16 The contractor shall have to obtain necessary licence from the Assistant Labour Commissioner (Central) Gandhidham/Adipur/Gopalpuri in case he has to engage 10 or more workers on any day during the execution of work.

5.17 Before commencement of work the Nodal officer or his nominee and the Contractor shall jointly survey and record all ground levels on the site if required. The Contractor shall supply all necessary equipment and attendance for carrying out such surveys.

5.18 As the work progresses, inspection of cement, aggregate, reinforcing steel, structural steel etc. and testing of the material will be done by the Contractor in the presence of the Nodal officer or his nominee. The Contractor's concrete plant and materials stores shall be always made accessible to the Nodal officer or his nominee for inspection and for taking samples. The Contractor shall facilitate in all possible ways the inspection and testing of samples by the Nodal officer or his nominee, Labour shall be provided by the Contractor for carrying out the testing's.

5.19 The items mentioned in the BOQ shall be executed in the Gandhidham area at any location required as per the directions of the EIC during the entire contract period.

- 5.20** The tenderers are expected to have full knowledge of the site of work and local working conditions in the Gandhidham area before submitting the tenders. The Engineer-in- Charge will after issue of work order will give to the contractor possession of so much of the site as in the opinion of Engineer-in-Charge may be required to enable the contractor to commence and proceed with the work and will from time to time as the works proceed give to the contractor possession of such portion of the site as may in the opinion of Engineer-in-Charge be required to enable the contractor to proceed to works without interruption of the work in accordance with the requirement. However, all efforts will be made to handover entire clear site at the time of starting of work. No claims/disputes about idling of machineries, tools, plants, equipment, manpower etc. what-so-ever for handing over the site of work late for starting the work shall be entertained.
- 5.21** Force Major - This will be restricted to natural calamities and acts of God only.
- 5.22** The flooring works are to be finished with neeru (cement slurry) if required without any extra cost.
- 5.23** All the royalties of the materials, quarry fees, octroi, charges, sales tax etc. are payable by the contractor directly to the authorities concerned and the rates tendered shall be deemed to be inclusive of all such charges. If required by EIC contractor shall submit royalty slip of each and every quantity used for work during the bill submission
- 5.24** All royalties of materials, quarry fees, etc., payable by the contractor directly to the authority concern and rates tendered shall be deemed to be inclusive of all charges. Before claiming security deposit, contractor shall produce "No dues certificate" from the Geologist, Geology and mining department of Bhuj/Anjar.
- 5.25** The contractor shall arrange to supply samples of coarse aggregate and fine aggregate etc. to the Port Laboratory for mix design for concreting works. Mixing of cement concrete works shall be on weigh batching basis as per IS. Requirement. The charges shall be borne by the contractor.
- 5.26** The contractor shall have to make good all damages done by him to structure nearby while executing the work and no extra payment shall be made to him on that account.
- 5.27** A Site Order book is to be maintained by the contractor at the site of work. Order and instructions written in the order book shall be deemed to have been legally issued to the contractor and the contractor shall sign each port promptly in the order book as a token of having seen the same. The order book shall be the property of the board and shall be handed over to the Nodal Officer or his nominee of the work in good condition on the completion of the work or whenever required by the Nodal Officer or his nominee.
- 5.28** The Contractor shall deposit / store any materials in such a way so as not to cause inconvenience to the employees / workers engaged on the Port activities and to nearby activities.
- 5.29** The stamp paper of requisite value shall be furnished by the contractor within 10 days from the date of issue of letter of acceptance, failing which he will not be permitted to start the work.
- 5.30** The value of the stamps to be affixed on the agreement shall be of appropriate value prescribed for bond as per latest provision of law enforced on the date of execution contract same shall be borne by the Contractor. However, if the contractor furnishes G.P. Notes or approved guarantees in respect of part of security deposit, the stamp duty chargeable for the amount shall be as prescribed for agreements and payable in accordance with latest provision by law in force at the time of execution of the contract. All the cost of the stamp duty shall be borne by the Contractor.
- 5.31** For execution of work, contractor may be permitted to construct temporary offices, store, labour room toilet etc. at his own cost along with necessary letter / drawing for the permission in written. Nothing will be paid for these purpose and before handing over the site on completion of the work, the contractor has to dismantle all these temporary structure erected by him. Completion certificate will be issued only after compliance of above aspects.

- 5.32** All the works until handed over to the Nodal Officer or his nominee shall stand at the risk of the contractor who shall be responsible to make good at his own cost all the losses and damage caused by or due to fires, weather, or any other reasons. The contractor shall hand over at the time of completion of work the work in good order and conditions and in conformity in every respect with the requirements of the contract and instructions of the Nodal Officer or his nominee.
- 5.33** All the precautions regarding the safety of the work shall have to be taken and the instruction of Engineer-in-charge in this respect shall have to be followed strictly.
- 5.34** During the execution of work, if dewatering is required the same is to be done by the contract or at his own cost and no claim on this account shall be pertained.
- 5.35** Contractor shall provide 2 nos. of four wheeler tourist vehicle (Innova/Ertiga/or equivalent) with driver during contract period for the one car for use of DPA employer/representative and other car for use for the around the clock of work. This vehicle will be used only for duties related to the works of this contract. Vehicle must be in very good condition and to the satisfaction of Engineer-In-charges. Necessary fuel/ oil/ driver / maintenance etc., will have to be borne by the contractor. During the currency of contract in case the contractor does not provide the vehicle the employer will engage the other tourist vehicle and actual charges incurred will be recovered from their due payments or Rs.3000/- per day for a one vehicle will be recovered.

5.36 ARBITRATION

- (i) Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, designs, drawings and instructions here in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim right, matter or any other thing what so ever, in any way arising out of or relating to the contract, design, drawings, specifications, estimates, instructions, order or to the condition or otherwise concerning the work or regarding the execution or failure to execute the same whether arising during the progress of work or after the completion thereof as described here in after shall be referred to the Chairman for sole arbitration by himself or by any Office appointed by him.
- (ii) It will be no objection to any such appointment that the arbitrator is an employee of the Board or the Government, that he had to deal with the matter to which the contract relates and that in course of his duties as an employee of the Board or the Government, he had expressed views on all or any of the matters in dispute or of different.
- (iii) The arbitrator, who has been dealing with the arbitration case, being transferred or vacating his office or in the event of his death or being unable to act for any reason, the Chairman then holding the office shall arbitrate himself or appoint any officer to act as arbitrator.
- (iv) It is also a term of the contract that no person other than the Chairman himself or any officer appointed by him shall act as arbitrator.
- (v) It is a term of the contract that only such question and disputes as were raised during progress of work till its completion and not there after shall be referred to arbitration. However, this would not apply to the questions and disputes relating to liabilities of parties during the guarantee period after completion of the work.
- (vi) It is a term of the contract that the party invoking arbitration shall give a list of disputes with amounts of claim in respect of each said disputes along with the notice seeking appointment of arbitrator.
- (vii) It is also a term of the contract that if the contractor does not make any demand for appointment of arbitrator in respect of any claims/disputes in writing, as aforesaid, within 120 days of receiving the intimation from the Nodal officer or his nominee that the final bill is ready for payment, the claim of the contractor shall be deemed to have been waived and absolutely barred and the Port Authority shall be discharged and released of all liabilities under the contract in respect of these claims.

- (viii) It is also a term of the contract that the arbitrator shall adjudicate only such disputes/claims as referred to him by the appointing authority and give separate award against each dispute/claim referred to him. The arbitrator will be bound to give claim wise detail and speaking award and it should be supported by reasoning.
- (ix) The award of the arbitrator shall be final, conclusive and binding on all the parties to the contract.
- (x) The arbitrator from time to time, with the consent of both the parties, enlarges the time for making and publishing the award.
- (xi) Arbitration shall be conducted in accordance with the provision of Indian Arbitration Act, 1996 or any statutory modifications or re-enactment thereof and rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause.
- (xii) It is also a term of the contract that if any fees are payable to the arbitrator, this shall be paid equally by both the parties.
- (xiii) It is also a term of the contract that the arbitration shall be deemed to have been entered on the reference on the date he issued the first notice to both the parties calling them to submit their statement of claims and counter statement of claims.
- (xiv) Venue of the arbitration shall be such place as may be fixed by the arbitrator at his sole discretion".

5.37 The Contractor has to carry out the site inspection and get acquainted with the work needs to be carried out before quoting. Available data in enclosed however, Contractor has to study in detail independently to assess the quantum and scope of work etc. if required.

5.38 Some indication of nature and extent of the works have been given on the drawings and those are preliminary only. Quantities indicated in the Schedule of Items are tentative and are subject to change. All items of work shall be executed in accordance with the relevant specification annexed thereto and the provisions of the contract.

5.39 PATENT RIGHTS & ROYALTIES

The Contractor shall hold the Board, its officers, agents and employees absolved (or blameless) from liabilities of any other nature of kind on account of copyright or copyright composition, secret process, patented or unpatented inventions, article or appliances manufactured or used in the performance of this contract including their use by the Board unless otherwise specifically stipulated in this contract.

5.40 WORKING HOURS

Each Tenderer shall submit with his tender a programmed for execution of the work. The contractor has to carry-out the work as per general working hours except for declared closed holidays by the Port. However, based on progress of work, if required, round the clock work can be allowed after approval of Engineer-In-Charge.

5.41 SETTING OUT

The Contractor shall be responsible for the true and proper setting out of the "Works" and the correctness of the positions, levels, dimensions and alignment of all parts of the works and for the provision of all necessary instruments, appliances and labour in connection herewith. If at any time during the progress of the works any error shall appear or arise in the position levels, dimensions or alignment of any part of the works, the Contractor shall immediately notify the Nodal Officer or his nominee who will direct the Contractor in what way the work shall be carried out and the Contractor, on being required to do so by the Nodal Officer shall at his own expense rectify such error to the satisfaction of the Nodal

Officer or his nominee at any stage of the work or the checking of any setting out or any line or level by the Nodal Officer or his nominee shall not in any way relieve the Contractor of his obligations under the contract.

The Contractor shall carefully protect and preserve all benchmarks, site rails, pegs and other things used in setting out the works.

5.42 NOTICE OF ADDRESS

The Contractor shall notify in writing to the Nodal Officer an address at Kandla/Gandhidham/Adipur for the service on the Contractor any communication or any notice to be given to him under the Contract and any such notice/communication to the Contractor shall be deemed to be duly served if sent by registered post to or left at such address or if delivered to the agent or representative of the Contractor. Any notice/communication to the Contractors shall also be deemed to be duly served if sent by registered Post to or left at the principal place of business or if the Contractor be a company the registered office of the Contractor or at the contractors last known address.

5.43 It will be necessary of the contractor to provide insurance cover to his workers and his staff.

5.44 Sub-Soil Data

In the area covered by the Deendayal Port, the nature of sub-soil is indicated in relevant tender drawing for guidance only. The tenderer shall satisfy him of the character and volume of work under the items and expected surface and/or sub-soil water to be encountered. Contractor must satisfy himself about the general conditions of the site and ascertain the existing and future obstruction likely to come up during the execution of the contract to carry out the work.

5.45 PLANT

The contractor shall be responsible for the supply, use and maintenance of all construction plant and equipment and he shall ensure that it is suitable for the work and is maintained in such a manner as to ensure its efficient working. The Nodal Officer or his nominee may direct that plant which is not efficient and is prejudicial to the quality of the work be removed from the site and replaced by plant to his satisfaction.

5.46 QUALIFIED PERSONNEL

Fully qualified and experienced concrete quality control Engineers shall be employed by the Contractor and shall be available on site at all times when important work is taking place. Operators for mechanical vibrators, mixers and foreman in charge of placing of concrete shall be fully trained and experienced in their classes of work.

5.47 ALLOTMENT OF WORK SITE

1. SITE OF WORK

Site will be handed immediately after award of work. However, No claim / disputes whatsoever for any reason if site is not handing over for starting the work at time. If the contractor suffers any delay the Nodal Officer or his nominee may grant at his discretion an extension of time for completion of work. However, no claim / disputes etc. arising out of extension of time so granted shall be entertained. No claim regarding extra payment/escalation shall be allowed on account of such Extension. Hence, the contractor while filling up their rates in the tender should consider the above aspects unfailingly.

2. WORKING AREA

Area for setting up batching plant, pre-cast yard, laboratory, office, storage of steel and cement, reinforcement yard, etc. shall be provided if available with DPA. The area to be used with due care that no damage to be done to the existing structure. If any damage is done the contractor shall repair the portion in its original shape at his own cost.

Contractor has to make suitable platforms for stacking of materials and setting up of equipment. The necessary barricading, lights, sign boards and flags etc., wherever necessary has to be provided by the contractor.

3. HUTMENT AREA FOR LABOURS

Area for temporary hutments, canteens, crèche, etc. for labour shall be allotted free of cost. However, if any leveling/dressing as well as filling required in the said area, contractor has to carry out the same at his own cost. The necessary barricading, lights, sign boards and flags etc., wherever necessary has to be provided by the contractor, shall be in line with green building guidelines.

5.48 WATCHING & LIGHTING

The contractor shall in connection with the works, provide and maintain at his own expenses, all lights, guards, fencing and watching when and where necessary or as required by the Nodal Officer or his nominee or by any Competent Statutory or other authority for preparation of works or for the safety and convenience of the public or others.

5.49 ALLOTMENT OF SITE

The Nodal Officer will, after the issue of written order to Contractor to commence the work, give to the contractor possession of so much of the site as in the opinion of the Nodal Officer may be required to enable the contractor to commence and proceed with the construction of the works in accordance with the programme submitted by the contractor and stated from time to time as the proceed, give to the Contractor possession of such portions of the site as may, in the opinion of the Nodal Officer or his nominee, be required to enable the contractor to proceed with the construction of the works without interruption if the work in accordance with the said programme. Nodal Officer reserves the right to take back from

the contractor the portions of "Site" which, in the Nodal Officer's opinion, is considered unnecessary for the purpose of the "Works".

If the contractor suffers any delay from failure in accordance with the terms of this Clause, the Nodal Officer shall grant an extension of the time for completion of the work without financial repercussions on either side.

5.50 PROGRESS PHOTOGRAPHS

The contractor at his own cost shall supply to the Nodal Officer or his nominee two copies of color photographs of works in progress as directed by the Nodal Officer or his nominee from time to time. The negatives of the photographs shall become the property of the Port Authority. The photographs shall be half plate size. The photographs shall be mounted in albums and shall be suitably inscribed. Two albums shall be handed over to the Nodal Officer or his nominee. No prints of the negatives may be supplied to any person or persons without the permission of the Nodal Officer or his nominee.

5.51 AMENDMENTS

The Board may, from time to time, add to or amend the regulation and on any question regarding the application, interpretation or effect of these regulation the decision of the Chief Labour Commissioner or Deputy Chief Labour commissioner of the Government of India or any other person authorized by the Board in that behalf shall be final.

5.52 INFLAMMABLE STORES

The contractor is to comply with all local regulation in respect of safe storage of all inflammable stores, explosive or other materials involving risk to third parties and is to take all precautions required in the transport and use of such materials. The contractor is to submit to the Nodal Officer or his nominee for approval all drawings and documents required for the sanctioning of storage sheds or other accommodation and is to build all such storage to the proper requirement at his cost.

5.53 FIRE HAZARDS

The contractor shall be required to comply with the petroleum act 1934 and petroleum rules 1976 during progress of the construction work. If Fire watch services as required, shall be given free of cost but arrangement from Marine / Concerned Department shall have to be made by the Contractor.

5.54 DEFECT LIABILITY:

The defect liability period for the work is 24 months from the date of completion of work as per completion certificate issued by the Engineer in charge. The contractor will be responsible to rectify all the defects observed during defect liability period at his own cost, failing which same will be rectified by the Engineer in charge and amount will be recovered from the performance security.

5.55 All the labour acts, rules and regulations in force from time to time are to be followed by the contractor and the contractor has to obtain license/ Registration from the Assistant Labour Commissioner (C), as per rules, during the course of execution of work.

5.56 The prospective bidders may raise quarry relating to bidding conditions, bidding process, and / or rejection of bid. The reason for rejecting the tender or non-issue a tender to prospective bidder will be disclosed where written enquires are made by the concerned bidder.

5.57 The bidder has to execute Integrity pact arrangements with Deendayal Port Authority, Kandla (as per agreement form enclosed) Shri Amiya Kumar Mohapatra, IFoS (Retd.) and Dr. Gopal Dhawan, Ex-CMD, MECL, has been appointed as Independent External Monitor for Integrity, whose address is as under:

1. Shri Amiya Kumar Mohapatra, IFoS (Retd.)

Qrs. No. 5/9, Unit-9, Bhoi Nagar,
Bhubaneswar-751 022
Mobile no. 9437002530
Email: amiyaifs@gmail.com

2. Dr. Gopal Dhawan, Ex-CMD, MECL,

House no. 120, Jal Shakti Vihar (NHPC Society) P4, Builders area, Greater Noida Gautam Budh Nagar, **Utter Pradesh – 201 315**
Mobile no. – 8007771467
Email: gdhawangeologist@gmail.com

5.58 The potential bidders shall download and print the IP Agreement signed by the Employer and their witness and affix his/her signature on the IP Agreement in the presence of a witness from his/her side, who shall also affix his/her signature thereof. Having completed the signing procedure, the potential Bidder shall upload the duly filled and signed IP Agreement on n-procure portal.

The procedure mentioned above regarding signing of Integrity Pact Agreement by both the parties (Employer and Potential bidders) shall be completed online. However, in case of any technical glitch due to which if any potential bidder is unable to upload the IP Agreement, then he/ she shall submit the Hard Copy of the dully filled, signed IP Agreement, to the Department concerned of DPA within a period of seven days and prior to opening of the Technical Bid, failing which Bid of potential Bidder shall be treated as disqualified.

In case of JV firm, IP agreement is to be filled and submitted in the name of the JV firm only

otherwise the bid will not be considered for further evaluation.

5.59 Removal of rejected / substandard materials

- i. Whenever any material brought by the contractor to the site of work is rejected, entry thereof should invariably be made in the site order book under the signature of Assistant Engineer, giving the approximate quantity of such materials.
- ii. As soon as the material is removed, a certificate to that effect shall be recorded by the JE/AE against the original entry, giving the date of removal and mode of removal, including the registration No of the truck and a copy of gate pass wherever applicable.

5.60 EXTRA SUBSTITUTED AND DEVIATED ITEMS OF WORK.

Any changes in the contract are broadly classified as deviations. While No changes should be done with an intention to cause any undue benefit to the contractor but in the interest of the work for valid reasons or when situation so demands quantities of agreement items can be increased or decreased, extra items can be executed, agreement items can be substituted materials/ T & P which was not stipulated can be issued and period of completion can be extended for which necessary provisions and unambiguous procedure should be incorporated in the contract to regulate rates/ payments for such deviations.

- 5.61** On award of the contract, the contractor to whom the contract has been awarded has to provide at least 10 (Ten) bonded copies of Agreement including the Technical bid, Price bid and the correspondence exchange between the parties till the award of the work. One full set including indexing, insertion of page nos. certification with index will be provided by the Department. The cost of above ten sets is to be borne by the contractor.

- 5.62** Contractor/service provider/supplier etc. has to ensure timely and proper filling of GSTR1 so that Deendayal Port Authority can avail input tax credit in timely manner. In case DPA not allowed input tax credit due to failure on part of the contractor/service provider/supplier etc., it will be a financial loss to the DPA and therefore same shall be recovered from the payment/deposit of the contractor/service provider/supplier.

5.63 Special Conditions for Environmental Protection

1. The Contractor shall strictly follow-up the Environmental rules as per the Environmental Protection Act 2022. While execution of work and as directed by Engineer in Charge.
2. All the Construction materials e.g. Cement, Aggregates, sand, structural steel & fill materials which are to be used in construction work shall be covered with Tarpaulin or other fabric material as directed by Engineer in Charge.
3. The contractor should stack and dispose the waste material in such a manner which is not destroying the environment.
4. The contractor shall sprinkle the water to minimize the dust emission.
5. Machine mixers, vibrators, way batcher's plant, diesel generator sets and other vehicles engines shall not be left running when not in use.
6. Emission of NO₂ and SO₂ shall be maintained within the work site area as per the International Regulations (MARPOL).
7. To prevent the minimize vibration and noise from machineries / vehicles during construction activities the contractor shall take the remedial action to minimize noise pollution as under: -
 - (i) Provide adequate silencers attached with all vehicles and machineries.
 - (ii) Install suitable mufflers on engine exhaust and compressor component.
 - (iii) The diesel generators set shall be used of noise less.
8. The contractor shall provide the barrier to prevent the construction material from mixing up with surface / ground water.
9. The contractor (s) should discharge Waste water generated during Construction work as per CPCB/GPCB regulations.
10. All the best construction practices as stipulated in additional conditions of contract for green

building certification must be followed in addition to what is specified above.

5.64 The contractor shall engage at his own cost for consultant for the work having requisite experience of Government or Semi-Government organization, shall also have experience of min 5 project completed in BIM and 5 Projects completed with Green Building certification/Precertification out of which min 4 projects with Gold/4-Star rating and min 1 with Platinum/5-star rating. The consultant has to carry out the work on round the clock basis and shall certify all requirement and tests as required under relevant IS or/and Codes. However, available services of DPA civil laboratory at Kandla can be availed at prescribed rates, if desired. The consultant shall be engaged by contractor at his own cost with prior approval of the Engineer-in-charge.

- 1) The consultant has to get approval of drawings from the local development authority i.e. Gandhidham Development Authority (GDA) or necessary statutory permission from relevant organization. DPA will assist for getting approval, if needed and statutory charges for approval will be borne by the port. All the expenses (other than statutory charges) will be borne by the contractor.
- 2) The changes or modification if such required during later stage which affects/change/modify the design intent shall be done in consultation with concept architect and DPA.
- 3) Consultant shall develop detailed Architectural drawings, structural drawings, services layout drawing as per design, 3D walk through (External covering all the building for minimum 3 minutes and internal covering furniture layout and finishes for minimum 3 minutes).

The scope is not limited to but also includes: -

- i. To prepare structural designs, drawings for the building, and approval thereof from Competent Authority.
 - ii. Necessary Working Drawings for Civil, Architectural, Structural, Interior, Furniture, Sanitary & Water supply system, Fire Fighting system, Land-Scaping, facade, Compound wall, grills, entrance gates, Development of surrounding area, Complete Electrification with CCTV Camera, Electrical and Air-Conditioning etc. are to be Supplied According to the Progress of the Construction Works and suggesting min 3 options of Colour Schemes with material.
 - iii. To prepare and review architectural / construction drawings including plan, elevation and cross section, blown up/part details of parts of buildings i.e. toilets, staircase, flooring, ceiling etc. as required to meet design intent.
 - iv. To prepare Phase-Wise Architectural & Structural detailed drawings and Working Drawings in Proper Scale as Necessary for Construction including plans, elevation, cross section etc.
 - v. Necessary Design, suggestions and Drawings for facility of solar to generates electricity in future development.
 - vi. To provide additional copies of drawings as and when required.
 - vii. All Designing as per norms of considering earthquake zone.
 - viii. Preparation and getting approval of the As-built Drawings from the competent Authority if some minor modifications are made during the construction works in accordance with the Building Rules.
 - ix. To furnish completion plan of the building including all services on completion of the project along with a complete set of design calculations and structural drawings to form a permanent record for DPA.
- 4) Consultant has to prepare and submit the PERT CHART/ GANTT bar chart/other such documents for monitoring the Project, Quality assurance plan, inspection & testing as per BOQ of work.
 - 5) The scope of work of consultant shall be till the complete execution of the Structure and interior work in all respect and getting approval of Build Drawings from competent authority.
 - 6) The consultant should advise to DPA & prepare report to achieve NET Zero Energy & Net zero Discharge campus.
 - 7) The BIM model for entire campus shall be prepared by consultant as specified in tender.
 - 8) **Green Building:**

- I. The design/drawings/documents should be prepared to Target highest rating through IGBC/GRIHA i.e. Platinum/5 star.
 - II. Analysis and suggest improvement/ corrections in the MEP/ Other relevant drawings/ documents and draft tender of the subject work for highest rating.
 - III. Preparation, submission & uploading all the documents in accordance with requirements, Documentation shall be supported by drawings, test results, equipment catalogues & calculations.
 - IV. To facilitate the planning team for selection of appropriate energy efficient & eco- friendly technologies, equipment & materials for the building e.g. lighting system, white goods, water treatment technologies, renewable energy, nontoxic paints, rapidly renewable materials, recycled materials, ecofriendly materials etc.
 - V. Preparation of vendors & suppliers list for inclusion in the tender & working out specifications of equipment & materials to suit the GRIHA/IGBC requirement.
 - VI. Develop templates for GRIHA/IGBC calculations to achieve certain points, this includes materials related criteria, construction of waste management at site, energy calculation etc.
 - VII. Conduct Solar Path Analysis for each fenestration to achieve the best design. (Shading device, Orientation etc.).
 - VIII. Perform Day light analysis to ensure optimum condition achieved as per the guidelines provided by ECBC 2017 & GRIHA/IGBC rating system.
 - IX. Perform shading Analysis for window-wall ratio, Glass properties (SHGC) & providing recommendations to meet the compliance of ECBC 2007.
 - X. Perform hourly calculations to show that thermal comfort conditions for conditioned as well as non-conditioned area are achieved.
 - XI. Perform Energy Simulation to predict the energy performance of energy system in the bldg. is less than the benchmarked energy performance as prescribed by GRIHA/IGBC/ISHRAE.
 - XII. Submit ECBC Compliance document to show that compliance of mandatory requirement of ECBC are meet.
 - XIII. Liaoning and coordinating with GRIHA/IGBC team for registration of Project, uploading relevant documents, responding to queries, observations, modifications and corrections given by GRIHA team within specified time framed and reporting client with latest update.
 - XIV. Acquiring of FINAL POST GRIHA/IGBC Rating certification approval including changes in drawings / design during execution of work.
 - XV. Assist client in finalizing the vendor/procurement of material in line with targeted Rating
 - XVI. All the registration/certification/audit/verification fee to be paid to certifying agency or their representatives shall be borne by contractor.
- 9) The consultant shall obtain necessary proof check for the detailed structural design and drawings for the work through IIT and getting vetted from Engineer-in-charge before issue Good for construction drawing at his own cost. All the expenses incurred by the consultant for various activities will be borne by the contractor.
 - 10) Consultant has to carried out soil investigation & Soil Testing Report for proposed location, for designing purpose without any extra cost.
 - 11) The consultant will supervise the construction work at periodical intervals and as and when required, in order to ascertain that the works are carried out generally in accordance with the drawings and specifications.
 - 12) The Authorized Technical Representative of consultant (Architect/Engineer) may approve and certify the quality, standard and specification of the materials supplied.
 - 13) To Coordinate the activities of various works as consultant with the site Engineers, advising the employer for implication for the deviations, materials if any etc.
 - 14) Deploy a full-time 2 nos. qualified Site Engineers (Graduate in Civil Engineering and having minimum 5 years of field experience) for supervision of construction work to maintaining the quality of the work as per provision of relevant IS codes and specifications of work & to provide necessary guidance as required for smooth execution of the work as the cost of the Consultant, additionally A graduate electrical engineer with minimum 5 years of experience in building projects, a qualified green building expert (IGBC-AP/GRIHA-CP/LEED-AP/EDGE-Expert) and ELV Expert/system integrators with an ITIL certification and a minimum of 10 years of experience shall be visiting the site on

monthly basis or as & when required. The CVs for all the staff that contractor/consultant wish to deploy on site shall be approved from engineer – in -charge.

- 15) Prepare and submit completion reports and drawings for the project as required and assist the Client in obtaining "Completion/ Occupancy Certificate" from statutory authorities, wherever required.
- 16) Certification of completion and assisting in obtaining occupancy certificate in all respect.
- 17) Consultant has to associate and discuss with port officers from time to time and takes in to account comments, suggestions of Engineer in charge.
- 18) Consultant shall take all measure to expedite the work as and when necessary, propose alternate methods and solutions to any technical problem that may arise during execution of work.
- 19) Consultant shall detail out the construction method and sequence of construction during construction stage.
- 20) Consultant should periodically (weekly) inspect the work to ensure proper interpretation of the detail drawings prepared by them and execution of work. Also, from time to time submit a report to the client.
- 21) Get approval of working drawing in time from Competent / applicable authorities, so that the execution of work should not delayed.
- 22) Co-ordinate and discuss with clients & contractor from time to time before finalization of working / alternative drawings.
- 23) Preparation of structural drawing / Architectural drawings should also ensure minimum variation in the quantity of accepted Tender.
- 24) Preparation of structural and architectural drawings should ensure no change in specification of material consider in accepted tender.
- 25) Before start work Consultant has to submit the detailed schedule and submit all drawings to DPA for approval. The DPA will examine from all aspects including schedule approved by DPA in execution of work and site its approval. The Consultant shall strictly adhere to the approved schedule and drawings.
- 26) In the event if contractor in execution of work fails to adhere to project schedule and complete construction work on specified mile stone date the Consultant shall undertake review of project construction and identified potential delay if any. If Consultant shall determine that completion of project is not feasible with time specified in Tender or execution of work it shall require that the consultant indicate within seven days the steps propose to be taken to expedite the progress and the period within which the project shall be completed.
- 27) If suspension of Construction work is for reasons not attributed to execution contractor, the Consultant shall determine the extension of time or completion to which the contractor executing the work is reasonably entitled and notify to DPA.

- 5.65 Special Conditions for Tender Documents: The all required documents for preliminary & Technical bids as per tender and other documents which are going to be submitted in physical form should be upload on (n)procure site while bidding in same sequence with index.
- 5.66 The contractor shall be registered under the building and other constructions workers (Regulation of employment and conditions of Services) Act, 1996.
- 5.67 The payment from 2nd bill to pre-final bill, shall be released, subject to the condition that the documentary evidence (copy of paid challan in Govt. Treasury) of the welfare Cess @1% of the work done or as amended by Statutory Authority from time to time, paid to concerned authority is submitted for the previous bill.
- 5.68 The documentary evidence (copy of paid challan in Govt. Treasury) of Welfare Cess @ 1% of work done or as amended by Statutory Authority from time to time, paid to concerned authority is submitted before releasing the performance Guarantee.
- 5.69 Payment to labors is to be made in accordance with latest CLC circular released from time to time failing which appropriate action will be taken against the prospective bidder by the tender issuing authority.
- 5.70 Contractor shall provide office with all furniture, new Two computers/laptop with printer and stationery with two office assistance personal minimum graduate knowing computer in the help of DPA official for the construction period of contract.
- 5.71 Bids shall remain valid for a period of 120 days from the date of opening of Preliminary bid of tender. A bid valid for a shorter period shall be rejected by the Employer as non-responsive. In exceptional circumstances, prior the expiry of the original time limit, the Employer may request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' response shall be made in writing

or by e-mail. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be permitted to modify his bid.

5.72 Third Party Inspection (TPI) Clause:

DPA engaged the Third Party Inspection Agency for quality assurance separately. The contractor has to co-operate with the Third Part Inspection Agency representative in his duties related to this work. The execution of work shall be subject to third party inspection by the agency engaged by DPA. The contractor is required to comply the observations queries of the agency and any cost incurred for this purpose shall be the responsibility of the contractor.

- 5.73 The defect liability period for the subject work is 24 months. However, the contractor shall be responsible for maintenance of the asset during defect liability period as per standard practices which includes regular inspections, routine unkeep, repairs and renovations to ensure the building remains in good condition and serves its intended purpose at his own cost, failing which same will be rectified by the Engineer in charge and amount will be recovered from the performance security.

B. SPECIFICATIONS

5.74 Scope of work:

The work to be performed under the scope of this specification shall broadly include:

- I. Construction of Pre-Engineered fabricated (PEB) Center of Excellence building having dry-wall, interior facilities, plumbing, electrical services, Audio visuals, acoustical services etc. including internal road, landscaping with all allied facilities etc.
- II. Proposed building needs to follow the green building norms as per IGBC/GRIHA and target to achieve highest rating.

The above work will be carried-out under the contract scope. Further, if required, the items mentioned in the BOQ shall also be executed in the Gandhidham/Port area at any location as per the directions of the EIC during the entire contract period.

5.75 Reference Codes, Standards & Specifications

The latest edition of the following Codes, Standards & Specifications shall applicable.

Codes & Standards

IS 383	Coarse and Fine Aggregate for Concrete - Specification				
IS 455	Portland Slag Cement - Specification				
IS 456	Plain and Reinforced Concrete - Code of Practice				
IS 516: Part 1	Hardened Concrete - Methods of Test Part 1 Determination of strength of hardened concrete				
IS 516 Part 2: Sec 1	Hardened Concrete - Methods of Test Part 2 Properties of Hardened Concrete other than Strength Section 1 Density of Hardened Concrete and Depth of Water Penetration Under Pressure				
IS 516 Part 2: Sec 2	Hardened Concrete - Methods of Test Part 2 Properties of Hardened Concrete other than Strength Section 2 Initial surface absorption				
IS 516: Part 3	Hardened Concrete - Methods of Test Part 3 Making, curing and determining compressive strength of accelerated cured concrete test specimens				
IS 516: Part 4	Hardened Concrete - Methods of preparing and testing of concrete cores	Test	Part	4	Sampling,
IS 516 Part 5: Sec 1	Hardened Concrete - Methods of Test Part 5 Non-destructive Testing of Concrete Section 1 Ultrasonic Pulse Velocity Testing				
IS 516: Part 6	Hardened Concrete - Methods of Test Part 6 Determination of Drying Shrinkage and Moisture Movement of Concrete Samples				
IS 516: Part 7	Hardened Concrete - Methods of Test Part 7 Determination of creep of concrete cylinders in compression				
IS 516: Part 8	Hardened Concrete - Methods of Test Part 8 Determination of modulus of elasticity in compression				

IS 516: Part 9	Hardened Concrete - Methods of Test Part 9 Determination of wear resistance
IS 516: Part 10	Hardened Concrete - Methods of Test Part 10 Determination of bond in reinforced concrete
IS 516: Part 11	Hardened Concrete. - Methods of Test Part 11 Determination of Portland Cement Content of Hardened Hydraulic Cement Concrete
IS 516: Part 12	Hardened Concrete - Methods of Test Part 12 Determination of water soluble and acid soluble chlorides in hardened mortar and concrete
IS 1199: Part 1	Fresh Concrete - Methods of Sampling, Testing and Analysis Part 1 Sampling of Fresh Concrete
IS 1199: Part 2	Fresh Concrete - Methods of Sampling, Testing and Analysis Part 2 Determination of Consistency of Fresh Concrete
IS 1199: Part 3	Fresh Concrete - Methods of Sampling, Testing and Analysis Part 3 Determination of Density of Fresh Concrete
IS 1199: Part 4	Fresh Concrete - Methods of Sampling, Testing and Analysis Part 4 Determination of Air Content of Fresh Concrete
IS 1199: Part 5	Fresh Concrete - Methods of Sampling, Testing and Analysis Part 5 Making and Curing of Test Specimens
IS 1199: Part 6	Fresh Concrete - Methods of Sampling, Testing and Analysis Part 6 Tests on Fresh Self Compacting Concrete
IS 1199: Part 7	Fresh Concrete - Methods of Sampling, Testing and Analysis Part 7 Determination of Setting Time of Concrete by Penetration Resistance
IS 1199: Part 8	Fresh Concrete - Methods of Sampling, Testing and Analysis Part 8 Determination of water soluble and acid soluble chlorides in mortar and concrete
IS 1199: Part 9	Fresh Concrete - Methods of Sampling, Testing and Analysis Part 9 Analysis of freshly mixed concrete
IS 1566	Hard-drawn Steel Wire Fabric For Concrete Reinforcement
IS 1786	High strength deformed steel bars and wires for concrete reinforcement
IS 1791	General Requirements for Batch Type Concrete Mixers
IS 1834	Hot Applied Sealing Compounds for Joints in Concrete-Specification
IS 1838: Part 1	Preformed fillers for expansion joint in concrete pavement and structures (non extruding and resilient type): Part 1 Bitumen impregnated fibre - Specification
IS 1838: Part 3	Preformed Fillers for Expansion Joints in Concrete Pavements and Structures(non-extruding and resilient type) Part 3 Polymer Based

IS 2386: Part 1	Methods of Test for Aggregates for Concrete - Part I : Particle Size and Shape
IS 2386: Part 2	Methods of test for aggregates for concrete Part 2 Estimation of deleterious materials and organic impurities
IS 2386: Part 3	Methods of test for aggregates for concrete Part 3 Specific gravity, density, voids, absorption and bulking
IS 2386: Part 4	Methods of test for aggregates for concrete Part 4 Mechanical properties
IS 2386: Part 5	Methods of Test for Aggregates for Concrete – Part V :Soundness
IS 2386: Part 6	Methods of test for aggregates for concrete : Part 6 Measuring mortar making properties of fine aggregates
IS 2386: Part 7	Methods of Test for Aggregates for Concrete – Part VII : Alkali Aggregate Reactivity
IS 2502	Code of Practice for Bending and Fixing of Bars for Concrete Reinforcement
IS 2505	Concrete vibrators - Immersion type - General requirements
IS 2506	General requirements for screed board concrete vibrators
IS 2514	Specification for concrete vibrating tables
IS 2750	Steel Scaffoldings
IS 2751	Code of Practice for Welding of Mild Steel Plain and Deformed Bars for Reinforced Concrete Construction
IS 3414	Code of Practice for Design and Installation of Joints in Buildings
IS 3370: Part 1	Code of practice Concrete structures for the storage of liquids

	Part 1 General requirements
IS 3370: Part 2	Code of Practice Concrete structures for the storage of liquids Part 2 Reinforced concrete structures
IS 3370: Part 4	Code of practice for concrete structures for the storage of liquids: Part 4 Design tables
IS 3384	Bitumen primer for use in waterproofing and damp-proofing
IS 4014: Part 1	Code of practice for steel tubular scaffolding Part 1 Definitions and materials
IS 4014: Part 2	Steel Tubular Scaffolding - Code of Practice Part 2 : Safety Provisions for Scaffolding
IS 4925	Concrete Batching and Mixing Plant
IS 4926	Code of Practice Ready-Mixed Concrete
IS 4990	Plywood for concrete shuttering work - Specification
IS 6313: Part 1	Code of practice for anti-termite measures in buildings: Part 1 Constructional measures
IS 6313: Part 2	Code of Practice for Anti-Termite Measures in Buildings - Part 2 :Pre-Constructional Chemical Treatment Measures
IS 6313: Part 3	Code of Practice for Anti-termite Measures in Buildings - Part 3 Treatment for Existing Buildings
IS 6461	Glossary of terms relating to cement concrete
IS 6509	Code of practice for installation of joints in concrete pavements
IS 8944	Chlorpyrifos Emulsifiable Concentrates
IS 9013	Method of making, curing and determining compressive strength of accelerated cured concrete test specimens
IS 9103	Specification for Concrete Admixtures
IS 10262	Concrete Mix Proportioning - Guidelines
IS 11433: Part 1	Specification for one part gun-grade polysulphide- based joints sealants Part 1 General requirements
IS 11433: Part 2	Specification for one part gun-grade polysulphide- based joint sealants: Part 2 Methods of test
IS 11817	Classification of Joints in Buildings for Accommodation of Dimensional Deviations During Construction

IS 12118: Part 1	Two-part Polysulphide- Based Sealants – Specification Part 1General Requirements
IS 12118: Part 2	Two Parts Polysulphide Based Sealants – Specification Part 2Methods of Test
IS 12119	General Requirements for Pan Mixers for Concrete
IS 13311: Part 2	Method of Non-destructive Testing of Concrete-methods of Test :Part 2 Rebound Hammer
IS 13620	Fusion Bonded Epoxy Coated Reinforcing Bars
IS 14959: Part 2	Method of Test determination of water soluble and acid soluble chlorides in mortar and concrete Part 2 : Hardened mortar and concrete
IS 14687	Guidelines for false work for concrete structures
IS 16131	Imidacloprid Suspension Concentrate (SC) - Specification
IS 16172	Reinforcement Couplers for Mechanical Splices of Bars in Concrete - Specification
National Ready Mixed Concrete Association (NRMCA)	Certification of Ready Mixed Concrete Production Facilities(Checklist with Instructions)
SP 23	Handbook on Concrete Mixes

5.76 Basic Material Requirements

- a) Concrete, mainly comprising a mixture of hydraulic Portland cement and graded aggregates (coarse & fine), is formed by chemical reaction (called hydration) when mixed with appropriate amount of water to achieve its strength and other properties. Some other additives and admixtures as required are also added to improve its performance and special characteristics.
- b) Proper selection of basic materials like cements, aggregates, water, reinforcements, admixtures are essential as per their inherent compositions and chemical properties to produce high performing, durable concrete, which shall be best suited to the construction / design conditions and the environmental applications and shall comply with the requirements specified in this specification.
- c) Sulphate resisting Portland cement shall be used only for specific requirements depending on environmental and process exposure conditions to which the structures may be subjected to like high sulphate concentrations, processes involving sulphur handling.
- d) Fibres may be added to concrete with prior approval from DPA for special applications to enhance properties, for which specialist literature may be referred to.

5.77 Construction Requirements

- a) The Contractor shall provide all basic materials like equipment, tools and experienced manpower necessary for carrying out the concrete work.
- b) All equipment, tools and machines to be used by the Contractor for the proper

execution of the work shall be subject to DPA approval and shall be maintained in good condition till the completion of the work.

5.78 Concrete Requirements

A. Concrete Grades

Concrete shall be designated by the grades. Characteristic Compressive strength for different grades of concrete shall be as per **Table-1**:

Table-1: Grades of Concrete

Sl. No.	Group	Grade	Specified Characteristic Compressive Strength of 150 mm cube at 28 days in N/mm ²	Suggested Applications
1.	Ordinary Concrete	M10	10	Filling & mass concrete, Screed & Plain Cement Concrete under foundations or any other applications decided by DPA.
2.		M15	15	
3.		M20	20	Plain Cement Concrete under masonry walls, Damp-Proof Courses, levelling concrete, dense fire proofing & Trapezoidal Drain lining or any other applications decided by DPA.
4.	Standard Concrete	M25	25	Pavement in non-vehicular movement area, Reinforced concrete Electrical & Instrumentation road crossings, Slopes Protection or any other applications decided by DPA.
5.		M30	30	All structural concrete like liquid retaining

Table-1: Grades of Concrete

Sl. No.	Group	Grade	Specified Characteristic Compressive Strength of 150 mm cube at 28 days in N/mm ²	Suggested Applications
				structure, retaining walls, grade floors, Slabs, Walls, columns, foundations, Dykes, Equipment Foundations, Pipe Sleepers, Pile & Pile Caps, underground structures, Trench & Drains, Manholes & Pavement in vehicular movement area or any other applications decided by DPA.
6.		M35	35	Pre-cast Concrete or any other applications decided by DPA
7.		M40	40	

Notes:

- a) The characteristic strength is defined as the strength of material below which not more than 5 % of the test results are expected to fall.
- b) In the designation of concrete mix M refers to the mix and the number to the specified compressive strength of 150 mm size cube at 28 days, expressed in N/mm².
- c) For concrete of compressive strength greater than M60, design parameters given in the standard may not be applicable and the values may be obtained from specialized literatures and experimental results.

B. Properties of Concrete

Properties of concrete such as increase of strength with age, tensile strength of concrete, elastic deformation, shrinkage, creep of concrete, thermal expansion shall be in accordance with IS 456.

C. Workability of Concrete

- a) Concrete mix shall be made with appropriate quantity of water to achieve workability, consistency and plasticity, so that it has the proper slump for ease of conveying, handling, placing and compacting without segregation.
- b) The concrete mix proportions chosen should be such that the concrete is of adequate workability for the placing conditions of the concrete and can properly be compacted with the means available. Recommended ranges of workability as per **Table-2** which are measured in accordance with IS 1199.

Table-2: Recommended Workability of Concrete for Various Types of Construction

Sl. No.	Placing Conditions	Degree of Workability	Slump (mm)
1	Blinding concrete; Shallow sections; Pavements using pavers.	Very Low	Refer Note-b
2	Mass concrete; Lightly reinforced sections in slabs, beams, walls, columns; Floors; Hand placed pavements; Canal lining; Strip footings.	Low	25 - 75
3	Heavily reinforced sections in slabs, beams, walls, columns; Slipform work; Pumped concrete.	Medium Medium	50 - 100 75 - 100
4	Trench fill; In situ piling	High	100 - 150
5	Tremie concrete	Very High	Refer Note-c

Notes:

- a) For most of the placing conditions, internal vibrators (needle vibrators) are suitable. The diameter of the needle shall be determined based on the density and spacing of reinforcement bars and thickness of sections. For tremie concrete, vibrators are not required to be used.
- b) In the “very low” category of workability where strict control is necessary, for example pavement & floorings concrete, measurement of workability by determination of compacting factor will be more appropriate than slump and a value of compacting factor of 0.75 to 0.80 is acceptable.
- c) In the “very high” category of workability, measurement of workability by determination of flow will be appropriate as per IS 9103.
- d) The slump of concrete mixes shall be measured by the Contractor’s Quality Control Engineer in the presence of DPA.

D. Initial Setting Time

- a) Concrete mix for ease of handling shall have the initial setting time not less than one (1) hour between the time it is produced and placed in the form work. Normally with a maximum time not exceeding one (1) hour between mixing and placing, the total time from the mixing to the initial set in the mix shall be minimum two (2) hours, but shall not exceed six (6) hours maximum and same shall be checked for site conditions during all season.
- b) However when the concrete workability is also tested from the trial mixes, the initial setting time of concrete comprising the same proportions of mineral admixtures (if any) with retarding super plasticizer as selected and applied, shall be determined in accordance with IS 1199: Part 7. at the maximum temperature in concrete during placement.

E. TYPE OF CONCRETE MIX

Unless otherwise noted on construction drawings, all lean / plain and reinforced concrete shall be nominal mix and design mix types, respectively.

a) Nominal Mix Concrete

Nominal mix concrete may be used for concrete of M20 or lower. The proportions of materials for nominal mix concrete shall be in accordance with Table-9 of IS 456.

b) Design Mixes for Blinding Concrete

The trial mix proportions for this concrete shall be left to the discretion of the Contractor. However, DPA may direct the contractor to carry out test whenever required. When they are selected, three (3) test mixes shall be made separately with these proportions and three (3) 150 mm test cubes shall be prepared from each mix for testing at 28 days. The trial mix proportions and water cement ratio shall be approved, if the average strength of the nine (9) cubes is not less than the specified characteristic strength.

c) Design Mixes for Structural Concrete**General**

- a) The Contractor shall prepare the design mixes as per IS 10262 & SP 23 to produce the grade of concrete having the required workability and characteristic strength not less than appropriate values given in **Table-1**. The target mean strength of concrete mix shall be equal to the characteristic strength plus 1.65 times the standard deviation.

- b) As long as the quality of materials does not change, a mix design done earlier but not prior to one year may be considered adequate for later work. However, in case the quality of materials changes or there is a break in the continuity of construction and the same work is allocated to a new contractor, the contractor to provide a new design mix.
- c) Irrespective of the grade of concrete required to be produced as per characteristic strength criteria, the minimum cement content and maximum free water cement ratio in the design concrete shall be strictly maintained as stipulated in **Table-3** for the corresponding grade of concrete.
- d) Several trial batches shall be made by varying the relative amounts of fine & coarse aggregates, cement contents or maximum water cement ratio, aggregates grading as well as desired slump to achieve right kind of workability and design strengths of the specified concrete grades. If dense impermeable concrete is required to resist adequately the ingress of harmful salts, the approved retarding super plasticizer shall be used in the trial mixes.
- e) Test concrete mixes shall be produced by the Contractor, when the trial mixes have established the proposed workability and the required proportions and quantities of the aggregates per cubic metre (m^3) with admixtures (if used) for each grade of concrete, which shall then be tested as follows:
 - i) Five (5) test mixes shall be prepared separately and six (6) test cubes shall be made from each test mix for each grade of concrete in presence of DPA Representatives. The test cubes shall be made, cured and tested.
 - ii) Thirty (30) cubes of each grade of concrete shall be tested for crushing strength at 28 days and the mean strength, standard deviation shall be established for each grade.

Standard Deviation

The standard deviation for each grade of concrete shall be calculated, separately.

- a) Standard deviation based on test strength of samples:
 - i) Number of test results of samples - The total number of test strength of samples required to constitute an acceptable record for calculation of standard deviation shall be not less than 30. Attempts should be made to obtain the 30 samples, as early as possible, when a mix is used for the first time.
 - ii) In case of significant changes in concrete - When significant changes are made in the production of concrete batches (for example changes in the materials used, mix design, equipment or technical control), the standard deviation value shall be separately calculated for such batches of concrete.
 - iii) Standard deviation to be brought up to date - The calculation of the standard deviation shall be brought up to date after every change of mix design.
- b) Assumed standard deviation

Where sufficient test results for a particular grade of concrete are not available, the value of standard deviation given in **Table-8** of IS 456 may be assumed for design of mix in the first instance. As soon as the results of samples are available, actual calculated standard deviation shall be used and the mix designed properly.

F. Concrete Mix Proportioning

General

- a) Proportioning, as used in this specification, shall mean the process of determining the proportions of the various ingredients to be used to produce concrete of the required workability when fresh / green and strength, durability and surface finish, when hardened. In specifying a particular grade of concrete, the following information shall be included:
- a) Type of mix, that is, design mix concrete or nominal mix concrete.
 - b) Grade designation.
 - c) Type of cement.
 - d) Maximum nominal size of aggregate.
 - e) Minimum cement content (for design mix concrete).
 - f) Maximum free water cement ratio.
 - g) Workability.
 - h) Mix proportion (for nominal mix concrete).
 - i) Exposure condition as per IS 456.
 - j) Maximum temperature of concrete at the time of placing.
 - k) Method of Placing.
 - l) Degree of supervision.
- b) Before using the concrete, Contractor shall get approval from DPA regarding the strength of the concrete design mix. However, this does not absolve the Contractor of his responsibility as regards achieving the prescribed strength of the mix. If during the execution of the work, cube tests show lower strengths than required than new fresh trial mixes shall be made by the Contractor and same shall be reviewed and approved by DPA. No claim to alter the rates of concrete work shall be entertained due to such changes in mix variations. Any variation in cement consumption shall be taken into consideration for material reconciliation. Preliminary mix designs shall be established well ahead of start of work.

Maximum Density

Suitable proportions of sand and the different sizes of coarse aggregates for each grade of concrete shall be selected to give as nearly as practicable the maximum density. This shall be determined by mathematical means, laboratory tests, field trials and suitable changes in aggregate gradation. The contractor shall submit to the DPA at least three sets of mix design and corresponding test results after varying the mix proportions and grading of aggregate so as to establish the maximum density of any particular grade of concrete.

Consistency

The concrete shall have a consistency such that it shall be workable in the required position and when properly vibrated it flows around reinforcing steel and all embedded fixtures.

Durability of Concrete

For achieving sufficiently durable concrete, strong, dense aggregates, low water-cement ratio and adequate cement content shall always be used. Workability of concrete shall be such that concrete can be completely compacted with the means available. Leak-proof formwork shall be used so as to ensure no loss of cement-slurry during pouring and compaction. Cover to reinforcement shall be uniform and as shown on construction drawings. Concrete mix design shall always take into account the type of cement, minimum cement content irrespective of the type of cement and maximum free

water cement ratio and minimum grade of concrete conforming to the exposure conditions as mentioned in Table-3.

Table-3: Minimum Cement Content, Max. Water Cement Ratio and Min. Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

Exposure	Plain Cement Concrete			Reinforced Cement Concrete		
	Minimum Cement Content (Kg/m ³)	Maximum Free Water Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content (Kg/m ³)	Maximum Free Water Cement Ratio	Minimum Grade of Concrete
Mild	220	0.60	-	300	0.55	M20
Moderate	240	0.60	M15	300	0.50	M25
Severe	250	0.50	M20	320	0.45	M30
Very Severe	260	0.45	M20	340	0.45	M35
Extreme	280	0.40	M25	360	0.40	M40

Free Water Cement Ratio

- Once a mix, including its free water cement ratio, has been determined and approved for use by the DPA, that free water cement ratio shall be maintained. The Contractor shall determine the water content of the aggregates frequently as the work progresses, and the amount of mixing water shall be adjusted so as to maintain the approved free water cement ratio. Maximum free water-cement ratio shall be as per **Table-3** for different exposure condition.
- The minimum cement content as mentioned in **Table-3** shall be adjusted for aggregates other than 20 mm nominal maximum size. The minimum cement content in the concrete mix shall be increased by 40 kg/m³ and decreased by 30 kg/m³ for 10 mm and 40 mm nominal maximum size aggregates respectively. For maximum cement content refer IS 456.
- Water cement ratio shall be continuously checked at the mixer with due allowance being made for water (if any) contained in the aggregates. Under no circumstances, additional water shall be added between the mixing and the time of concrete placement. The Contractor may be asked by DPA representative to carry out further tests for water cement ratio on fresh concrete samples taken at the time of placement.

Limits to Deleterious Constituents

Careful selection of the mix and the constituent materials shall be made to limit the presence of deleterious constituents in concrete. The total water soluble sulphate content of the concrete mix shall not exceed 4 percent by mass of the cement in the mix. The total acid soluble chloride content as well as other deleterious constituents in the concrete mix as per IS 456.

G. Formwork

General

Formwork shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall have sufficient rigidity to maintain the tolerances specified in clause Table -6 of this specification.

Form work and its supports shall maintain their correct position and be to correct shape and profile so that the final concrete structure is within the tolerances on the shapes, lines and dimensions shown in the construction drawing shall be within the limits specified below, unless required otherwise, for functional / aesthetic reasons. The decision of the DPA shall be final and binding in this regard.

- | | | |
|----|--|---|
| a) | Deviation from specified dimensions of cross section of columns and beams. | +10 mm
-5.0. mm |
| b) | Deviation from dimensions of footings (These tolerances apply to Cast-in-situ concrete dimensions only, not to positioning of vertical reinforcing steel or dowels.) | |
| | a) Dimensions in plan | +50 mm
-10.0. mm |
| | b) Eccentricity | 0.02 times the width of the footing in the direction of deviation but not more than 50 mm |
| | c) Thickness | ± 0.05 times the specified thickness, whichever is less. |
| c) | Deviation in length (major dimension of single unit) | |
| | Up to 3.0 m | ± 6.0 mm |
| | 3.0 m to 4.5 m | ± 9.0 mm |
| | 4.5 m to 6.0 m | ± 12.0 mm |
| | Additional deviation for every subsequent 6.0 m. | ± 6.0 mm |
| d) | Deviation in straightness or bow (deviation from specified line) for a single or continuous member) e.g. beam, column or slab edge. | |
| | Up to 3.0 m | 6.0 mm |
| | 3.0 m to 6.0 m | 9.0 mm |
| | 6.0 m to 12.0 m | -12.0 mm |
| | Additional for every subsequent 6.0 m. | -6.0 mm |
| e) | Deviation in squareness shall be measured taking the longer of two adjacent sides as the base line. | |

The shorter side shall not vary in its distance from a perpendicular so that the difference between the greatest and shortest dimensions exceeds 6mm. For this purpose, any error due to lack of straightness shall be ignored. Squareness shall be checked with respect to the straight lines that are most nearly parallel with the features being checked. When the nominal angle is other than 90 degree, the included angle between check lines shall be varied accordingly.

- f) Deviation in twist shall be within a limit such that any corner shall not be more than the limit given below from the plane containing other three corners:
- | | |
|--|---------|
| up to 600mm wide and up to 6.0 m in length | 6.0 mm |
| over 600mm wide and for any length | 12.0 mm |
- g) Maximum deviation in flatness from a 1.5 m straight edge placed in any position on a nominally plain surface shall not exceed 6.0 mm.

Material

Formwork shall be constructed of new timber or plywood of sound quality without any fissures and cracks or steel framing and shall be lined with either minimum 12 mm thick new plywood with smooth face or other equal and approved lining material. Forms for concrete shall be of plywood conforming to IS 6461 or steel or as directed by the DPA and shall give smooth and even surface after removal thereof.

Design and Installation

- a) The design and material specification of the formwork, as well as its construction / erection shall be the sole responsibility of the Contractor, who shall take care of all the relevant safety aspects during concrete work.
- b) The contractor shall prepare, before commencement of actual work, design and drawings for formwork and get them approved by the DPA. Formwork shall be designed as per IS 14687 with all appropriate loads associated with the placing of concrete and shall resist lateral pressure arising due to plastic flow of concrete like a liquid with a specific gravity up to 2.5.
- c) Formwork shall be installed on hard ground or hard surface so that there shall not be any chance of settlement, when concrete is placed and vibrated.
- d) The formwork shall be true, rigid and adequately braced both horizontally as well as diagonally. The forms shall have smooth and even surface and be sufficiently strong to carry, without deformation or deflection, the dead weight of the green concrete, working load, wind load and also the side pressure exerted by the green concrete. As far as practical, clamps shall be used to hold the forms together. Where use of nails is unavoidable minimum number of nails shall be used. Projected part of nail shall not be bent or twisted for easy withdrawal.
- e) Where through tie rods are required to be put to hold the formwork and maintain accurate dimension, they shall always be inserted through a precast concrete block (of same mix proportion as is to be used for concreting) with a through hole of bigger

diameter. The Precast block shall tightly fit against in inner faces of formwork. The holes left after the withdrawal of tie rods shall be fully grouted with cement-sand mortar of same proportion as that used for concrete. However, use of such precast block shall in no case impair the desired appearance or durability of the structure. No such tie rods shall be used in any liquid retaining or basement structure.

- f) Form joints shall not permit any leakage. The formwork shall be strong enough to withstand the effect of vibrations practically without any deflection, bulging, distortion or loosening of its components.
- g) Forms for beams and slabs (span more than 6.0m) shall have camber of 1 in 500 so as to offset the deflection and assume correct shape and line after deposition of concrete. For cantilevers, the camber at free end shall be $1/100^{\text{th}}$ of the projected length. Where architectural considerations and adjunctive work are critical, smaller form cambers shall be adopted as decided by the DPA.
- h) All vertical wall forms may be designed and constructed for the following minimum pressure. The pressures listed in **Table-4** are intended as guide only and the Contractor shall ensure that the formwork is adequately strong and sturdy.

Table-4: Minimum Design Pressure for Wall Formwork

Rate of pour in meter per hour	Pressure in KN/m ²	
	At 10° (in Celsius)	At 24° (in Celsius)
0.6	36.0	29.0
0.9	40.0	32.0
1.2	44.0	35.0
1.5	46.0	37.0
Note: All horizontal forms shall be designed and constructed to withstand the dead load of the Green concrete, reinforcement, equipment, material, embedment and a minimum live load of 2.0 KN/m ²		

Cleaning and Treatment of Formwork

- a) All rubbish, particularly, chippings, shavings and sawdust shall be removed from the interior of the forms before the concrete is placed. The face of formwork in contact with the concrete shall be cleaned and treated with form release agent. Release agents should be applied so as to provide a thin uniform coating to the forms without coating the reinforcement.
- b) All surfaces of forms and embedded materials shall be thoroughly cleaned off accumulated cement paste or grout from previously cast concrete and other foreign material before new concrete is placed.

Inspection of Forms

Temporary openings shall be provided at the base of column and wall forms and other places necessary to facilitate cleaning and inspection. Before concrete is placed, all forms shall be carefully inspected to ensure that they are properly placed, sufficiently rigid and tight, thoroughly cleaned, properly treated and free from foreign material. The complete form work shall be inspected and approved by the DPA before the reinforcement bars are placed in position. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the work shall be stopped until the defects have been corrected as per the instructions of the DPA.

Chamfers and Fillets

All comers and angles shall be formed with 45 degree moulding to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets, unless otherwise detailed or specified shall be 25 mm x 25 mm. For heavier work chamfers or fillets shall be 50 mm x 50mm.

Care shall be exercised to ensure accurate mouldings. The diagonal face of the moulding shall be planed or surfaced to the same texture as the forms to which it is attached.

Reuse of Forms

- a) Any particular formwork shall be reused to such number that the quality of the specified finish can be maintained; and shall not have any damages due to weight of concrete, vibration during placement & removal of formwork.
- b) Before reuse, all forms shall be thoroughly scrapped, cleaned, examined and when necessary, repaired and retreated, before resetting. Formwork shall not be reused, if declared unfit or un-serviceable by the DPA.

Removal of Forms or Stripping Time

- a) In the determination of time for removal of forms, consideration shall be given to the location and character of the structures, the weather and other conditions including the setting and curing of the concrete and material used in the mix.
- b) Forms and their supports shall not be removed without the approval of the DPA. Forms shall not be released until the concrete has achieved a strength of at least twice the stress to which the concrete may be subjected at the time of removal.
- c) The formwork shall be removed without shock and methods of form removal likely to cause over stressing or damage to the concrete, shall not be adopted. Supports shall be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own weight.
- d) In normal circumstances when average air temperature exceeds 15 degree Celsius during the period under consideration after pouring of concrete and where ordinary Portland cement is used, forms may generally be removed after expiry of following periods mentioned in **Table-5**.

Table-5: Recommended Stripping Time of Formwork

Sl. No.	Type of Formwork	Minimum Period Before Striking Formwork
1	Vertical formwork to Walls, columns and beams	16 to 24 hours or as decided by DPA Engineer In Charge during execution
2	Soffit formwork to slabs (Props to be refixed immediately after removal of formwork)	3 days.
3	Soffit formwork to beams (Props to be refixed immediately after removal of formwork)	7 days.
4	Props to slabs:	
	a) Spanning up to 4.5 m.	7 days.
	b) Spanning over 4.5 m	14 days.
5	Props to beams and arches:	
	a) Spanning up to 6.0 m	14 days.
	b) Spanning over 6.0 m	21 days
6	Cantilever Construction Formwork shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength (minimum 14 days).	

Table-5: Recommended Stripping Time of Formwork

Sl. No.	Type of Formwork	Minimum Period Before Striking Formwork
Notes:		
i)	For other cements, the stripping time recommended for ordinary Portland cement shall be suitably modified as per the instructions of the DPA.	
ii)	The number of props left under, their sizes, supporting arrangement, and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.	
iii)	Where the shape of the element is such that the formwork has re-entrant angles, the form work shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.	
iv)	For rapid hardening cement, 3/7 of the above mentioned periods shall be considered subject to a minimum of 16 hours.	

Staging or Scaffolding

- a) Staging or Scaffolding shall be properly planned and designed by the Contractor. Use

of only steel tubes is permitted for staging or scaffolding. The Contractor shall get it reviewed by DPA before commencement of work. While designing and during erection of scaffolding or staging, the following measures shall be considered:

- i) Sufficient sills or under pinnings in addition to base plates shall be provided particularly where scaffolding are erected on soft grounds.
 - ii) Adjustable bases to compensate for uneven ground shall be used.
 - iii) Proper anchoring of the scaffolding or staging at reasonable intervals shall be provided in each direction with the main structure wherever available.
 - iv) Horizontal braces shall be provided to prevent the scaffolding or staging from rocking.
 - v) Diagonal braces shall be provided continuously from bottom to top between two adjacent rows of uprights.
 - vi) The scaffolding or staging shall be checked at every stage for plumb line.
 - vii) Wherever the scaffolding or staging is found to be out of plumb line it shall be dismantled and re-erected afresh and effort shall not be made to bring it in line with a physical force.
 - viii) All nuts and bolts shall be properly tightened and care shall be taken that all clamps & couplings are firmly tightened to avoid slippage
 - ix) Erection work of a scaffolding or staging under no circumstances shall be left totally to semi-skilled or skilled workmen and shall be carried out under the supervision of a technically qualified civil engineer of the Contractor.
- b) For smaller works or works in remote areas, wooden ballies may be permitted for scaffolding or staging by the DPA at his sole discretion. The contractor must ensure the safety and suitability of such works as directed by EIC.

c) **Tolerances**

Tolerances shall be achieved without appreciable changes by the formwork to the hardened concrete as specified in **Table-6** of this specification.

Table-6: Tolerances for Formed Surfaces

Sl. No.	Type of Structure	Tolerance
1	Buried or Unexposed Concrete	± 15 mm
2	Exposed Concrete including Floor Slabs and Paving	± 6 mm

H. Exposed or Architectural Concrete Work

Finishing

Repairing to exposed concrete work shall be avoided. Rendering and plastering shall not be

done. Minor repairing, if unavoidable shall be done with the written permission of the DPA.

I. REINFORCEMENT

General

- a) The Contractor shall develop the bar bending schedule for all R.C.C structures and structural parts and shall get it reviewed by the DPA. Reinforcement shall be cut and bent to shape as per dimensions shown in the bar bending schedule or in the construction drawings.
- b) If protective fusion bonded epoxy coating is required to be applied on reinforcement bars, the same shall be done as per IS 13620. All repairs to applied protective coating required due to mishandling or bending of reinforcement bars shall also be done as per relevant clauses of IS 13620.

Straightening, Cutting and Bending

- a) All reinforcing bars shall be cut, bent or formed to the dimensions and configurations as per the bar bending schedules prepared by the Contractor from the approved construction drawings, and shall be within the tolerances specified in IS 2502.
- b) In case bars are supplied in coils, they shall be smoothly straightened without any kinks. Cold twisted deformed bars shall be bent cold. Bars larger than 25 mm in size (except cold twisted deformed bars) may be bent hot at cherry red heat to a temperature not exceeding 850⁰ Celsius as per the instructions of the DPA. The bars shall be allowed to cool gradually without quenching.
- c) Bars shall be bent in a slow and regular movement to avoid fractures. A second bending of reinforcement bars shall be avoided but when reinforcement bars are bent aside at construction joints and afterwards bent back into their original position, care should be taken to ensure that at no time is radius of the bend less than **4 times** bar diameter for plain mild steel or **6 times** bar diameter for high strength deformed bars. Care shall also be taken when bending back bars to ensure that concrete around the bars is not damaged. All bars shall be properly tagged for easy identification.
- d) Bars which develops cracks or splits after bending shall be rejected. Reinforcing bars having a reduced section, kinks and visible transverse cracks at bends or otherwise damaged shall not be used and shall be removed from the site.
- e) Reinforcing bars shall not be tack or spot-welded for any purpose. Fully welded splice or other welding to reinforcement shall be permitted as an exception by DPA, only after the Contractor's proposed method of welding appropriate to the grade of steel and type of welding rod has been found satisfactory & approved.

Minimum Cover to Main Reinforcement:

- a) ☐ oncrete cover as protection of reinforcement from weather and other effects is measured from the concrete surface to the outermost surface of the reinforcement to

which the cover requirement applies. Where concrete cover is prescribed for a class of structural members, it is measured to the outer edge of stirrups, ties, or spirals if transverse reinforcement encloses main bars; to the outermost layer of bars if more than one layer is used without stirrups or ties; to the metal end fitting or duct of post-tensioning tendons; or to the outermost part of the head on headed bars.

- b) Cover to reinforcing bars shall be carefully checked before casting of concrete, as insufficient cover can lead to the ingress of chloride in the concrete and cause corrosion to the reinforcements.
- c) Unless specified otherwise, actual clear concrete cover shall not deviate from required nominal cover by -0 mm to +10 mm. **Nominal cover to meet durability requirement and specified period of fire resistance shall be as per IS 456.** Nominal cover shall be as per IS 456, however the following minimum clear cover shall be provided for R.C.C. works. Concrete clear cover including ties or links shall not be less than following as specified in **Table-7**. In corrosive environments or other severe exposure conditions, the specified concrete cover shall be increased as deemed necessary and as agreed with DPA.

Table-7: Minimum Concrete Cover

Sl. No.	Description	Minimum Clear Cover (mm)
1	Slab (roof & floors, canopy, cantilever, waist slab)	25 mm
2	Beam (roof, floor, tie & lintel)	45 mm or dia. of bar whichever is
3	Column	50 mm above FGL & 75 mm below FGL
4	Retaining wall, Basement and Pit Wall	
4a	Face in contact with earth	50 mm

Table-7: Minimum Concrete Cover

Sl. No.	Description	Minimum Clear Cover (mm)
4b	Free face	45 mm or dia. of bar whichever is
5	Liquid retaining structure	
5a	Face in contact with liquid	50 mm or dia. of bar whichever is
5b	Face away from liquid but in contact with earth	50 mm
5c	Free face	45 mm or dia. of bar whichever is
6	Foundation slab, base slab, pedestal, plinth beam	75 mm
7	Pile cap	
7a	Bottom Face	125
7b	Top & Sides	75

- d) The above requirements mentioned in Table-7 shall not be applied to concrete construction of trench, local foundation, minor platform foundation, sump pit, manhole, paving and other miscellaneous concrete construction, for which minimum clear cover shall be 40 mm. Designer shall ensure that the reinforcement cover, mentioned above shall in no case be lower than that required by IS 456 as per exposure condition of site and other recommendation of confirmatory Geo-technical

investigation report.

Placing & Fixing

All reinforcement shall be fixed in the correct position and shall be properly supported to ensure that displacement will not occur when the concrete is placed and compacted. The uncoated reinforcement bars shall be tied at every intersection by two strands of 16 SWG black soft annealed binding wire. The epoxy coated reinforcement bars shall be tied with 2 strands of PVC coated GI 18SWG wire at every intersection. Crossing bars shall not be tack welded for assembly of reinforcement. The reinforcement bars shall be kept in position by using the following methods:

- a) In case of beam and slab construction, precast cover spacer blocks (having the same sand contents as the concrete which shall be placed) of size 40 x 40 mm and thickness equal to the specified covers shall be placed firmly in between the bars and forms so as to secure and maintain the specified covers over the reinforcement. When reinforcement bars are placed in two or more layers in beams, the vertical distance between the horizontal bars shall be maintained by introducing spacer bars at 1 to 1.2 m centre to centre.
- b) In case of thick rafts & pile caps having two or multi layers of reinforcement, the vertical distance between the horizontal bars shall be maintained by introducing suitable chairs, spacers.
- c) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them. The templates shall be removed after the concreting has been done below it.
- d) Exposed portions of reinforcement bars shall not be subjected to impact or rough handling and workmen will not be permitted to climb on extending bars until the concrete has attained sufficient strength so that no movement of the bars in the concrete is possible.

Tolerances for Placement

Unless otherwise directed by the DPA, reinforcement shall be placed within the following tolerances. Otherwise, they shall be unfastened and shall be fixed again to maintain the specified covers.

- a) For effective depth 200 mm or less: ± 10 mm
- b) For effective depth more than 200 mm: ± 15 mm

Cleaning of Reinforcement

- a) All reinforcement shall be cleaned to ensure freedom from mud, paint, loose mill scale, loose rust, oil, form releasing agents, grease or any other harmful material that may adversely affect bonding with concrete before placing them in position. Reinforcement shall not be surrounded by concrete unless it is free from all such materials. Rough handling and dropping of reinforcement from a height shall be avoided
- b) All cleaning materials such as rags, sand papers shall be disposed off as directed by DPA.

Substitution

When indicated diameter of reinforcement bar is not available, the Contractor shall use other diameter of reinforcement bars on written approval of the DPA.

Tolerance to Cover

The actual concrete cover shall not deviate from the required nominal cover by - 0 mm to + 10 mm measured over the steel reinforcement including links.

Special requirements for Handling, Stacking & Placing of Epoxy Coated Reinforcing bars.

- a) Epoxy coated reinforcing bars shall be carefully handled and it shall be ensured that these do not rub on any hard surface or against another epoxy coated or uncoated reinforcing bar whether during conveying and transportation, stacking or placing.
- b) During transportation and while stacking the epoxy coated reinforcing bars shall be placed on wooden planks not spaced farther than 600 mm. When placed in stacks the epoxy coated reinforcing bars shall be neatly tied in bundles using PVC binding material.
- c) The cut ends of bars shall be touched up with special touch up material of specifications as provided by the coating agency. After cutting of the bar the application of touch up material shall be completed within four hours.
- d) While bending the bars the pins of work benches shall be provided with a PVC or plastic sleeve. Each bending operation on epoxy coated reinforcing bar shall be completed in time not less than 90 seconds.
- e) Epoxy coated reinforcing steel bar shall not be directly exposed to sun rays or rain, and shall be protected with opaque polyethylene sheets or similar means as approved by the DPA.
- f) While doing concreting the workmen or machinery shall not rest or move on the epoxy coated reinforcing bars. Wooden planks shall suitably be placed to create proper gang-way.
- g) Since bond strength in epoxy coated reinforcing bars is less compared to normal bars which require specific design, hence contractor shall design accordingly and submit to DPA for review and approval. The location of epoxy coated reinforcing bars shall be in accordance with the recommendation of Geo-technical investigation report or corrosion specialist.

Splicing or Overlapping

Only bars of full length shall be used as shown in the Construction drawings. But where this cannot be done, overlapping of bars shall be done as directed by the DPA. Where practicable, the overlapping bars shall not touch each other, but these shall be kept apart by 25 mm or 1.25 times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be tied with two strands of 16 SWG black soft annealed binding wire for uncoated bars and with PVC coated GI 18 SWG wire for epoxy coated bars. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moment is maximum.

Welded Joints or Mechanical Connections

- a) Welding of reinforcing bars shall not be permitted without the written permission of DPA. If Fusion Bonded Epoxy coated bars are used, welding of reinforcing bars shall generally not be permitted. However, if permitted, the joint shall be coated with epoxy as per IS 13620.
- b) Welded joints or mechanical connections in reinforcement may be used if permitted by DPA but in all cases of important connections, tests shall be made to prove that the joints are of the full strength of bars connected. Welding of reinforcements shall be done in accordance with the recommendations of IS 2751 and IS 9417. Welded joints shall be located at suitable staggered positions. Maximum one welded joint shall be allowed per bar.
- c) The mechanical splices in reinforcement by means of couplers and clamps shall be used as per IS 16172 with the written approval of the DPA. However, tests shall be made as directed by DPA to prove that such connections are of the full strength of the bars on trial joints. Mechanical connections for Fusion Bonded Epoxy coated bars shall not be used.

CONCRETE PRODUCTION

- **General**

- a) Concrete of high quality shall be produced by meeting the requirements as specified in the relevant clauses of this specification.
- b) Generally concrete production shall be carried out in a central batching plant and mixing equipment, approved by DPA. Mixing and the addition of water in the truck mixers shall not be permitted.

- **Batching**

- a) The appropriate quantities of Portland cement and each size of aggregates, as approved on the basis of the trial mixes for designated concrete grades shall be measured by means of weigh batching. Water and admixtures for mixing shall preferably be measured by weight than by volume. However for small jobs, concrete by volume batching shall be allowed upon DPA approval.
- b) Batching equipment shall be capable of consistently measuring all the quantities within the following tolerances for the each batch smallest or largest as per IS 4925.
 - i) Cement & other cementitious materials: ± 1 %
 - ii) Water: ± 1 %
 - iii) Sand Aggregates: ± 2 %
 - iv) Admixtures: ± 3 %
- c) All weighing or measuring equipment shall be calibrated on a regular basis by the third party inspection; and validity of the test certificates for the calibrated equipment

shall be limited for a period of Six (6) months only to ensure that the required accuracy is continuously maintained. All weighing or measuring equipment shall be approved by DPA and shall be maintained in serviceable condition.

- d) It is important to maintain the water-cement ratio constant at its correct value. The moisture content of aggregates (fine and coarse) shall be determined on daily basis to check any apparent change therein and shall be recorded for adjustment. The weight of aggregates added to mix shall be revised accordingly. The water added to the mix shall similarly be modified to meet the water cement ratio as per this specification or as per the concrete trial mix.
- e) The amount of the added water shall be adjusted to compensate for any observed variations in the moisture contents according to weather conditions and moisture content in the aggregates shall be determined in accordance with IS 2386: Part 3. To allow for the variation in mass of aggregate due to variation in their moisture content, suitable adjustments in the masses of aggregates shall also be made. In the absence of exact data, only in the case of nominal mixes, the amount of surface water may be estimated from the values given in Table-10 of IS 456.

- **Concrete Mixing**

- 1. **General**

- a) The mixing of concrete shall be strictly carried out in an approved type of mechanical concrete mixer. The mixer shall be fitted with water measuring devices. The mixing shall be continued until there is a uniform distribution of the material and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete shall be remixed.
- b) Use of Ready Mixed Concrete supplied by Ready Mixed Concrete Plants or from on and off-site batching plants (IS 4926) shall be preferred for structural concrete.
- c) All records and charts for the batching and mixing operations shall be prepared and maintained by the contractor as per the instructions of DPA.

- 2. **Mixer**

- a) Mechanical Mixers shall comply with IS 1791 and IS 12119 and shall be maintained in satisfactory operating condition. These shall be used only for producing lean or plain concrete or nominal mix concrete wherever permitted.
- b) The batch mixer shall be capable of thoroughly combining the aggregates, cement and water into a homogeneous and uniform mass within the specified mixing time & discharging the concrete without any harmful segregation. The mixer shall bear the Manufacturer's rating plate indicating the rated capacity and the recommended revolution per minute & shall be operated accordingly.
- c) The contents of the drum shall be discharged completely before recharging further.
- d) Whenever mixing is to be suspended for 30 minutes or longer, the drum of the mixer

shall be thoroughly washed out with clean water. The operator shall be DPA approved and shall be competent enough to remain in continuous control of the mixer operation. The wash water shall be disposed off as directed by DPA.

- e) Re-tempering shall not be allowed for partially hardened concrete by adding additional quantities of water, cement or aggregates. All the pieces of partially hardened concrete shall be removed and disposed off as directed by DPA.

3. **Mixing Time**

Mixing time shall be as indicated in the Table-8. Excessive mixing requiring additions of water shall not be permitted. Time shall start when all solid materials are poured in the revolving mixer drum, provided that all of the mixing water shall be introduced before one-fourth of the mixing time has elapsed. The DPA may, however, direct a change in the mixing time, if he considers such a change necessary.

Table-8: Minimum Mixing Time for Mixers

Capacity Of Mixer	Minimum Mixing Time
2.0 m ³ or less	2 minutes
Above 2.0 m ³	3 minutes or as recommended by the mixer manufacturer.

4. **Hand Mixing**

Hand mixing of concrete shall not be permitted. However, for non-critical applications namely foundations for crossovers, isolated operating platforms etc., using concrete of maximum grade M20 and located at far away isolated places, this may be permitted by the DPA as a special case. Ten percent (10%) extra cement shall be added to the design proportion. Mixing shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency.

- **Admixtures**

Admixtures in concrete shall be used only with the prior approval of the DPA and shall comply with IS 9103.

- **Ready-Mixed Concrete**

- a) Ready-mixed concrete shall be batched, mixed off the project site and delivered to the construction area in a freshly mixed and unhardened state in accordance with IS 4926 and shall also be acceptable to DPA, provided it complies with the following requirements of this specification as below.
- b) Ready-mixed concrete shall be produced completely by means of central mixing in stationary mixers of the tilting drum type and transported by an agitator truck. Truck mixing shall not be allowed.
- c) The plant shall be certified by **Ministry of Public Works, Government of Gujarat**

and shall conform to the “Certification of Ready-Mixed Concrete Production Facilities (Checklist with Instructions)” of National Ready Mixed Concrete Association (NRMCA).

- d) The Manufacturer of the concrete shall furnish to the purchaser (Contractor or DPA) with each batch of concrete before unloading at the site, a delivery ticket on which is printed, stamped or written, minimum information concerning ready mix concrete as follows:
- i) Name of the ready-mix concrete plant supplier with logo and address.
 - ii) Serial number of ticket.
 - iii) Date and time of loading i.e time of first contact between cement and water.
 - iv) Truck number or vehicle identification.
 - v) Name of supplier.
 - vi) Grade and mix description of concrete.
 - vii) Type and strength class of cement as well as brand.
 - viii) Content of cement.
 - ix) Water cement ratio.
 - x) Nominal maximum size of aggregates.
 - xi) Source of aggregates.
 - xii) Type, brand and amount of admixtures (if used).
 - xiii) Amount of concrete in cubic metre.
- e) However, in case of prolonged restrictions on concreting due to extreme weather conditions or unwarranted delays in transportation, should the Contractor's request for dry mix concrete in such situation be granted by the DPA for a particular work, a special procedure for Quality Control shall be prepared by the Contractor and shall be approved by DPA.

- **Dry Mix Concrete**

The Contractor may procure dry mix concrete from the Supplier (Batching Plant) and mixing of water shall be done at site. However, all necessary controls, advice on water admixtures, site supervision and temperature controls shall be as per this specification; and concreting shall be witnessed by the DPA

CONVEYING, PLACING, COMPACTION & FINISHING

- **General**

The entire concrete placing programme including transportation arrangements, deployment of equipment, layout, proposed procedures and methods, shall be submitted before 24 hours prior to concreting for DPA approval. No concreting shall be placed until his approval has been received. Approval of the DPA for pouring concrete shall be taken as “conveyed”, when the concrete pour card is signed by him.

- **Chuting**

- a) The use of long troughs, chutes and pipes for conveying concrete from the mixer to the forms shall be permitted only on written authorization from the DPA. In case an inferior quality of concrete is produced by the use of such conveyors, the DPA may order discontinuance of their use and the substitution of a satisfactory method of placing the concrete. Open troughs and chutes shall be equipped with baffles and be in short lengths to avoid segregation. Chutes shall be designed so that the concrete is, to some extent, remixed at the lower end by passing down through a funnel shaped pipe or drop chute. Alternatively, they shall discharge into a storage hopper from which the concrete shall be transported to the point of placing by wheel barrows or other means.
- b) Where drop chutes are used, a sufficient number of these must be provided, so that the concrete discharged from the chute is not required to flow laterally more than 1.0 m. Where a drop chute is swung from the vertical, the bottom two sections must be maintained in a vertical position to avoid segregation. The addition of water at any point in the system of transportation, to facilitate the movement of concrete shall not be permitted.
- c) All chutes, troughs and pipes, shall be kept clean and free from coatings of hardened concrete by thoroughly flushing them with water after each run; water used for flushing shall be discharged clear of the structure. Concrete shall not be normally permitted to fall freely from a height of more than 1.5 m nor to strike the forms at an angle. However, a deviation from this normal practice may be allowed provided proper precaution is taken, while placing concrete into the forms to avoid segregation, to the satisfaction of the DPA.

- **Vibrators**

Concrete shall be compacted with mechanical vibrating equipment supplemented, if necessary to obtain consolidation, by hand spreading, rodding and tamping. The vibrators shall be of immersion type with operational frequency ranging between 8000 to 12000 vibrations per minute. Immersion type vibrators shall comply with IS 2505. Screed board concrete vibrators or concreting vibrating tables conforming to IS 2506 and IS 2514 respectively, shall be used where specifically required and directed by DPA.

- **Conveying Concrete**

- a) Concrete, after being thoroughly mixed in the mixer and discharged from it, shall be conveyed within the specified time limit to the final place at the job site by suitable buckets, dumpers, pumps, transit mixers containers or conveyors which shall prevent segregation, initial hardening or loss of the ingredients and maintaining the required workability.
- b) Transit mixers containers shall be slowly revolved at the agitating speeds as specified by the Manufacturer to maintain the plasticity of concrete. However, addition of water is prohibited during transit and at the point of discharge. Water tanks shall be completely disconnected from the containers of the transit mixers.
- c) Concrete shall be unloaded through the use of chutes, spouts, skips or by pumps as acceptable to DPA; but under no circumstances any aluminium pipe or other

conveying equipment containing aluminium shall be allowed to come in contact with fresh concrete, when it is conveyed to the point of placement.

- d) During hot or cold weather, concrete shall be transported in deep containers. Other suitable methods to reduce the loss of water by evaporation in hot weather and heat loss in cold weather may also be adopted. All equipment used for transporting and placing of concrete shall be maintained in clean condition. All buckets, hoppers, chutes, dumpers and other equipment shall be thoroughly cleaned after each use and shall be free from any partially or fully hardened concrete prior to loading so that fresh concrete shall not be contaminated.

- **Placing Concrete**

- a) The work shall be properly planned and organized in such a manner that concrete shall be compacted in its final position within Two (2) hours from the time of introducing cement into the aggregates.
- b) Before placing new concrete over hardened concrete, the surfaces shall be properly cleaned, moist and treated with DPA approved proprietary bonding agent in accordance with the Manufacturer's instructions.
- c) Before placing concrete, all soil surfaces upon which or against which concrete is to be placed shall be well compacted and free from standing water, mud or debris. Soft or yielding soil shall be removed and replaced, with lean concrete or with selected soils or sand and compacted to the density as directed by DPA. The surface of absorptive soil (against which concrete is to be placed) shall be moistened thoroughly so that moisture is not drawn from the freshly placed concrete. Similarly, for concrete to be placed on formworks, all chippings, shavings and sawdust shall be removed from the interior of the forms before the concrete is placed.
- d) Concrete shall not be placed until the formwork, the placement of reinforcing steel, embedded parts; pockets have been inspected and approved by the DPA. Any accumulated water on the surface of the bedding layer shall be removed by suitable means before start of placement. No concrete shall be placed on a water covered surface.
- e) Concrete shall be discharged by vertical drop only and the drop height shall not normally exceed 1.5 m throughout all stages of delivery until the concrete comes to rest in forms. For continuous concreting operation windows of suitable size shall be kept in the formwork or chutes shall be used to avoid segregation of concrete. Concrete shall be placed through spouts or flexible drop chutes, where dense reinforcing bars may cause segregation of the coarse aggregates.
- f) Concrete shall be deposited as near as practicable in its final position to avoid rehandling. Concrete shall be placed in successive horizontal layers not exceeding 500 mm or as directed by DPA Engineer-in-charge. The bucket loads, or other units of deposit, shall be placed progressively along the face of the layer with such over-lap as will facilitate spreading the layer of uniform depth and texture with a minimum of

hand shoveling. Any tendency to segregation shall be corrected by shoveling coarse aggregates into mortar rather than mortar on the coarse aggregates. Such a tendency for segregation shall be corrected by redesign of mix, change in process or other means, as directed by the DPA.

- g) All struts, stays and braces (serving temporarily to hold the forms in correct shape and alignment pending the placing of concrete at their locations) shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These shall not be buried in the concrete. Concrete shall be thoroughly compacted with vibrators and fully worked around the reinforcement. Embedded fixtures and into comers of formwork before setting commences and shall not be subsequently disturbed. Methods of placing shall be such as to preclude segregation and avoid displacement of reinforcement or formwork.
- h) The formation of stone-pockets or mortar bondage in comers and against face forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for thorough bonding as directed by the DPA. Care shall be taken to avoid displacement of reinforcement and embedded inserts or movement of formwork.
- i) Unless otherwise approved, concrete shall be placed in single operation to the full thickness of foundation rafts, slabs, beams and similar members. Concrete shall be placed continuously until completion of the part of the work between approved construction joints or as directed by the DPA.
- j) The method of placing and compaction employed in any particular section of the work shall be to the entire satisfaction of the DPA. Concrete that has set standing and becomes stiffened shall not be used in the work.

- **Consolidating Concrete**

- a) All fresh concrete shall be consolidated by vibration, spading, rodding or forking so that the concrete is thoroughly compacted around the reinforcing bars, embedded items and into corners of forms, eliminating entrapped air, honeycombs & stone pockets within the section.
- b) Immersion type vibrators shall be inserted in a vertical position at intervals of about 500 mm, depending upon the mix, the equipment used, and experience on work. The vibrators shall be withdrawn slowly to prevent the formation of voids and shall not be used to move the concrete horizontally along the forms, which may cause segregation. The spacing shall provide some overlapping of the area vibrated at each insertion. In no case shall vibrators be used to transport concrete inside the forms. Over vibration or under vibration shall not be permitted as both are harmful. Hand tamping in some cases may be allowed subject to the approval of the DPA.
- c) Immersion vibrators shall penetrate through the full depth of the layer and when the underlying layer is of fresh concrete, shall enter & re-vibrate that layer to ensure that the successive layers are fully bonded.

- d) Excessive vibration shall not be allowed so as to avoid surface laitance, segregation and leakage through formwork or damages to the embedded items & formwork.
- e) In placing concrete in layers which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, bonding and moulding of the concrete between the succeeding batches.
- f) The vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layer is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.
- g) Care shall be taken to prevent contact of vibrators against all embedded reinforcing steel or inserts. Vibrators shall not be allowed to come in contact with forms.
- h) The use of form vibrators shall not be permitted for compaction of in-situ concrete without specific authorization of the DPA.
- i) The use of surface vibrators of screed board type shall not be permitted for consolidation of concrete under ordinary conditions. However, for thin slabs (of thickness less than 200 mm) surface vibration by such vibrators may be permitted, upon approval of the DPA.
- j) Whenever vibration has to be applied externally, the design of formwork and the disposition of vibrators shall be carefully planned to ensure efficient compaction and to avoid surface blemishes.
- k) Minimum one (1) spare vibrator shall be kept available on the job site during all concrete placing operations.

Bonding Concrete

- a) When freshly mixed concrete is to be placed in contact with recently hardened concrete, the surface of joints shall be properly prepared to secure a high quality bond and water tightness.
- b) The hardened concrete shall be thoroughly roughened and cleaned of all laitance, dry mortars, deposits, dust, grease, oil or other foreign materials by stiff wire brushing, chipping hammers, water blasting, scarifiers or any other mechanical equipment to expose sound concrete with some coarse particles.
- c) The hardened concrete of construction joints, joints between footings and columns or walls, between columns or walls and beams or floors they support, joints in unexposed walls shall be dampened (but not saturated) with water immediately prior to placing fresh concrete.
- d) The hardened concrete of horizontal construction joints in exposed work and joints in the middle of beams, girders, joists and slabs shall be dampened (but not saturated) and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. The grout shall be at least 10 mm thick and before attaining its initial set, the fresh concrete shall be placed.

Embedded Items in Concrete

- a) Prior to placing concrete in the formwork, all the reinforcing bars, embedded items shall be checked for the required cleanliness and shall be free from loose rust, scale, oil that may adversely affect the bonding capacity of concrete.
- b) Concreting shall not be started unless the Anchor Bolts, inserts, water bars, electrical conduits, pipe sleeves, pipes, fixtures etc., wherever required, are laid by the concerned agency. The Contractor shall afford all the facilities and maintain co-ordination of work with other agencies engaged in electrical and such other works as directed by the DPA.
- c) Before concreting, the Contractor shall provide, fabricate and lay in proper position all metal inserts, anchor bolts, pipes etc. (which are required to be embedded in concrete members) as per relevant Construction drawings and directions of DPA.
- d) All embedment, inserts etc. shall be fully held and secured in their respective positions by the concerned agencies to the entire satisfaction of DPA so as to avoid any dislocation or displacement during the concreting operations. The Contractor shall take all possible care during concreting to maintain this embedment's or inserts in their exact locations.
- e) The Contractor shall take care of adequate time for inspection and any corrective actions to be implemented in his planning, when concrete pours are scheduled.

Concrete Joints

Joints in concrete shall be located as far as practicable at places so that harmful liquids including saline water from any source cannot collect or pond over them.

Construction Joints

- a) Construction joints shall be provided in position as shown or described on the construction drawings or as directed by the DPA. Such joints shall be kept to the minimum. These shall be straight and at right angles to the direction of main reinforcement and shall be placed at accessible locations to permit cleaning out of laitance, cement slurry and unsound concrete.
Construction joints shall comply with IS 11817
- b) In a column, the joint shall be formed about 100 mm to 150 mm below the lowest soffit of the beams framing into it. Concrete in a beam and slab shall be placed throughout without a joint but if the provision of a joint is unavoidable, the joint shall be vertical and located within 1/3 to 1/4 of the span, unless otherwise shown on the construction drawings.
- c) When stopping the concrete on a vertical plane in slabs and beams, an approved stop board shall be placed with necessary slots for reinforcement bars. The construction joints shall be keyed by providing a triangular or trapezoidal fillet nailed on the stop board. Inclined joints shall not be permitted. Any concrete flowing through the joints of stop board shall be removed soon after the initial set. When concrete is stopped on a horizontal plane, the surface shall be roughened and cleaned after the initial set and a triangular or trapezoidal groove shall be provided for keying with the new concrete

later.

- d) Stop ends for vertical joints shall be removed as soon as practicable without any damage to the concrete face. The surface shall be roughened to remove all laitance, without disturbing the coarse aggregate by pressure jetting with air and water or by wire brushing. Care shall be taken to ensure that the joint is clean prior to placing fresh concrete. The new concrete shall be well worked against the old face to ensure good joint. The use of expanded metal or other perforated material as a stop-end is not acceptable.
- e) When the work has to be resumed on a surface which has hardened, such surface shall be cleared of any foreign materials and roughened to expose the tips of the coarse aggregate. This may be done by manual chipping of concrete, with a high pressure water jet or by any

other appropriate means as per DPA's directions. It shall then be swept clean and thoroughly washed and wetted before any new concrete is poured. Any set mortar or concrete sticking to the exposed reinforcing rods in and around such joints shall be thoroughly removed. The reinforcements shall be wire brushed and washed just before pouring any cement slurry or mortar. For vertical joints neat cement slurry shall be applied on the surface before it is dry. For horizontal joints the surface shall be covered with a layer of mortar about 10 to 15 mm thick composed of cement and sand in the same ratio as the cement and sand in concrete mix. This layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing new concrete.

- f) Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement slurry. On this surface layer of concrete not exceeding 150 mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots; work thereafter shall proceed in normal way.

Finishing of Concrete Surfaces

Generally after forms are removed, the concrete surfaces shall be cleaned off from all bulges, ridges and honey-combing etc. and small projections by chipping or tooling. The DPA may, at his discretion allow rectification by necessary chipping and packing or grouting with concrete or cement mortar. However, if honey-combing or sagging is of such extent as being undesirable, the DPA may reject the work totally and his decision shall be binding. All burrs and uneven faces shall be rubbed smooth with the help of carborundum stone. Stains shall be removed to present a concrete surface in uniform colour. However, the cast surfaces of concrete may be specified with one of the following finishes, as described in the specification or drawings:

- a) Rough form finish for all concrete surfaces not exposed to view.

- b) Smooth form finish for all concrete surfaces exposed to view.

Rough Form Finish

Rough form finish surfaces shall be reasonably true to line and plane with no specific requirements for selected facing materials. Holes and minor defects shall be patched; otherwise surfaces shall be left with the texture imparted by the forms. This finish shall be produced as **class F1** for surfaces against which backfill, rendering or further concrete will be placed. Appearance is not important, but where backfill shall be placed against the concrete, the surface finish shall be made smooth to apply coating over it as a continuous protective membrane.

Smooth Form Finish

Smooth form finish surfaces shall be produced with a hard, uniform texture on the concrete by using the suitable form facing material such as plywood tempered hardboard, metal, plastic, paper or other acceptable material capable of providing the desired result. Smooth form finishes shall be distinguished with the following **classes F2 or F3** as below:

- a) **Class F2** finish shall be provided for surfaces that are permanently exposed to view, but where highest specification of finish is not required.

Joints between panels shall be horizontal or vertical unless otherwise specified. The finish shall be such that no general filling or surface pitting are required, but fins, surface discoloration or other minor defects shall be remedied by approved methods to DPA satisfaction.

The cast surfaces wherever necessary, shall be coated to protect it from ingress of chlorides, but in any case ledges shall not be allowed at the position of joints in the formwork where they can collect salts after being washed down by dew or rainwater or from saline water.

- b) **Class F3** finish shall be provided for surfaces that are permanently exposed to view, but here good appearance and alignment are of special architectural importance.

To achieve this class of finish, the formwork shall be made by the Contractor with the large sheets of applicable facing materials. The sheets shall be arranged in a uniform pattern approved by DPA.

Joints between sheets wherever possible, shall be made to coincide with architectural features, sills, window heads or changes in direction of the surface. All joints between panels shall be vertical or horizontal unless specified otherwise. Suitable joints shall be arranged and fitted so that no blemish or mark is imparted to the finished surfaces.

Unformed Finish

Unformed finishes shall be distinguished with one of the following classes **U1 to U4** as below:

- c) **Class U1** finish is for surfaces of roads, subsequent stages of construction, bonded concrete topping or cement mortar bed to receive paving. The concrete shall be uniformly levelled and tamped. Proper surface treatment shall be required at the time of topping application.

- d) **Class U2** finish is broom finish for ramps and sidewalks.
- e) **Class U3** finish shall be floated finish for surfaces of beds and slabs to receive mastic paving, tile paving bedded in mastic and for exposed surfaces, when a hard, smooth, steel trowelled surface is not required. When the concrete has hardened sufficiently, this finish shall be wood floated to give a uniform surface free from tamping marks.
- f) **Class U4** finish shall be hard, smooth, steel trowelled finish for tops of buried foundations (to be coated later), surfaces of concrete paving, tops of walls, coping and other members exposed to weathering. It also applies to surfaces of beds and slabs to receive thin, flexible sheet & tile pavings bedded in adhesives. The finish shall be steel trowelled by hand or machine to produce a dense, smooth, uniform surface free from trowel marks.

PROTECTION OF FRESHLY LAID CONCRETE

Newly placed concrete shall be protected, by approved means, from rain, sun and wind. Concrete placed below the ground level shall be protected from falling earth during and after placing. Surface shall be kept free from contact with such ground or with water draining from such ground during placing of concrete for a period of at least 3 days, unless otherwise directed by the DPA. The groundwater around newly poured concrete shall be kept to an approved level by pumping or other approved means of drainage and adequate steps shall be taken to prevent floatation and flooding. Steps shall be taken to protect immature concrete from damage by debris, loading, vibration, abrasion, mixing with deleterious materials that may, in the opinion of the DPA, impair the strength and durability of the concrete.

CURING

- **General**

- a) Curing is the process of preventing the loss of moisture from the concrete. whilst maintaining a satisfactory temperature regime. The prevention of moisture loss from the concrete is particularly important if the water cement ratio is low, if the cement has a high rate of strength development, if the concrete contains granulated blast furnace slag or pulverized fuel ash. The curing regime should also prevent the development of high temperature gradients within the concrete. The rate of strength development at early ages of concrete made with super sulphated cement is significantly reduced at lower temperatures. Supersulphated cement concrete is seriously affected by inadequate curing and the surface has to be kept moist for at least seven days.
- b) Curing is one of the most important factors in the production of good quality dense, strong, durable concrete by maintaining a satisfactory level of moisture content and temperature in concrete during its early period, immediately following the placement of concrete.
- c) Freshly laid concrete shall be protected from premature drying, excessively hot or cold temperatures, mechanical injury and shall be maintained with minimal loss of

moisture at a relatively constant temperature, for the time period required to complete hydration of the cement & proper hardening of the concrete.

- d) Curing shall be started after 8 hours of placement of concrete in normal weather, and in hot weather after 4 hours. The water used for curing shall be of the same quality as that used for making of concrete.
 - e) The Contractor shall have all equipment and materials required for curing on hand and ready to use before concrete is placed.
- **Curing Methods**
 - a) Concrete shall be cured by keeping it continuously moist for 24 hours to prevent loss of water due to evaporation, rapid rise of temperature within concrete and its hardening as per the following methods:
 - i) Moist curing.
 - ii) Membrane curing.
 - b) The Contractor shall employ one of the above DPA approved methods and shall ensure by regular & frequent inspection that concrete is properly cured.

- **Moist Curing**

- a) Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances such as hose, sprinklers etc. A layer of sacking, canvas, hessian, or other approved material, which will hold moisture for long periods and prevent loss of moisture from the concrete, shall be used as covering. Type of covering which would stain, disfigure or damage the concrete, during and after the curing period, shall not be used.
- b) Exposed surfaces of concrete shall be kept continuously in a damp or wet condition by ponding or by covering with a layer of sacking, canvas, hessian or similar materials and kept constantly wet for at least seven (7) days from the date of placing concrete in case of ordinary Portland Cement and at least ten (10) days where mineral admixtures or blended cements are used. The period of curing shall not be less than ten (10) days for concrete exposed to dry and hot weather conditions. In the case of concrete where mineral admixtures or blended cements are used, it is recommended that above minimum periods may be extended to fourteen (14) days.
- c) For curing the concrete in pavements, floors, flat roofs or other level surfaces, the ponding method of curing shall be used. For the first 24 hours after concreting the concrete shall be cured by use of wet sacking, canvas, hessian etc. The minimum water depth of 25 mm for ponding shall be maintained. The method of containing the ponded water shall be approved by the DPA. The ponded areas shall be kept continuously filled with water, and leaks, if any, shall be promptly repaired. Areas cured by ponding method shall be cleared of all debris and foreign materials after curing period is over.

- **Membrane Curing**

- a) Membrane curing by curing compounds may be used in lieu of moist curing with the permission of the DPA. Such compounds shall be applied to all exposed surfaces of the concrete by spraying or brushing as soon as possible after the concrete has set. Minimum film thickness of such curing compounds shall be as per the recommendation of the manufacturer and shall conform to ASTM C309. This film of curing compound shall be fully removed from the concrete surface after the curing period as specified by the manufacturer. DPA may not allow curing by curing compounds for those surfaces where use of curing compound may be detrimental to application of future finishes over the concrete. Impermeable membranes such as polyethylene sheeting covering closely the concrete surface may also be used to provide effective barrier against evaporation.
- b) The curing compound shall be white and shall be water based wax emulsion for concrete above grade, which will not be subsequently coated. Otherwise the curing compound shall be compatible with coating.
- c) Liquid membrane curing compounds shall be applied as recommended by the Manufacturer and shall not be used on any surface to which additional concrete or other material is to be bonded, unless it is proven that the curing compound shall not prevent bonding.
- d) Curing compound shall be approved by DPA and shall be obtained from the DPA approved supplier.
- e) For concretes containing Portland pozzolana cement, Portland slag cement or mineral admixture, the curing period as mentioned in clause of this specification shall be doubled. Curing by ponding shall, however, commence after the first 24 hours of concreting. Formed Surfaces
- f) Metal forms heated by the sun and all wooden forms in contact with the concrete shall be kept wet to minimize moisture loss until they can be safely removed. After removal of forms, the concrete shall be cured until the end of the curing period.
- g) Horizontal surfaces shall be treated with a curing compound after the concrete is placed. Placed concrete shall be banded and flooded with water or draped with wet hessian together with a perforated soaker hose pipe, covered with white impervious sheeting held firmly in place along all edges.
- h) Vertical timber formwork shall be draped with wet hessian as soon as the concrete is placed. Vertical surfaces shall be treated with a curing compound after the formwork is removed, draped with wet hessian, covered with white impervious sheeting held firmly in place along all edges and kept continuously wet for the curing period. Care shall be taken to avoid faster drying by moving winds through the formwork.
- i) Hessian shall be as per AASHTO M182 weighing at least 0.29 kg/m^2 . Impervious sheeting shall be 1000 g polyethylene and shall be lapped not less than 150 mm at edges & ends.

- **Protection from Mechanical Injury**

During the curing period, the concrete shall be protected from damaging mechanical disturbances, particularly load stresses, heavy shock and excessive vibration. All finished concrete surfaces shall be protected from any damages caused by construction equipment, materials or curing methods and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

- **Repair and Replacement of Unsatisfactory Concrete**

- a) After the formwork being removed, the exposed concrete shall be thoroughly inspected for any surface defects such as honeycombs, blisters, shrinkage cracks, scaling, crazing, curling, wavy surfaces, uneven colour shall be identified & reported to DPA.
- b) Concrete if found not meeting the requirements of surface finishes as specified in this specification, shall be repaired by the Contractor to the complete satisfaction of DPA.
- c) The Contractor shall ensure that the replaced or repaired concrete shall not be a source of potential ingress of chlorides or any harmful chemicals and shall be as good as the original concrete regarding impermeability, strength, durability & desired surface finishes.
- d) Repair shall be made as soon as possible after the forms are removed and before the concrete becomes too hard with prior permission from the DPA, in writing. Stone pockets, segregation patches and damaged areas shall be chipped out and the edges undercut slightly to form a key. All loose material shall be washed out before patching. No excess water shall be left in the cavity, but the concrete shall be damp. A good bond between the patch and parent concrete shall be obtained by sprinkling dry cement on the wet surface or by throwing mortar with force on to the wetted concrete, or by brush in a coat of thick cement grout of about 1: 1 (1 cement: 1 sand) just before applying the patching material. Before this has dried, the remainder of the patch shall be filled with mortar or concrete, depending on the extent of the repair.
- e) Cement concrete or mortar used in repair of exposed surfaces shall be made with cement from the same source as that used in concrete and blended with sufficient amount of white Portland cement to produce the same colour as in the adjoining concrete. The proportions of ingredients shall be same as those used in parent concrete. The mortar shall be as dry as possible and well compacted into the cavity. All filling shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the filling has been cured and dried.
- f) For larger repairs to hardened concrete, necessary formwork bearing tightly at the edges of the cavity shall be provided. Concrete shall be chipped out to a depth of at least 100 mm and preferably 150 mm. Mortar shall be scrubbed into all surfaces with a wire brush before placing the concrete. Damaged reinforcement shall be adequately spliced with new steel so as to maintain the original strength. Additional reinforcement, if required in the patch, shall be provided as per the instructions of

DPA.

- g) In case in the opinion of the DPA defects in the concrete is excessive or beyond repair, the contractor shall either redo the structure or take other remedial measures as instructed by the DPA.
- h) Approved epoxy formulation for bonding fresh concrete used for repairs with already hardened concrete shall be used by the Contractor if asked by the DPA. Epoxy shall be applied in strict accordance with instructions of the manufacturer.
- i) All repair works due to non-conformance or non-adherence to specification, if allowed by the DPA, shall be carried out free of cost.

Immediately after patching is completed, the patched area shall be covered with an approved non-staining water saturated material which shall be kept wet and protected against sun and wind for a period of 12 hours. Thereafter, the patched area shall be kept continuously wet by a fine spray or sprinkling for not less than 10 days.

J. Special condition in respect of cement.

- (1) The contractor shall procure 53 grade (conforming to IS 269-1989) OPC cement, as required in the work, from reputed manufacturers of cement having a production capacity not less than one million tons or more per annum as approved by the Ministry of Industry, Government of India, and holding license to use ISI certification mark for their product.
- (2) The supply of cement shall be taken in 50 kg. bags bearing manufacturer's name, date of manufacturing, batch number and ISI marking. The cement shall be brought at site in bulk supply of approximately 50 tons or as decided by the Engineer-in-charge. The cement godown of the capacity to store a minimum of 200 bags of cement shall be constructed by the contractor at site of work for which no extra payment shall be made. In case of big projects with mass consumption of cement, the same can be brought in Silos.
- (3) Samples of cement arranged by the contractor shall be taken by the Engineer-in-charge and got tested in accordance with provisions of relevant BIS codes. In case the test results indicate that the cement arranged by the contractor does not conform to the relevant BIS codes, the same shall stand rejected, and it shall be removed from the site by the contractor at his own cost within a week's time of written order from the Engineer-in-charge to do so. The cement shall be used on the work only after satisfactory test results have been received. The contractor shall supply free of charge the cement required for testing including its transportation cost to testing laboratories. The cost of tests shall be borne by the contractor.
- (4) Double lock provision shall be made to the door of the cement godown. The keys of one lock shall remain with the Engineer-in-Charge or his authorized representative and the keys of the other lock shall remain with the contractor. The contractor shall be responsible for the watch and ward and safety of the cement godown. The contractor shall facilitate the inspection of the cement godown by the Engineer-in-Charge at any time.
- (5) The actual issue and consumption of cement on work shall be regulated and proper accounts maintained as provided in the contract. The theoretical consumption of cement shall be worked out as per procedure prescribed in the contract and shall be governed by conditions laid therein. In case the cement consumption is less than theoretical consumption including permissible variation, recovery at the rate so prescribed shall be made. In case of excess consumption no adjustment need be made.

- (6) The damaged cement shall be removed from the site immediately by the contractor on receipt of a notice in writing from the Engineer-in-charge. If he does not do so within 3 days of receipt of such notice, the Engineer-in-charge shall get it removed at the cost of the contractor.
- (7) The cement procured by the contractor should not have aged more than 6 weeks. The original bills for verification to this effect shall be submitted with every bill of measurement.

K. Special conditions for steel

- (1) The contractor shall procure TMT bars of Fe415/ Fe500/ Fe550 grade as per tender conditions.
 - (a) The grade of the steel such as Fe415/Fe500/Fe 550 or other grade to be procured is to be specified as per BIS 1786-2008.
 - (b) The TMT bars procured from primary producers shall conform to manufacture's specifications.
 - (c) The TMT bars procured shall conform to the specifications.
 - (d) For TMT bars procured either from primary producers or secondary producers, the specifications shall meet the provisions of IS 1786 : 2008 pertaining to Fe 415D or Fe 500D or Fe 550D grade of steel as specified in the tender.
- (2) The contractor shall have to obtain and furnish test certificates to the Engineer-in-charge in respect of all supplies of steel brought by him to the site of work.
- (3) Samples shall also be taken and got tested by the Engineer-in-Charge as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the contractor does not conform to the specifications as defined under para (1) above, the same shall stand rejected, and it shall be removed from the site of work by the contractor at his cost within a week's time of written orders from the Engineer-in-Charge to do so.
- (4) The steel reinforcement bars shall be stored by the contractor at site of work in such a way as to prevent their distortion and corrosion, and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.
- (5) For checking nominal mass, tensile strength, bend test, re-bend test etc. specimens of sufficient length shall be cut from each size of the bar at random, and at frequency not less than that specified below:

Size of bar	For consignment below 100MT	For consignment above 100MT
Under 10 mm dia bars	One sample for each 25 MT or part thereof	One sample for each 40 MT or part thereof
10mm to 16mm dia bars	One sample for each 35 MT or part thereof	One sample for each 45 MT or part thereof

Over 16mm dia bars	One sample for each 45 MT or part thereof	One sample for each 50 MT or part thereof
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- (6) The steel procured by contractor should not have aged more than 6 weeks. The original bills to this effect shall be submitted with every bill of measurement.
- (7) The contractor shall supply free of charge the steel required for testing including its transportation to testing laboratories and the testing charges shall be borne by the contractor.
- (8) The actual issue and consumption of steel on work shall be regulated and proper accounts maintained. The theoretical consumption of steel shall be worked out as per procedure prescribed in the contract. In case the consumption is less than theoretical consumption including permissible variations (+3% for cutting into pieces +/- 2% for variation in weight) recovery at the rate so prescribed shall be made. In case of excess consumption, no adjustment need to be made.

L. SUPPLY OF WATER

- (1) The contractor shall have to make his own arrangements for the water required for execution of work and for labours etc.
- (2) Water used for mixing and curing shall be clean and free from injurious amounts of oil, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel.
- (3) Unfiltered potable water is generally considered suitable for mixing and curing. Mixing and curing with sea water shall not be permitted in any case.
- (4) Periodically samples of water shall be tested as per IS-3025 and as a guide, the following concentrations represent the maximum permissible values:
 - (a) To neutralize 200 ml sample of water using Phenolphthalein as an indicator, it should not require more than 2 ml of 0.1 normal NaOH.
 - (b) To neutralize 200 ml sample of water using Methyl Orange as an indicator, it should not require more than 10ml of 0.1 normal HCL.

5.79 STEEL STRUCTURE SPECIFICATION

A. DEFINITIONS/ TERMINOLOGY

i) Bead

A single run of weld metal deposited on surface.

ii) Butt Weld

A weld in which the weld metal lies substantially within the extension of the planes arc the surfaces *on* the parts joined.

iii) Crater

A depression left in weld metal where the *arc* was broken or the flame was removed.

iv) End Crater

A crater at the end of a weld or at the end of a joint.

v) **Fillet Weld**

A weld of approximately triangular cross-section joining two surfaces approximately at the right angles to each other in a lap joint, tee joint or corner joint. It is of two types:

- (1) Continuous
- (2) Intermittent.

vi) **Fusion Welding**

Any welding process in which the weld is made between metals in a state of fusion without hammering or pressure.

vii) **Non- fusion Welding**

A term applied to the deposition, by the Oxy-Acetylene process of filler metal on parent metal without fusion of the latter.

Oxy-Acetylene Pressure Welding

Pressure welding in which any Oxy-Acetylene flame is used to make the surface to be united plastic. No filler metal is used.

viii) **Run**

The metal deposited during one passage of the electrode or blow pipe in the making of a joint.

ix) **Weld**

A union between two pieces of metal at faces rendered plastic or liquid by heat or pressure, or both, Filler metal may be used to effect the union.

B. MATERIALS

i) **Micro-Alloying Elements**

Elements such as niobium, boron, vanadium and titanium added singly or in combination to obtain higher strength to weight ratio and better toughness, formability and weldability as compared to unalloyed steel of similar strength level.

ii) **Weldability**

A metallic substance is considered to be weldable by a given process and for the given purpose, when metallic continuity to a stated degree can be obtained by welding using a suitable procedure, so that the joints comply with the requirements specified in regard to both their local properties and their influence on the construction of which they form a part.

iii) **Controlled Rolling**

A hot rolling process in which the temperature of the steel and its reduction ratio are controlled, particularly during the final rolling passes, in order to achieve fine grain micro structure and optimum mechanical properties.

iv) **Normalizing Rolling**

A hot rolling process in which the final rolling passes are carried out at a suitable higher temperature, followed by cooling in natural air to a temperature below the transformation temperature, in order to produce a structure, analogous to that obtained by a separate normalizing treatment of hot rolled product.

I. Structural Steel

1. **Supply of Material** : General requirements relating to supply of structural steel shall conform to IS 8910.
2. **Grades** : There shall be nine grades of steel as given in Tables 10.1 and 10.2. While placing the order the steel should be designated by 'Designation' (See Table 10.1 and 10.2).
3. **Manufacture** : The processes used in the steel making and further hot rolling into steel plates, strips, sections, flats, bars, etc., are left to the discretion of the

manufacturer/supplier. If required, secondary refining may follow steel making, as also normalizing rolling/controlled rolling during manufacturing of sections or as per the agreement between the purchaser and the manufacturer/supplier.

4. Freedom from Defects

All finished materials shall be well and cleanly rolled to the dimensions, sections and masses specified. The finished material shall be reasonably free from surface flaws; laminations; rough/ jagged and imperfect edges and all other harmful defects.

Minor surface defects may be removed by the manufacturer/supplier by grinding provided the thickness is not reduced locally by more than 4 percent below the minimum specified thickness. Reduction in thickness by grinding greater than 4 percent but not exceeding 7 percent may be made subject to mutual agreement between the purchaser and manufacturer/supplier.

Subject to agreement with the purchaser, surface defects which cannot be dealt & may be repaired by chipping or grinding followed by welding and inspection by a mutually agreed procedure such that :

- (a) After complete removal of the defects and before welding, the thickness of the item is not to be reduced by more than 20 percent at any place.
- (b) Welding is carried out by procedure APPROVED by competent authority with approved electrodes and the welding is ground smooth to the correct nominal thickness; and
- (c) Subsequent to the finish grinding, the item may be required to be normalized or otherwise heat-treated at the purchaser's discretion.

Welding as mentioned in above is not permissible for grade designation E 250 material

5. **Chemical Composition** : Ladle Analysis the ladle analysis of the steel, when carried out by the method specified in the relevant part of IS 228 or any other established instrumental /chemical method, shall be as given in Table 10.1. In case of dispute, the procedure given in IS 228 and its relevant parts shall be the referee method and where test methods are not specified shall be as agreed to between the purchaser and the manufacturer/supplier.

6. Rivets

Rivets shall be made from rivet bars of mild steel as per IS 1148.

7. Bolts

These are of two types namely turned and fitted bolts and black bolts. Turned & fitted bolts are turned to exact diameter in automatic lathe. For these bolts, whether reamed or drilled bolts, the same unit stresses are allowed as for rivets. In case of black bolts which are not finished to exact sizes, a lower working stress other than for turned bolts is adopted. They shall conform to IS 1367 – Technical supply conditions for threaded steel fasteners.

8. Electrodes

The electrodes required for metal arc welding shall be covered electrodes and shall conform to IS 814.

II. STEEL WORK IN SINGLE SECTION FIXED INDEPENDENTLY WITH CONNECTING PLATE

The steel work in single section of R.S. joists, flats, Tees Angles fixed independently with or without connecting plate, is described in these clauses.

1. Fabrication

The steel sections as specified shall be straightened and cut square to correct lengths and measured with a steel tape. The cut ends exposed to view shall be finished smooth. No two pieces shall be welded or otherwise jointed to make up the required length of member. All straightening and shaping to form, shall be done by pressure. Bending or cutting shall be carried out in such a manner as not to impair the strength of the metal.

2. Painting

All surfaces which are to be painted, oiled or otherwise treated shall be dry and thoroughly cleaned to remove all loose scale and loose rust. Surfaces not in contact but inaccessible after shop assembly, shall receive the full specified protective treatment before assembly. This does not apply to the interior of sealed hollow sections. Part to be encased in concrete shall not be painted or oiled. A priming coat of approved steel primer such as Red Oxide/Zinc Chromate primer conforming to IS 2074 shall be applied before any member of steel structure are placed in position or taken out of workshop.

3. Erection

Steel work shall be hoisted and placed in position carefully without any damage to itself and other building work and injury to workmen. Where necessary mechanical appliances such as lifting tackle winch etc. shall be used. The suitability and capacity of all plant and equipment used for erection shall be up to the satisfaction of the Engineer-in-charge.

4. Measurements

The work as fixed in place shall be measured in running metres correct to a millimetre and weights calculated on the basis of standard tables correct to the nearest kilogram. The standard weight of steel sections shall conform to IS 808 with tolerance in sizes as per IS 1852. Tolerance in weight is given in Table 10.3. Steel sections shall be acceptable within tolerance limits. Payment for steel sections shall be made as per actual weight within tolerances. Sections having weight on higher side than permissible tolerance, may be acceptable but payment shall be made on the basis of standard weight only. Steel sections having weight variations lower side than permissible variation shall not be acceptable. Unless otherwise specified, weight of cleats, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators, diaphragm gussets (taking overall square dimension) fish plates, etc. shall be added to the weight of respective items. In riveted work allowance is to be made for weight of rivet heads. Unless otherwise specified an addition of 2.5% of the weight of structure shall be made for shop and site rivet heads in riveted steel structures. No deduction shall be made for rivet/ or bolt holes (excluding holes for anchor or holding down bolts). Deduction in case of rivet or bolt hole shall however be made if its area exceeds 0.02 sqm. The weight of steel sheets, plates and strips shall be taken from relevant Indian standards based on 7.85 Kg/m² for every millimeter sheet thickness. For rolled sections, steel rods and steel strips, weight given in relevant Indian Standards shall be used.

Rate

Rate includes the cost of labour and materials required for all the operations described above.

III. STEEL WORK IN BUILT UP SECTIONS (RIVETED AND BOLTED)

The steel work in built up section (Riveted and bolted) such as trusses, framed work etc. is specified in this clause.

5. Laying Out

A figure of the steel structure to be fabricated shall be drawn on a level platform to full scale. This may be done in full or in parts, as shown on drawings or as directed by the Engineer-in-Charge. Steel tape shall be used for measurements.

6. Fabrication

Fabrication shall generally be done as specified in IS 800. In major works or where so specified, shop drawings giving complete information for the fabrication of the component parts of the structure including the location, type, size, length and details or rivets, bolts or welds, shall be prepared in advance of the actual fabrication and approved by the Engineer-in-charge. The drawings shall indicate the shop and field rivets, bolts and welds. The steel members shall be distinctly marked or stenciled with paint with the identification marks as given in the shop drawings.

Great accuracy shall be observed in the fabrication of various members, so that these can be assembled without being unduly packed, strained or forced into position and when built up, shall be true and free from twist, kinks, buckles or open joints. Wooden or metal sheet

templates shall be made to correspond to each member, and position of rivet holes shall be marked accurately on them and holes drilled. The templates shall then be laid on the steel members, and holes for riveting and bolting marked on them. The ends of the steel members shall also be marked for cutting as per required dimensions. The base of steel columns and the positions of anchor bolts shall be carefully set out at the required location.

The steel section shall be straight or to be straightened or flattened by pressure unless required to be of curvilinear form and shall free from twists. These shall be cut square either by shearing or sawing to correct length and measured by steel tape. No two pieces shall be welded or joined to make up for the required length of member.

7. **Making Holes : Holes through more than one thickness of materials for** members, such as compound stanchion and girder flanges shall, where possible, be drilled after the members are assembled and tightly clamped or bolted together. Punching may be permitted before assembly, provided the holes are punched 3mm less in diameter than the required size and reamed after assembly to the full diameter. The thickness of material punched shall be not greater than 16 mm.

8. ***Rivet Holes***

The diameter for rivets and black bolts holes shall be taken as the nominal diameter of a rivet/ black bolts plus 1.5 mm for rivets/ bolts of nominal diameter less than or equal to 25 mm” and 2.0 mm for rivets of nominal diameter exceeding 25 mm, unless specified otherwise. Holes for turned and fitted bolts shall be drilled or reamed large by 0.2 to 8 mm depending upon the dia. of bolts. Holes shall have their axis perpendicular to the surface bored through. The drilling or reaming shall be free from burrs, and the holes shall be clean and accurate. Holes for rivets and bolts shall not be formed by gas cutting process. Holes for counter sunk bolts shall be made in such a manner that their heads sit flush with the surface after fixing.

9. ***Assembly***

Before making holes in individual members, for fabrication and steel work intended to be riveted or bolted together shall be assembled and clamped properly and tightly so as to ensure close abutting, or lapping of the surfaces of the different members. All stiffeners shall be fixed (or placed) tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or dressed true and straight, and fitted close together.

Web plates of girders, which have no cover flange plates, shall have their ends flush with the tops of angles unless otherwise required. The web plate when spliced, shall have clearance of not more than 5mm. The erection clearance of cleated ends of members connecting steel to steel shall preferably be not greater than 1.5 mm. The erection clearance at the ends of beams without web cleats shall not be more than 3 mm at each end but where for practical reasons, greater clearance is necessary, seating designed suitably shall be provided. Column splices and butt joints of struts and compression members *requiring* contact for stress transmission shall be accurately, machined and close butted over the whole section. In column caps and bases, the ends of shafts together with the attached gussets, angles, channels etc. after riveting together shall be accurately machined so that the parts connected, butt against each other over the entire surfaces of contact. Connecting angles or channels shall be fabricated and placed in position with great accuracy so that they are not unduly reduced in thickness by machining. The ends of all bearing stiffeners shall be machined or grounded to fit tightly both at top and bottom.

10. ***Riveting***

Rivets shall be used, where slip under load has to be avoided.

Preliminaries before Rivetings:- Members to be riveted shall have all parts firmly placed and held together before and during riveting, and special care shall be taken in this respect for all single riveted connections. For multiple riveted connections, a service bolt shall be provided in every third or fourth hole.

11. Process of Riveting

The riveting shall be carried out by using machines of the steady pressure type. However, where such facilities are not available hand riveting may be permitted by the Engineer-in-charge. The rivets shall be heated red hot, care being taken to control the temperature of heating so as not to burn the steel. Rivets of diameter less than 10mm may be driven cold. Rivets shall be finished neat with heads full and of equal size. The heads shall be central on shanks and shall grip the assembled members firmly.

All loose, burnt, or badly formed rivets with eccentric or deficient heads shall be cut out and replaced. In cutting out rivets, care shall be taken so as not to injure the assembled members. Caulking and recapping shall not be permitted.

For testing rivets, a hammer weighing approx. 0.25 kg shall be used and both heads of the rivet (Specially the machine head) shall be tapped. When so tested, the rivets shall not give a hollow sound and a jar where so specified, other tests shall be carried out to ensure the soundness of rivets.

All rivets heads shall be painted with approved steel primer paint within a week of their fixing.

12. Bolting

The nominal length of the bolt shall be the distance from the underside of the head to the further end of the shank. The nominal diameter of the bolt shall be the diameter at the shank above the screwed threads. Bolts, nuts and washers shall be thoroughly cleaned and dipped in double boiled linseed oil, before use. All bolts heads and nuts shall be hexagonal unless specified otherwise. The screwed threads shall conform to IS 1363 and the threaded surface shall not be tapered. The bolts shall be of such length as to project at least two clear threads beyond the nuts when fixed in position, and these shall fit in the holes without any shake. The nuts shall fit in the threaded ends of bolts properly. Where necessary, washers shall be tapered or otherwise suitably shaped to give the heads and nuts of bolts a satisfactory bearing. The threaded portion of each bolt shall project through the nut at least two thread. In all cases where the full bearing area of the bolt is to be developed, the bolt shall be provided with a washer of sufficient thickness under the nuts to avoid any threaded portion of the bolt being within the thickness of the parts bolted together.

Where there is a risk of the nuts being removed or becoming loose due to vibrations or reversal of stresses, these shall be secured from slackening by the use of lock nut, spring washers as directed by the Engineer-in-charge.

13. Erection

Steel members shall be hoisted and erected in position carefully, without any damage to itself, other structures and equipment and injury to workmen. The method of hoisting and erection proposed to be adopted by the contractor shall be got approved from the Engineer-in-charge in advance. The contractor however shall be fully responsible for the work being carried out in a safe and proper manner without unduly stressing the various members and proper equipment such as derricks, lifting tackles, winches, ropes etc. shall be used.

1. The work of erection may be done in suitable units as may be directed by the Engineer-in charge. Fabricated members shall be lifted at such points so as to avoid deformation or excessive stress in members. The structure or part of it placed in position shall be secured against over-turning or collapse by suitable means. During execution, the steel members shall be securely bolted or otherwise fastened when necessary temporarily braced to provide for all loads including those due to erection equipments and its operation to be carried safely by structure during erection. The steel members shall be placed in proper position as per approved drawing, final riveting or permanent bolting shall be done only after proper alignment has been checked and confirmed.

2. Trusses shall be lifted only at nodes. The trusses above 10 m in span shall not be lifted by slinging at two mid points of rafters, which shall be temporary braced by a wooden member of a suitable section. After the trusses are placed in position, purlins and wind bracings shall be fixed as soon as possible. The end of the truss which faces the prevailing winds shall be fixed with holding down bolts, and the other end kept free to move. In case of trusses of spans upto 10m the free end of the truss shall be laid on lead sheet or steel plate as per design, and the holes for holding down bolts shall be made in the form of oblong slots so as to permit the free movements of the truss end. For larger spans the truss shall be provided with proper bearing as per design.
3. Columns and stanchions shall be erected truly vertical with the necessary cross bracing etc. and the base shall be properly fixed with the foundation concrete by means of anchor bolts etc. as per drawing.
4. Anchor bolts to be placed in the concrete foundation should be held in position with a wooden template. At the time of concreting anchor bolt locations shall be provided with suitable timber mould or pipe sleeve to allow for adjustment which shall be removed after initial setting of concrete. The spaces left around anchor bolts shall be linked to a stopping channel in the concrete leading to the side of the pedestal and on the underside of the base plate to allow the spaces being grouted up after the base plate is fixed in the position along with the column footing. Grouting shall be of cement mortar 1:3 (1 cement: 3 coarse sand) or as specified.

14. **Bedding of Column, Stanchions etc.:-** Bedding shall not be carried out until the steel work has been finally levelled, plumbed and connected together. The stanchion shall be supported on steel wedges and adjusted to make the column plumb. For multi-storeyed buildings, the bedding shall not be done until sufficient number of bottom lengths of stanchions have been properly lined, levelled and plumbed and sufficient floor beams are fixed in position. The base plates shall be wedged clear of the bases by M.S. wedges and adjusted where necessary to plumb the columns. The gaps under the base plate may be made upto 25 mm which shall be pressure grouted with cement grouts. With small columns, if permitted by the Engineer-in-charge, the column base shall be floated on a thick cement grout on the concrete pedestal. The anchor bolt holes in the base plate may be made about 10 to 15 mm larger than the bolts. In such cases suitable washers shall be provided.

15. Painting

Before the members of the steel structure are placed in position or taken out of the workshop these shall be painted as specified in 10.2.2.

16. Measurements

The work as fixed in position shall be measured in running metres correct to a millimeter and their weight calculated on the basis of standard tables correct to the nearest kilogram.

The standard weight of steel sections shall conform to IS 808 with tolerance in sizes as per IS1852. Tolerance in weight is given in Table 10.3. Steel sections shall be acceptable within tolerance limits. Payment for steel sections shall be made as per actual weight within tolerances. Sections having weight on higher side than permissible tolerance, may be acceptable but payment shall be made on the basis of standard weight only. Steel sections having weight variations lower than permissible variation shall not be acceptable.

Unless otherwise specified. Weight of cleats, brackets, packing pieces, bolts nuts, washers, distance pieces, separators diaphragm gussets (taking overall square

dimensions) fish plates etc. shall be added to the weight of respective items. No deductions shall be made for skew cuts. In riveted work, allowance is to be made for weight of rivet heads. Unless otherwise specified and addition of 2.5% of the weight of structure shall be made for shop and site rivet heads in riveted steel structures.

No deduction shall be made for rivet/ or bolt holes (excluding holes for anchor or holding down bolts). Deduction in case of rivet or bolt hole shall, however, be made if its area exceeds 0.02 m².

The weight of steel sheet and strips shall be taken from relevant Indian Standards based on 7.85 kg/m² for every millimetre sheet thickness. For rolled sections, steel rods and steel strips, weight given in relevant Indian Standards shall be used.

IV. **STEEL WORK IN BUILT UP SECTION (WELDED)**

The steel work in built up sections (welded) such as in trusses, form work etc. is specified in this clause.

1. **Fabrication**

Straightening, shaping to form, cutting and assembling, shall be as per above mentioned clause as far as applicable, except that the words "riveted or bolted" shall be read as "welded" and holes shall only be used for the bolts used for temporary fastening as shown in drawings.

2. **Welding** : Welding shall generally be done by electric arc process as per IS 816 and IS 823.

The electric arc method is usually adopted and is economical. Where electricity for public is not available generators shall be arranged by the contractor at his own cost unless otherwise specified. Gas welding shall only be resorted to using oxyacetylene flame with specific approval of the Engineer in-charge. Gas welding shall not be permitted for structural steel work Gas welding required heating of the members to be welded along with the welding rod and is likely to create temperature stresses in the welded members. Precautions shall therefore be taken to avoid distortion of the members due to these temperature stresses.

The work shall be done as shown in the shop drawings which should clearly indicate various details of the joint to be welded, type of welds, shop and site welds as well as the types of electrodes to be used. Symbol for welding on plans and shops drawings shall be according to IS 813.

As far as possible every efforts shall be made to limit the welding that must be done after the structure is erected so as to avoid the improper welding that is likely to be done due to heights and difficult positions on scaffolding etc. apart from the aspect of economy. The maximum dia. of electrodes for welding work shall be as per IS 814. Joint surfaces which are to be welded together shall be free from loose mill scale, rust, paint, grease or other foreign matter, which adversely affect the quality of weld and workmanship.

3. **Precautions** : All operation connected with welding and cutting equipment shall conform to the safety requirements given in IS 818 for safety requirements and Health provision in Electric and gas welding and cutting operations.

Inspection and testing of welds shall be as per IS 822.

4. **Assembly** : Before welding is commenced, the members to be welded shall first be

brought together and firmly clamped or tack welded to be held in position. This temporary connection has to be strong enough to hold the parts accurately in place without any disturbance. Tack welds located in places where final welds will be made later shall conform to the final weld in quality and shall be cleaned off slag before final weld is made.

5. **Erection** : The specification shall be as described above except that while erecting a welded structure adequate means shall be employed for temporary fastening the members together and bracing the frame work until the joints are welded. Such means shall consists of applying of erection bolts, tack welding or other positive devices imparting sufficient strength and stiffness to resist all temporary loads and lateral forces including wind. Owing to the small number of bolts ordinarily employed for joints which are to be welded, the temporary support of heavy girders carrying columns shall be specially attended. Different members which shall be fillet welded, shall be brought into as close contact as possible. The gap due to faulty workmanship or incorrect fit if any shall not exceed. 1.5 mm if gap exceeds 1.5 mm or more occurs locally the size of fillet weld shall be increased at such position by an amount equal to the width of the gap.

6. **Painting** : Before the member of the steel structures are placed in position or taken out of the workshop these shall be painted as specified above.

7. **Measurements**

The mode of measurements shall be the same as above mentioned except that weight of welding material shall not be added in the weight of members for payment and nothing extra shall be paid for making and filling holes for temporary fastening of members during erection before welding.

MECHANICAL PROPERTIES AND CHEMICAL COMPOSITION OF STEEL

TABLE 10.1
Chemical Composition

Grade Designation	Quality	Ladle analysis, Percent, Max					Carbon Equivalent (CE), Max	Method of Dexodiation ¹
		C	Mn.	S	P	Si		
1	2	3	4	5	6	7	8	9
E 165 (Fe 290)	-	0.25	1.25	0.045	0.045	-	-	Semi-killed or killed
E 250 (Fe 410 W)	A	0.23	1.50	0.045	0.045	0.40	0.42	Semi-killed or killed
E 250 (Fe 410 W)	B	0.22	1.50	0.045	0.045	0.40	0.41	Killed
E 250 (Fe 410 W)	C	0.20	1.50	0.040	0.040	0.40	0.39	Killed
E 300 (Fe 440)	-	0.20	1.30	0.045	0.045	0.45	0.40	Semi-killed or killed
E 350 (Fe 490)	-	0.20	1.50	0.045	0.045	0.45	0.42	Semi-killed or killed
E 410 (Fe 540)	-	0.20	1.60	0.045	0.045	0.45	0.44	Semi-killed or killed
E 450 (Fe 570)	D	0.22	1.60	0.045	0.045	0.45	0.46	Semi killed or killed
E 450 (Fe 590)	E	0.22	1.80	0.045	0.045	0.45	0.48	Semi killed or killed

Notes:

1. Carbon equivalent (CE) based on ladle analysis =

$$\frac{\text{Mn}}{\text{C} + 6} + \frac{(\text{Cr} + \text{Mo} + \text{V})}{5} + \frac{(\text{Ni} + \text{Cu})}{15}$$

2. When the steel is killed by aluminium alone, the total aluminium content shall not be less than 0.02 per cent. When the steel is killed by silicon alone, the silicon content shall not be less than 0.10 per cent. When the steel is silicon-aluminium killed, the silicon content shall not be less than 0.30 per cent and total aluminium content shall not be less than 0.01 per cent.

3. Micro alloying element like Nb, V, Ti and B shall be added singly or in combination. Total micro alloying element shall not be more than 0.25.
4. New grades designation system based on yield stress has been adopted, simultaneously old designations have also been given in parentheses.
5. Steel of qualities A, B and C are generally suitable for welding processes. The weldability increases from quality A to C.
6. Copper may be present between 0.20 to 0.35 per cent as mutually agreed to between the purchaser and the manufacturer. The copper bearing quality shall be designated with a suffix Cu, for example, E 250 Cu. In case of product analysis, the copper content shall be between 0.17 and 0.38 per cent.
7. Nitrogen content of steel shall not exceed 0.012 per cent which shall be ensured by the manufacturer by occasional check analysis. For micro alloyed steel this is to be reduced to 0.009 per cent.
8. The steel, if required may be treated with rare earth element for better formability.
9. Lower limits for carbon equivalent and closer limits for other elements may be mutually agreed to between the purchaser and the manufacturer.
10. Incidental element-Elements not quoted in Table 1 shall not be intentionally added to steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition from scrap or other materials used in manufacture of such elements which affect the hardenability, mechanical properties and applicability.

1. "To be supplied subject to the agreement between the purchaser and the manufacturer".

TABLE 10.2
Mechanical Properties

Grade Designation	Quality	Tensile strength Min. MPa	Yield stress, ReH Min. MPa			Percentage elongation at Gauge length L_0 5.65 $\sqrt{S_0}$ Min.	Internal Bend Diameter (Min.)		Charpy V-Notch Impact Energy Min. J	
			<20	20-40	>40		<25	>25	at Room Temp.	At 20°C
1	2	3	4	5	6	7	8	9	10	11
E 165 (Fe 290)	-	290	165			23	2t	-	-	-
E 250 (Fe 410 W)	A	410	250	240	230	23	3t	2t	-	-
E 250 (Fe 410 W)	B	410	250	240	230	23	2t	3t	27 (See Note 3)	
E 250 (Fe 410 W)	C	410	250	240	230	23	2t	3t	27 (See Note 3)	
E 300 (Fe 440)	-	440	300	290	280	22	2t	3t	50	30
E 350 (Fe 490)	-	490	350	330	320	22	2t	3t	50	25
E 410 (Fe 540)	-	540	410	390	380	20	2t	3t	50	25
E 450 (Fe 570)	D	570	450	430	420	20	2t	3t	45	20
E 450 (Fe 590)	E	590	450	430	420	20	2t	3t	45	20

1 1 MPa= 1MN/m² = 0.102 kgf/mm² =144.4 psi

2 Temperature of Charpy impact values will be subject to mutual agreement.

3 The more stringent requirements than those given above may be as agreed to between the purchaser and the manufacturer.

TABLE 10.3

Sl. No.	Steel Section	Tolerance in weight per meter percentage		Standard weight as per IS
		Plus Side	Minus Side	
(i)	Beams and columns (RS joists)	(a) Beams ≤ 200 mm	(-) 1	IS 808
		(+) 4		
		(b) > 200 mm		
(ii)	Channels	2.5	2.5	IS 808
(iii)	Equal and unequal leg Angles			
	(a) upto 3 mm thickness	5	5	IS 808
	(b) Over 3 mm thickness	5	3	
(iv)	Tee bars			
	(a) Web thickness upto 3 mm	5	5	IS 1173
	(b) Web thickness above 3 mm	2.5	2.5	
(v)	Bulb angles	2.5	2.5	IS 1252
(vi)	Bars in straight length			
	Upto and including 10 mm	7	7	IS 1732
	Over 10 mm and upto and including 16 mm	5	5	
	Over 16 mm	3	3	
(vii)	Bars in coils	Weight tolerance is not applicable		
(viii)	Flats			
	Upto 3 mm thickness	5	5	
	Over 3 mm thickness	5	3	
(ix)	Plates	5	2.5	IS 1730
(x)	Strips	10	10	IS 1730
	Consignment in straight length			
	(i) upto 5 tons	7	7	IS 1730
	(ii) Above 5 tons	5	5	
(xi)	Sheets			
		Thickness		
	Over in mm	Upto and including in mm	Tolerance on calculated weight (Percent)	IS 1730
		1.25 mm	± 9	
	1.25 mm	1.60	± 8	
	1.6	4.00	± 7	

WELDING PROCESS

- The work shall be positioned for downward welding wherever possible.
- Arc length voltage and amperage shall be suited to the thickness of material, type of groove and other circumstances of the work. The welding current and electrode sizes for different types of joints shall be as per IS 9595.
- The sequence of welding shall be such as will avoid undue distortion and minimize residual shrinkage stresses. Recommendation of IS 9595 shall be followed.

Process of Welding

The electrode manipulation during welding shall be such as to ensure that:

- The parent metal is in a fused stage when the filler metal makes contact with it.
- The weld metal does not overflow upon any unfused parent metal forming overlapping.
- The parent metal is not under-cut along the weld toes.
- The flowing metal floats, the slag, the oxides, and the gas bubbles to the surface behind the advancing pool. In case any of these requirements is unattainable by manipulation, the current shall be adjusted or the electrode size changed. Each time the arc is started the electrode shall be moved in such a way that the fusion of base metal at the starting point is assured. At the completion of a run the movement of electrode shall be slowed down to fill the arc crater. After every interruption of the arc except at completion of a run, the arc shall be restarted ahead of the previous deposit and then move back to fill the crater or such alternative technique shall be used as will ensure complete filling of the crater, or complete fusion between the new and old deposit and the base metal at the point of junction, and result in continuity of weld, Before welding operation is completed, all traces of slag shall be removed from the deposit, by chipping if necessary,

and the deposit and the adjoining base metal shall be wire brushed and cleaned at all points. The requirements shall apply not only to successive layers, but also to successive beads, and to the over lapping area wherever a junction is made on starting a new electrode.

- (5) The welds shall be free from cracks, discontinuity in welding and other defects such as (i) under-size (ii) over-size, (iii) under-cutting and (iv) over-cutting in the case of fillet welds and defects (ii), (iii) & (iv) in the case of butt welds.

All defective welds which shall be considered harmful to the structural strength shall be cut out and rewelded. In case of welded butt joints in steel of thickness upto 50mm the weld joint shall be subjected to radiographic examination as described in IS 1182.

All welds shall be cleaned of slag and other deposits after completion. Till the work is inspected and approved painting shall not be done. The surface to be painted shall be cleaned of spatter, rust, loose scale, oil and dirt.

Reference IS Codes to be followed:

1. IS:277: Specification - Galvanized steel strips and sheet (Plain & Corrugated).
2. IS: 800 : Code of Practice for General Construction in Steel.
3. IS: 806 :Code of Practice for use of Steel tubes in general building construction
4. IS: 808: Dimensions for hot rolled steel beam, column, channel and angle sections
5. IS: 812: Glossary of Terms Relating to Welding and Cuhing of Metal.
6. IS: 813: Scheme of Symbol for Welding
7. IS: 814: Covered Electrodes for Manual Metal Arc Welding of Carbon and Carbon Manganese Steel.
8. IS: 816: Code of Practice for Use of Metal Arc Welding for General Construction in Mild steel
9. IS: 817: Code of Practice for Training and Testing of Metal Arc Welders.
10. IS: 818: Code of Practice for safety and health requirements in electric and gas welding and cutting operations.
11. IS: 822: Code of Practice for Inspection of Welds.
12. IS: 1161: Steel Tube for Structural purposes.
13. IS: 1278: Filler Rods and Wires for Gas Welding.
14. IS: 1363: Hexagonal Bolts, Screws and Nuts of Product Grade-C.
15. IS: 1364: Hexagonal Bolts, Screws and Nuts of Product Grade A & B.
16. IS: 1367: Technical Supply Conditions of Threaded Steel Fasteners.
17. IS: 1393: Code of Practice for Training and Testing of Oxy-acetylene Welders.
18. IS: 1477: Practice for Painting of Ferrous Metals in Buildings.
19. IS: 1608: Code of Practice for Testing of Metallic materials.
20. IS: 1730: Dimensions for steel plates, sheets, strips and flats for general engineering purpose
21. IS: 185Z: Rolling and cutting tolerances for hot rolled steel products.
22. IS:2016: Plain Washers
23. IS:2062: Steel for General Structural Purposes.
24. IS:2629: Recommended practice for Hot Dip Galvanizing on Iron & steel.
25. IS: 3502: Steel Chequered Plates.
26. IS: 3640: Hexagon fit bolts
27. IS: 3757: High strength structural bolts.
28. IS: 4000: High strength structural bolts in steel structures - Code of Practice. Ho Dip Zinc

29. IS: 4759: Hot Dip Zinc Coating on Structural Steel and other allied products.
30. IS: 4923: Specification - Hollow steel sections for structural use.
31. IS: 5369: General Requirements of Plain Washers and Lock Washers.
32. IS: 6419: Welding Rods and Bare Electrodes for Gas Shielded Arc Welding of Structural Steel.
33. IS: 6610: Heavy Washers for Steel Structures.
34. IS: 6623: High Strength Structural Nuts.
35. IS: 6639: Specification for hexagon bolts for steel structures.
36. Specification for hardened and tempered washers for high strength structural bolts and nuts
37. IS: 6745: Specification for hexagon bolts for steel structures.
38. IS: 7025: Safety Code for Erection of Structural Steel Works.
39. IS: 7215: Tolerances for Fabrication of Steel Structures.
40. IS: 7307: Approval Test for Welders Working to Welding to Approved Welding Procedures
41. IS: 8172: Vertical Steel ladder.
42. IS: 12778: Hot rolled parallel flange section for beams, columns, and bearing pile — dimension and section properties.
43. IS: 12B43: Tolerances for execution of Steel Structures.

SAND BLASTING

Providing and applying sand blasting as per ISO 8501/other relevant standards,/as directed by EIC on MS structural members ,including all labour ,materials, transportation etc. Complete.

5.80 INTERNAL , EXTERNAL DRY WALL CONSTRUCTION (LGS SYSTEM) AND FACADE WORK

Designing, providing, installing and fixing factory finished custom designed cold form Light Gauge Steel Framed comprising of steel wall panel, manufactured out of minimum 0.70 mm thick steel sheet as per design requirements. The steel sheet shall be galvanized (AZ- 150gms Aluminum Zinc Alloy coated steel having minimum yield strength 300-550 Mpa) conforming to AISI specifications and IBC 2009 LGSFS frame shall be designed as per IS: 801 using commercially available software such as Frame CAD Pro-11.7/ STAAD PRO-V8i/ArchitekV2.5.16/ Revit architecture-2011 or equivalent.

The framing section shall be cold form C-type having minimum web depth 89 mm x 39mm flange x 11mm lip in required length as per structural design requirement duly punched with dimple/slot at required locations as per approved drawings. The slots will be along center line of webs and shall be spaced minimum 250mm away from both ends of the member. The frame can be supplied in panelized or knock down condition in specific dimensions and fastened with screws extending through the steel beyond by minimum of three exposed threads. All self-drilling tapping screws for joining the members shall have a Type II coating in accordance with ASTM B633(13) or equivalent corrosion protection of gauge 10 & 12, TPI 16 & 8 of length 20mm. The frames shall be fixed to RCC slab or Tie beam over Neoprene rubber using self-expanding carbon steel anchor bolt of dia as per approved drawings.

The rate includes the concept design, detailed design, fabrication of sections, transportation, installation and all required fixing arrangement at site as described above.

(a) EXTERNAL WALL SYSTEM

Providing and fixing of external wall system on Light gauge steel frame work with outer face cement boards as per standard sizes fixed with self- drilling /taping screws / fasteners @ 60cm c/c of approved make. A groove of 2 mm to 3mm shall be maintained and grooves shall be sealed with polymer/silicon-based sealant. The board shall be fixed in a staggered pattern. Screws shall be of counter sunk rib head of 1.60mm to 4 mm thick or 8 to 10 gauge of length varying from 25 to 45 mm and. Internal face 12.5 mm thick gypsum plaster board fixed on cement board as per standard sizes fixed with self- drilling /taping screws / fasteners @ 60cm c/c of approved make, proper taping and jointing to be done using fibre mesh tape and epoxy and acrylic based jointing compound for seamless finish.

Outer face: Outer face having 9mm thick HD fibre cement board fixed on 8mm thick fibre cement board, Type A, as per IS:14862:2000 (high pressure steam cured) Inner Face: - 12.5 mm thick gypsum plaster board conforming to IS 2095:2011 fixed on 8 mm thick fibre cement board confirming to IS: 14862:2000 of type B (High pressure steam cured)

Outer face: Outer face having 8 mm thick cement bonded particle Board fixed on 10 mm thick cement bonded particle board. (Termite, Fire and Moisture Resistance) as per IS 14276:1995. Inner face: -12.5 mm thick gypsum plaster board conforming to IS 2095:2011 fixed on 8 mm thick cement bonded particle board (Termite, fire and moisture resistance) confirming to IS:14276:1995) Sub A/R-1 Filling the groove (i.e. 2-3mm gap between boards), taping and jointing of the first layer 6mm and 9mm thick fibre cement boards with epoxy based sealing compound or with silicon sealant. Second layer is fixed over it in a staggered pattern.

(b) Internal Wall system

Providing and fixing internal wall panels on Light gauge steel frame work with 12.5mm thick gypsum plaster board conforming IS 2095:2011 fixed on cement board as per standard sizes fixed with self-drilling / taping screws / fasteners @ 60cm c/c of approved make, Screws shall be of counter sunk rib head of 1.60mm to 4 mm thick or 8 to 10 gauge of length varying from 25 to 45 mm. Proper taping and jointing to be done using fibre mesh tape and epoxy and acrylic based jointing compound for seamless finish.

Cement Fiber Board 8 mm thick as per IS 14862:2000 of type B (High pressure Steam Cured) Cement Bonded particle board 8 mm (Termite, Fire & Moisture Resistance), as per IS:14276:1995

(c) FACADE System

Providing and fixing of facade system on Light gauge steel frame work with both face having double layer of cement boards as per standard sizes fixed with self- drilling /taping screws / fasteners @ 60cm c/c of approved make. A groove of 2 mm to 3mm shall be maintained and grooves shall be sealed with acrylic/polymer/silicon-based jointing compound for seamless finish. The boards shall be fixed in a staggered pattern. Screws shall be of counter sunk rib head of 1.60mm to 4 mm thick or 8 to 10 gauge of length varying from 25 to 45 mm and.

Both Outer face: Outer face having 9mm thick HD fibre cement board fixed on 8mm thick fibre cement board, Type A, as per IS:14862:2000 (high pressure steam cured)

5.81 WATER PROOFING BELOW RCC FOUNDATION

(a) (Water proofing for foundation)

Horizontal application - the membrane must be applied to smooth, prepared substrate, concrete binding is preferred. substrate shall be free from loose aggregate or other sharp protrusions. Standing water must be removed to prevent contamination of overlaps and subsequent compromise of waterproof properties.

Supply and laying of 1.2 mm Thick (Based on manufacturer specifications) HDPE 80 membrane (below Raft) which is pressure sensitive, Fully bonded and foot trafficable, weather resistant, which bonds with poured concrete so that prevents water ingress or migration. The membrane will have following properties

- (i) puncture resistance of > 900 N per ASTM E154,
- (ii) tensile strength \geq 21MPa as per ASTM D412 , and
- (iii) Hydrostatic head resistance >70m as per ASTM D 5385 and resist lateral migration of water
- (iv) Peel Strength to Poured-in-Place Concrete after 7 days of water immersion should be $>880\text{N/m}$ as per ASTM D 903.
- v) Lap peel adhesion of $>400\text{ N/m}$ at 22°C as per ASTM D1876.
- vi) Elongation of at least 500 % as per ASTM D412.

All systems to be installed as per manufacturer's specification and executed by manufacturer's certified applicators. Rates includes all lead and lift, for all materials, labours as directed by Engineer-in-Charge. The membrane shall be capable of UV exposure without additional protection for a maximum of 45 days prior to concrete pouring. Also Providing Joint treatment to earthing rods complete as per approved Specification and drawings Complete including cost of all labour, material, T & P, lead, lift, taxes etc. as per instruction & satisfaction of EIC.

Make : Asian Paint /Pidilite/MYK Arment/Kerakoll or equivalent

(b) Waterproofing for Terraces

SUSTAINABLE HIGH PERFORMING HIGH SRI COOL ROOF SYSTEM - COOL TOPS PREMIUM (5 COAT) Providing and applying with prior surface preparation, a set of coatings by different GRIHA & GREEN PRO certified product systems to provide with highly elastomeric High Albedo coatings of Panache designed COOL TOP PREMIUM Cool Roofing System, the system having minimum Solar Reflective Index value of not less than 108 (SRI) and aged SRI of min 75 after 4years, maintaining the thickness of not less than 300 micron for the complete system, providing energy efficiency and reducing the cooling load on the buildings. A sustainably performing Panache designed Premium Cool Roof System of five-coat NIR (Near Infra radiation) elastomeric Cool Roof coating system with Green Pro & GRIHA certified products on clean dirt , oil, grease free various substrates like Cemented roofs, Cement/Marble/terracotta/ Mangalore Tiled roofs, existing China mosaic installed roofs; Shingles, Flat & Slant roofs, GI (Galvanized Iron) roofs, Pre-coated sheet / new existing, pre-installed roofs , old AC (Asbestos / Cement) roofs, Cement corrugated Sheets with saturated two coats of insulating ceramic based anchoring coat of Panache make Cool Guard, reducing

the porosity of the substrate and strongly bonding with the substrate, maintaining the thickness of not less than 150 micron; two coats of highly IR Reflective elastomeric coats of Panache make Cool Top maintaining the thickness not less than 100 microns , providing elasticity, elongation, U V resistance with high reflectivity & emissivity to the surface adding the cooling property to the cool roofing system and one coat of transparent UV Protective Coat of Panache make TRANSEAL maintaining the reflectivity & enhancing the life of the treated Cool Tops coated roofs maintaining the thickness not less than 50 micron ; protecting the surface from water, dirt, algae fungus development & providing the anti-carbonation benefits to the complete roof structure.

Surface Treatment: Providing and laying water proofing treatment of roof including cleaning the surface with wire brush, treating all surface cracks, construction joints and honeycombs by grouting with specialized non shrink grout and preparation of surface in all aspects to receive the waterproofing.

Coving: Providing and Applying at the junction of slab and vertical offsets with Cement Mortar 1:4 and admixed with ReArm Bond SBR 45 at dosage of 5 litre per 50kg cement.

Application of Primer: Apply Epoxy based primer FloArm Primer 1260 of MYK Arment or equivalent over well prepared surface at 200-400 gm per Sq.m.

Application of Polyurea waterproof coating: Providing and applying Two component liquid applied hybrid polyurea based waterproofing system AquaArm Purtech H1 of MYK Arment or equivalent . It has to be applied @1.5 kg/sq.m to achieve a thickness of 1.5 mm in two coats. The membrane will have the following technical parameters: Tensile Strength (ASTM D 412) : >12 N/mm² , Elongation at break (ASTM D 412) : >500% , Tear Resistance (DIN 53515): 50 N/mm, Adhesion To concrete (ASTM D 4541-02) : >1.5 N/mm² (concrete failure), Puncture resistance (ASTM E 154) : 800N ± 100.

Providing and laying 150 Gsm Geo fabric membrane as separation layer.

Protection Screed: Horizontal Areas: Providing and Laying M25 grade screed concrete in 1:100 to an average thickness of 100 mm mixed with Integral Waterproofing admixture AquaArm Proof WP 10 at the dosage of 125 ml/bag of cement over waterproofing layer to a minimum thickness of 75 mm as per site requirement including control joints of 4M X 4M size and filling the panels with polyurethane sealant.

5.82 GRC JALI.

PART 1 – GENERAL Specification for GRC.

1.1 RELATED DOCUMENTS

A. To be read with the general conditions sections of this specification and other related sections of the contract documents.

1.2 SUMMARY

A. Section includes GRC Panels/Jali/Fines using/without steel structures as a grid work which is fixed on Prefabricated Structure.

1.3 FAÇADE TYPOLOGY INCLUDED

A. GRC Jali

B. GRC Cladding.

C. GRC Fines.

D. GRC Cornices

1.4 REFERENCES

A. Recommended practice for GRC panels – PCI Manual 4th edition.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include GRC design mixes.

B. Shop Drawings: Show fabrication and installation details for GRC panels, including the following:

1. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Panel elevations, sections, and dimensions.
3. Thickness of facing mix, GRC backing and bonding pads for typical panels.
4. Finishes.
5. Joint and connection details.
6. Erection details.
7. Panel frame details for typical panels, including sizes, spacing's, thicknesses, and yield strengths of various members.
8. Locations and details of connection hardware attached to structure.
9. Size, location, and details of flex, gravity, and seismic anchors, etc. For typical GRC Elements.
10. Other items sprayed into GRC Elements.
11. Erection sequence for special conditions.
12. Relationship to adjacent materials.
13. Descriptions of loose, cast-in, and field hardware.

C. Samples:

1. Prior to commencement of manufacture, submit range samples of the proposed finish representative of the finished face showing typical range of colour and texture.
2. Design reference samples for initial verification of design intent, approximately 12 by 12 inches (300 by 300 mm) and of actual thickness, representative of finishes, colour, and textures of exposed surfaces.

1.6 MOCK-UPS

A. Element: At an agreed stage during detailed design construct in approved location a mock-up of: As per drawings.

B. Function: As installation reference GRC Elements.

C. The subcontractor must make provision for constructing a full-size/Part mock-up to inspect the unit's relative to the adjacent structure, metal screens, brackets, windows, etc.

D. Inspection: Obtain approval of appearance before proceeding. Retain mock-up in undisturbed condition until completion of GRC installation cladding/ components.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For GRC manufacturer, must have minimum 10 years of experience and Work Order of 10 Cr or above

B. Mill Certificates: For structural-steel shapes and hollow structural sections used in panel framing (Manufacturer Raw Material Certificate).

C. Steel Sheet Certification. For steel sheet used in cold-formed steel panel framing for fabrication work if any.

D. Source Quality-Control Program: For GRC manufacturer.

E. Source Quality-Control Test Reports: For GRC, inserts, and anchors.

F. Welding Certificates for Fabrication work if any.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that follow as per GRCA/PCI's

Guidelines.

B. Manufacturer's responsibility includes fabricating [and installing] GRC panels and providing professional engineering services needed to assume engineering responsibility for GRC panels.

C. Engineering responsibility includes preparation of Shop Drawings and comprehensive engineering analysis, based on GRC production test values, by a qualified professional engineer experienced in GRC design.

D. QAP/QC shall be maintained throughout the production of the glass fiber reinforced concrete Elements. Contract out the remainder of the units to be manufactured at a 10 Years' Experience plant/Manufacturer.

E. Source Limitations: Obtain GRC panels through one source from a single manufacturer.

I. GRCA/PCI Manuals: Comply with requirements and recommendations in the following PCI manuals, unless more stringent requirements are indicated:

1. PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels."

2. PCI MNL 130, "Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products".

J. Mock-ups: Build mock-ups to demonstrate aesthetic effects and set quality standards for fabrication and installation.

K. Pre-installation Conference.

1.9 TESTING

A. Quality Control:

1. Contractor shall submit a report prior to commencing work that details the testing methodology and procedures to the Engineer for approval based on the following.

2. All testing procedures are to be in accordance with ASTM C974-03, ASTM C948-81(2001), ASTM C122896(2004), ASTM C1230-96(2004), ASTM C1229-94(2001), describing methods for determining properties of glass fibre reinforced material. External/Internal Test Certificate to be submitted along the whole project for max 200 sq. mt every time.

3. Reference should be made to the standard details of the following tests:

a. Determination of the glass content of uncured glass fibre reinforced material.

b. Water/solid ratio of the cementitious matrix of uncured glass fibre reinforced material.

c. Determination of the dry and wet bulk densities, water absorption and apparent porosity of the Cured glass fibre reinforced material.

d. Determination of the limit of proportionality, modulus of rupture, and directionality ratio of cured glass from reinforced cement material 10 mm to 12.5 mm OR 12.6 mm to 15 mm thickness.

B. Dry Materials:

1. Production samples: Take during manufacture.

2. Constituent samples: Take roving, sand, cement and facing material samples from each consignment. Store until test data has been processed.

a. Admixtures, curing agents, formwork release agents: Retain manufacturers' certificates.

C. Wet Materials:

1. Production samples: Take before production starts and when mix or equipment settings are changed.

a. Matrix consistency

b. Roving delivery rate: Bag test to GRCA, 'Specification for the manufacture, curing and testing of GRC products'.

2. Test boards: Take from each shift.

a. Fibre content standard: To ASTM C1229-94(2001).

3. Thickness tests: At regular intervals over area of each production panel.

4. Values for compliance: a. Minimum fibre content requirement (for all mixes): As mix design.

D. Production Non-Compliance:

1. Extent of GRC at risk:

a. Failure of single test board: Material produced between previous complying test board and next complying test board.

b. Failure of consecutive groups of four boards: First and fourth test boards together with all intervening material.

2. Action in the event of production non-compliance: Submit proposals.

E. Pull Out Test for Anchors:

1. Pull out test for all anchoring Systems to be conducted by an approved Third Party or by approved. This is if required.

Manufacturer in the job site. Test results to be submitted to Engineer for approval.

2. Cladding/ components.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Handle and transport GRC panels to avoid damage.

1. Place non-staining resilient spacers between panels.

2. Support panels on non-staining material during shipment.

3. Protect panels from dirt and damage during handling and transport.

B. Store GRC panels to protect from contact with soil, staining, and physical damage.

1. Store panels with non-staining resilient supports in same positions as when transported.

2. Store panels on firm, level, and smooth surfaces.

3. Place stored panels so identification marks are clearly visible.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

A. Completion of Design:

1. GRC: Complete detailed design.

a. Compliance: To GRCA 'Specification for the manufacture, curing and testing of GRC products'.

b. Related works: Coordinate in detailed design.

B. Minimum Properties of GRC as per below.

C. General:

1. Design, detail, fabricate, supply, and install panels and associated features shown on the Contractor is responsible for the detailed structural design, integrity and fixing of panels to meet the criteria shown on the Engineer's drawings and coordination with other building and safety elements.

2. Where the Engineer's approval is called for within this section of the specification this refers to design intent only

3. Where, in the tenderer's opinion the panels can be fabricated in a more economical method, such as precast concrete in lieu of glass fibre reinforced concrete, this is to be qualified and a separate schedule indicating these prices to be submitted.

D. Integrity of Cladding:

1. All works are to be executed according to the valid standard, directives, government codes and building regulations, prior requirements, and any other applicable recommendations and regulations, such as:

a. Requirement: Determine sizes and thickness of cladding panels, size, number and spacing of fixings, configuration and location of secondary support systems and incorporation of accessories to ensure the cladding system will resist factored dead, imposed and design live loads, and accommodate deflections and thermal movements

without damage.

b. Refer to the schedule and architectural drawings for size, location, and type of panels, JALI, Fine, and Cornice etc.

c. If required by the design, all panels and associated features must be weather tight under all conditions. Adequate connection grooves and drainage pipes to drain moisture from the inner face panels, together with ventilation to the cavity must be provided. This includes the junction between panels and precast elements, and the interface with adjacent elements and support structure.

d. If required by the design, panels to be free draining. Specialist sub-contractor to ensure detailed panel design allows adequate drainage and drip details to prevent future staining of panels or materials below panels.

e. All panels and cladding must accommodate without damage, all drying, shrinkage, creep, deflections, and thermal movement.

f. All precast units must be reinforced as necessary to resist shrinkage, handling stresses, and service loads. Webs to framed units must be reinforced.

g. All panels and elements are to be detailed to ensure compliance with the specified requirements for accuracy in both manufacture and erection, to accommodate deviations in the building structure. The Sub-Contractor is to ensure that the design of the panels considers the alignment, devices, and methods of fixing which will give ample adjustability in three dimensions relative to the location of the panels or elements.

2. Wind loads: Wind load shall be calculated according to IS 875 Part-3 2015 considering mean recurrence interval of 50years.

3. Dead loads Dead load shall be computed by considering the self-weight of the cladding system and the associated components including the fixtures, accessories, etc.

4. Impact loads

5. Thermal Induced Load Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects. Consider temperature of +/- 45°C without any reduction in the specified performance.

6. Deflection Limit: The allowable deflection limit should be $L/240$.

7. Stress Limit: As per PCI Manuals.

E. Panel Accuracy:

1. Accuracy of moulds: Check overall dimensions, straightness, square-ness, twist, and flatness of moulds immediately before each reuse, and of each unit as soon as possible after demoulding. Make adjustments to moulds as necessary.

F. Fire Endurance:

1. PCI Manual 4th Edition, clause 4.11.

2.2 COMPONENTS

A. GRC Cladding panels/Jali/Cornices/Fins etc:

1. Primary support structure: Reinforced concrete frame with dense blockwork infill.

2. GRC units:

a. Backing mix and production method: As per specialist subcontractor's recommendation and to Engineer's approval.

b. Construction: Ribbed single skin panels or as per specialist subcontractors detail design.

c. Finish: Self finished pigmented panels finished as drawings.

d. Fire rating: External surfaces: Class 1 surface spread of flame to BS 476-7.

e. Additional performance requirements: As per drawings.

3. Fixings and fasteners: As indicated.

4. Joints: Open drained joints/Sealant.

5. Cavity barriers: Not required.
 6. Thermal insulation: Not required.
 7. Air barrier: As per drawings. a. Accessories/ Other requirements: As per drawings or as required by specialist sub-contractor.
 - B. GRC Components as Shown on Drawings:
 1. Primary support structure as drawings.
 2. GRC components:
 - a. Backing mix and production method: Specialist sub-contractor to submit proposals for.
 - b. Engineer's approval.
 - c. Construction: Specialist sub-contractor to submit proposals for Engineer's approval.
 - d. Finish: Specialist sub-contractor to submit proposals for Engineer's approval.
 - e. Fire rating: External surfaces: Class 1 surface spread of flame to BS 476-7.
 3. Fixings and fasteners: As indicated.
 4. Joints: As drawings.
 - a. Accessories/ Other requirements: As drawings.
 - C. Fixings and Fasteners to Cladding:
 1. Design: Fixings and fasteners for lifting/ fixing into position to GRCA 'Guide to fixings for glass fibre reinforced concrete cladding'.
 2. Loadbearing fixing type: Anchor to be Chisel pointed threaded anchor steel rod c/w full nut and washer, secured with HVU foil capsule, urethane-methacrylate based synthetic resin grout. Resin to be Styrene free with two hours fire rating/integrity.
 - a. Material: HDG/Epoxy Painted/equivalent.
 3. Manufacturer: Contractor to submit proposals for Engineers approval.
 4. Manufacturer: Contractor to submit proposals for Engineers approval.
 5. Extent of adjustment: To accommodate support structure and cladding fabrication/ installation tolerances.
 6. Method of fixing to primary support structure: Site drilling, coring, or cutting into structure:
 7. Contractor to submit proposals for positions other than shown on detail drawings for approval by Engineer.
 - a. Isolation of fixings: Separate dissimilar metals at risk of bimetallic corrosion with suitable plastics washer, sleeves etc.
 - D. Panel Reinforcement:
 1. In addition to the reinforcement required for structural purposes, all precast units must be reinforced as necessary to resist handling and shrinking stresses if required as per design.
 2. All stainless-steel reinforcement is to be type HDG/Epoxy painted/equivalent.
 3. At time of placing concrete, all reinforcement is to be cleaned and free of corrosive pitting, loose mill scale, rust, oil, and other substances that may adversely affect the reinforcement or concrete, or the bond between the two.
 - a. The subcontractor is to fix accurately and securely as per approved Drawings.
- ### 2.3 MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements
- ### 2.4 MOLD MATERIALS
- A. Moulds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous GRC surfaces within tolerances; nonreactive with GRC and capable of producing required finish surfaces.
- B. Form Liners: Provide solid backing and form supports to ensure that form liners remain in place during GRC application. Use with manufacturers recommended liquid-release agent that will not bond with, stain, or adversely affect GRC surfaces and will not impair

subsequent surface or joint treatments of GRC.

C. Surface Retarder: Chemical liquid set retarder capable of temporarily delaying hardening of newly placed GRC face mix to depth of reveal specified if required.

2.5 GFRC MATERIALS

A. Portland Cement: ASTM C150, Type I, II, or III.

B. Glass Fibers: Alkali resistant, with a minimum zirconia content of 16 percent, 1 to 2 inches (25 to 50 mm) long, specifically produced for use in GRC, and complying with ASTM C1666/C 1666M.

C. Sand for GRC Backing: Washed and dried silica, complying with composition requirements of ASTM C144; passing No. 20 (0.85-mm) sieve with a maximum of 2 percent passing No. 100 (0.15-mm) sieve.

D. Facing Aggregate.

1. Fine Aggregate: Natural sand or sand manufactured from coarse aggregate, ASTM C33, except for gradation with a maximum of 5 percent passing No. 100 (0.15 mm) sieve and a maximum of 3 percent passing No. 200 (0.075 mm) sieve.

E. Colouring Admixture: ASTM C979, synthetic mineral-oxide pigments or coloured water reducing admixtures, temperature stable, nonfading, and alkali resistant.

F. Water: Potable; free from deleterious material that may affect colour stability, setting, or strength of GRC and complying with chemical limits of PCI MNL 130.

G. Polymer Curing Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130.

H. Air-Entraining Admixture: ASTM C260, containing not more than 0.1 percent chloride ions.

I. Chemical Admixtures: ASTM C494/C494M, containing not more than 0.1 percent chloride ions.

2.6 GFRC MIXES

A. Backing Mix: Proportion backing mix of Portland cement, glass fibers, sand, and admixtures to comply with design requirements. Provide nominal glass-fiber content of not less than 5 percent by weight of total mix.

B. Face Mix: Proportion face mix of Portland cement, fine and coarse aggregates, and admixtures to comply with design requirements.

C. Mist Coat Mix: Portland cement, sand slurry, and admixtures, of same proportions as backing mix without glass fibers.

D. Polymer Curing Admixture: 6 to 7 percent by weight of polymer-curing admixture solids to dry Portland cement or as per manufacturer.

E. Air Content: 8 to 10 percent; ASTM C185.

F. Coloring Admixture: Not to exceed 10 percent of cement weight.

G. The GRC material must meet the following minimum strength requirements at 28 days.

1. Compressive Strength 40 MPa (tested in accordance with BS EN 12390 Part 3)

2. Flexural Yield Strength (LOP) 08MPa (tested in accordance with BS EN 1170 Part 5)

3. Ultimate Flexural Strength (MOR) 18MPa (tested in accordance with BS EN 1170 Part 5)

4. Facing mixes shall achieve a minimum compressive strength of 30MPa when tested at 28 days and in accordance with BS EN 12390 Part 3.

5. Facing mixes shall also be designed to reproduce the colour and finishing treatments agreed to on samples provided by the manufacturer and selected by the Consultant.

2.7 SUPPORT STRUCTURE AND FIXING

A. Cold-Formed Steel Framing: Steel tubing confirming to IS 806. Finish hollow structural sections with wall thickness less than 3/16 inch (4.76 mm)

B. Steel for anchor fixation shall conform to the appropriate requirements as per IS code with a minimum diameter of ¼-inch (6 mm).

C. Finish: Zinc coated by hot-dip process according to ASTM A123/A123M/Epoxy primer coated with PU paint of total 100 DFT after fabrication, or ASTM A153/A153M.

D. Bolts: As per IS codes.

2.8 STEEL Refer to section 2 – Structural steel works.

2.9 FABRICATION

A. General

1. GRC units delivered to Site shall be of the required size. All GRC pieces must be cut to size and edge treated at the factory.

2. Site cutting and swiping or nipping of edges or corners of any GRC pieces on site will not be permitted.

B. Curing

1. Non polymer modified mixes shall be de-moulded not less than 12 hours or not more than 36 hours after manufacture. During this time the component and mould shall be completely covered with impervious sheeting to prevent moisture loss.

2. Immediately upon de-moulding the component shall be transported to a specially constructed curing area where water sprinkling shall be retained for a minimum period of five days before the finishing operations are commenced.

3. Polymer modified mixes shall be de-moulded not less than 12 hours or not more than 36 hours after manufacture and upon de-moulding shall be stored and not allowed to be exposed to temperatures exceeding 30°C or below 5°C for a period of 2 days before the finishing operations are commenced.

C. Proportioning and Mixing:

1. Carefully measure mix constituents in a manner to achieve the desired mix proportions.

2. Meter the glass fiber and cement slurry to the spray head at rates to achieve the desired mix proportion. Check rates in accordance with standard procedures described in PCI "Recommended Practice for Glass Fiber Reinforced Concrete".

3. Maintain cleanliness of equipment and always working procedures.

D. Hand Spray Application:

1. Spray applies a mist coat consisting of the matrix without fiber. Apply this coating not to exceed 1.8 mm thick to avoid an un-reinforced surface.

2. Spray-up main body of material before the mist coat has set.

3. Apply by spraying such that uniform thickness and distribution of glass fiber and cement matrix is achieved during the application process.

4. Consolidate by rolling or such other techniques as necessary to achieve complete encapsulation of fibers and compaction.

5. Control thickness by using a pin gauge or other approved method. Perform a minimum of 2 measurements per 0.5 square meters of panel surface with at least 3 measurements per panel.

6. Perform hand forming of intricate details, incorporate formers or infill material, and overspray before the material has achieved its initial set to insure complete bonding.

3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of work.

B. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Install GRC panels to supporting members and backup materials if required as per

Design.

B. Lift GRC panels and install without damage.

C. Install GRC panels level, plumb, square, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.

1. Maintain horizontal and vertical joint alignment and uniform joint width.

2. Remove projecting hoisting devices.

D. Connect GRC panels in position by bolting or welding, or both, as indicated on shop drawings. Remove temporary shims, wedges, and spacers as soon as possible after connecting is completed.

E. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.3 requirements for welding, appearance, quality of welds, and methods used in correcting welding work.

1. Protect GRC panels from damage by field welding or cutting operations, and provide non-combustible shields as required.

F. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

3.3 ERECTION TOLERANCES

A. Erect GRC panels to comply with the following noncumulative tolerances:

1. Plan Location from Building Grid Datum: Plus, or minus 1/2 inch (13 mm).

2. Top Elevation from Nominal Top Elevation: As follows:

a. Exposed Individual Panel: Plus, or minus 1/4 inch (6 mm).

b. Non-exposed Individual Panel: Plus, or minus 1/2 inch (13 mm).

c. Exposed Panel relative to Adjacent Panel: 1/4 inch (6 mm).

d. Non-exposed Panel relative to Adjacent Panel: 1/2 inch (13 mm).

3. Support Elevation from Nominal Elevation: As follows:

a. Maximum Low: 1/2 inch (13 mm).

b. Maximum High: 1/4 inch (6 mm).

4. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet (30 m): 1 inch (25 mm).

5. Plumb in Any 10 Feet (3 m) of Element Height: 1/4 inch (6 mm).

6. Maximum Jog in Alignment of Matching Edges: 1/4 inch (6 mm).

7. Maximum Jog in Alignment of Matching Faces: 1/4 inch (6 mm).

8. Face Width of Joint: As follows (governs over joint taper):

a. Panel Dimension 20 Feet (6 m) or Less: Plus or minus 1/4 inch (6 mm).

b. Panel Dimension More Than 20 Feet (6 m): Plus or minus 3/8 inch (10 mm).

9. Maximum Joint Taper: 3/8 inch (10 mm).

10. Joint Taper in 10 Feet (3 m): 1/4 inch (6 mm).

11. Differential Bowing, as Erected, between Adjacent Members of Same Design: 1/4 inch (6 mm).

3.4 REPAIRS

A. Repairs will be permitted provided structural adequacy of GRC panel and appearance are not impaired, as approved by Architect.

B. Mix patching materials and repair GRC so cured patches blend with colour, texture, and uniformity of adjacent exposed surfaces.

C. Prepare and repair accessible damaged galvanized coatings with galvanizing repair paint according to ASTM A780.

D. Wire brush, clean, and paint accessible weld areas on prime-painted components with same type of shop primer.

E. Remove and replace damaged GRC panels when repairs do not comply with requirements.

3.5 CLEANING AND PROTECTION

A. Perform cleaning procedures, if necessary, according to GRC manufacturer's written instructions. Clean soiled GRC surfaces with detergent and water, using soft fiber brushes and sponges, and rinse with clean water.

Prevent damage to GFRC surfaces and staining of adjacent materials.

5.83

- a) Providing & fixing of GRC jali as per designs and drawings given or approved by architect/engineer in charge, thickness shall be 30 mm having glass reinforcement content of 3% to 5%, having tensile strength of 6 to 11 Mpa, to be fixed with mortar and fixtures as required. Finished as mentioned in drawings. The rate includes all materials and labours required at all heights. Framing if required shall be measured and paid separately under relevant item.

Item shall be measured in Sqm for payment purpose.

Make : Everest Composites, Birla White, Sanisha.

- b) Providing and fixing of GRC cornice for the locations defined as per Architect. The quoted rate shall include the cost of material, labour, fixing, etc., complete

5.84 **FALSE CEILINGS**

(a) Perforated panels

Providing and fixing Perforated panels of width 128mm, thickness of 16mm and length of 2440mm or as required by the Architect / approving engineer, made of a HDMR board substrate with laminated facing as per the approved shade / species and finish and a melamine balancing layer over the reverse side. The board shall have a special perforated pattern where the visible surface has a "Helmholtz" fluted perforation of 2mm width and 30mm each. The Back side of each panel is being perforated with 8mm round hole for superior acoustic performance. Installed on specially extruded aluminum sections of 25 mm duly fixed using screws and plugs spacing at 600mm c/c. Place the clip to install the first set of wooden panels by inserting the clips for border and insert the groove of panel into projecting flange of aluminum clip. Continue installing rows of panels by inserting the tongue into the groove of earlier inserted panel and progressively installing clips for inside into the next keel till the actual height is achieved. Use clips for the border to finish off the installation. Edges should be finished using wooden moulding of matching colour. The system shall give NRC of 0.62 with as per ASTM C 423, The color and design shall be approved by architect & Engineer In-charge.

Make: Hilux, Gyptech, Knauf Danoline, Anutone, Evershine.

(b) MDF perforated acoustic panels.

Providing and fixing eco-friendly light weight 12mm thick MDF Perforated Acoustical Panels in 595x595mm size having square edge with MDF Engineer wood board core laminated visible face with glass wool padding for the best sound and thermal Insulation. Ceiling tile with Exposed GI T- Grid (T 24) at given level by architect or site drawing with support hanger to the soffit and adjustable clip to give a seam less look of 2 ft. x 2 ft module. The MDF perforated tiles shall be face finished with Melamine or Wood Polish with non-woven tissue on the back.

(c) Wood Fibre Panel

Providing and Fixing 15mm thick Magnesium Bonded (MgO) Wood fiber panel having min density of 400 kgs with wood strands of having width of 1 mm. The panel shall hNRC 1.0 ASTM C 423 moisture content less than 5 percent and shall pass fire test as per UL94. Boarding: INSTALLATION: -To comprise main runner spaced at 1200mm centres securely fixed to the structural soffit using suspension system at 1200mm maximum centre. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size 3000 x 19 x 19 mm, secured to walls at 450 mm maximum centers and as per the drawing and the work complete in all respects to the satisfaction of Engineer in-charge.

Make: Gyproc, Gyptech, Greenlam, Century, Anutone.

(d) Gypsum Perforated board ceiling

Providing and fixing single layer Advanced Persona G gypsum perforated board false ceiling fixing and finishing all level false ceiling using 1830 x 1220mm Pax- Persona G Perforated gypsum boards having thickness of 12.50 mm of approved make equivalent, fixed to the suspended grid, fabricated and fixed to the soffit of roof / beams and wall using - Gyptech Ceiling sections - perimeter channels of size 20 mm x 27 mm x 30 mm fixed to the wall using metal screws and nylon sleeves recommended by the manufacturer at a spacing not exceeding 450 mm c/c, intermediate channels of size 15 mm x 45 mm x 15 mm of at a spacing not exceeding 1200 mm c/c suspended using ceiling angles of size 25 mm x 10 mm and appropriate length, fixed to the soffit of R.C.C beams / slabs using G.I soffit cleats of size 27 mm x 37mm x 25 mm x 1.6 mm and metal expansion fasteners of 38 mm x 8mm diameter at a spacing not exceeding 1200 mm c/c, ceiling sections of size 26 mm x 26 mm x 45 mm provided across the intermediate channel at a spacing of 475 mm c/c, at bottom which shall be fixed by G.I connecting clips of 2.64 mm diameter at junctions. specification. Additional perimeter channels / ceiling sections shall be provided around the cut outs for light fittings A/C diffusers etc. The ceiling boards shall be fixed to the suspended grid using 6 mm x 25 mm self-tapping screws. The joints shall be finished with joint paper tape and Gyptech jointing compound or approved make and providing and applying. No deduction shall be made opening less than to 0.50 Sqm. the edge of perforated gypsum boards shall be joined and finished with Gyptech jointing compound and fiber tape. A layer of glass fiber coated tissue of minimum 350 GSM shall be applied on the surface for finishing with the suitable adhesive as per the guideline by the manufacturer, the rate shall include water based acrylic paint coating in two coat with brush / roller on the surface in coordination with engineer in charge. the NRC certification as per ASTM C423 shall be submitted along with manufacturer MTC. Rockwool of 48Kg density and 50mm thickness shall be filled at the back of ceiling.

(e) Baffle Ceiling

Providing and fixing acoustic Baffle in Linear shape as per architect design and color tissue/ Fabric faced with flexible adjustable wire and baffle hanging clip as per site requirement or level given by architect with support hanger to the soffit and adjustable pin to give a ravishing view. The panel shall be Color Glass fiber tissue/ fabric wrapped and have

superior acoustic properties that will be attached to wire with the help of hanging springs to be installed on both the ends to provide steady hanging of the panel. This may be of size 1150 x 200 made of Fire retardant rock wool panel of 50 mm.thick First and last hangers should not be at a distance more than 300 mm from the end.

(f) Fabric Wrapped fibre core panel

Supply and Installation of Generic Soak Plane, kerfed edge, fabric wrapped magnesite bonded 2mm wide pinewood fibre core panel ,GreenPro certified, of size 600x1200x20mm thk, with plane finish, volume density 400Kgs/m³, weight 8 kg/m² installed with requisite accessories on framework by Contractor. And Generic strut H-Spline.

"First framework on wall to be erected by contractor so as to achieve desired profile and finish level as per arch dwg. Members of framework to receive Generic Strut H-Spline should be @ 600mm c/c max. Generic Strut H-Spline having sectional thickness 2mm and length 2400mm to be fixed perpendicular to the framework behind at 600mm centres. Generic Soak Plane, Kerfed edge panels shall then be inserted into the Strut H-Spline along their long edges of 2400mm to perfect fit with staggered short edges.

Note: Thickness is for bare panels. Add 3mm for Plane fabric. (Fabric colour as per architect's choice from currently valid swatch card). The system is back lined with the acoustical infill Generic SynthPF 10x25 held in position with dab spots of Stick S7.

Technical Parameters

- "• Fire (Class) – 1 & P
- Acoustics – NRC upto 0.7
- Thermal conductivity (W/mk)– 0.07
- Climate (°C, RH) – 50, 95
- Light reflectance (%) – Color dependent
- Green (VOC, RC %) – Low, 30

5.85 WALL PANELLING

(a) Wooden Veneer Wall Paneling

Providing and fixing GROOWOOD Linear Grooved Panel (30/2, 15/2) panels of width 128mm, thickness of 15mm and length of 2440mm or as required by the Architect / approving engineer, made of a fibre board substrate with laminated/Melamine facing as per the approved shade / species and finish and a melamine balancing layer over the reverse side. The board shall have a special perforated pattern where the visible surface has a "Helmholtz" fluted perforation of 2mm width and 30mm each. The Back side of each panel is being perforated with 8mm round hole for superior acoustic performance. Installed on specially extruded aluminum sections of 25 mm duly fixed using screws and plugs spacing at 600mm c/c. Place the Pax -GROOWOOD clip to install the first set of wooden panels by inserting the clips for border and insert the groove of panel into projecting flange of aluminum clip. Continue installing rows of panels by inserting the tongue into the groove of earlier inserted panel and progressively installing clips for inside into the next keel till the actual height is achieved. Use clips for the border to finish off the installation. Edges should be finished using wooden moulding of matching colour. The system shall give NRC of 0.62 with as per ASTM C 423, The color and design shall be approved by architect & Engineer In-charge.

(b) Fabric Phonetic Acoustical Wall Paneling

Providing and fixing of gyptech Fabric Phonetic Acoustical Wall Paneling with square edges made of fibre glass substrate 25mm thick and wrapped on the front side with an acoustically transparent and fire-resistant fabric with an option of colors as per the choice of the Architect/ Engineering- in charge of size 2400x600, 1800x600, 600x1200 or 600x600 mm providing a minimum sound absorption level of 0.90 NRC to be affixed to wall using Wall panel hooks and construction adhesives supplied by gyptech Systems Pvt. Ltd. as per the instructions laid down by the manufacturer. Wall panel hooks of adequate quantity as specified by the manufacturer shall be fixed to the wall surface using self-tapping screws. Silica based construction adhesive shall be dabbed on to the projecting elements (spikes) of the hooks. Gyptech Fabric wall panels shall be pierced through the spikes of the hooks ensuring the line and level of the panels are maintained.

(c) Accoustic wall paneling

Supply and Installation of Generic Soak Plane, kerfed edge, fabric wrapped magnesite bonded 2mm wide pinewood fibre core panel ,Greenport certified, of size 600x1200x20mm thk, with plane finish, volume density 400Kgs/m3, weight 8 kg/m2 installed with requisite accessories on framework by Contractor (framework not by Generic).and Generic strut H-Spline.

Supply and installation of Stretch Hush system consisting of FR Grade Hush fabric with high-performance Polyester core and acoustically-transparent face covering of choice colour, size 1.4mx75m, stretched horizontally by using combination of Strand2 primer 600x1200x15mm thk, Anutone Strut FS15 Tracks, SynthPF 10x25 infill with requisite accessories on framework.

5.86 PAINTING WORK

Providing and applying 2 Coats of Fenomastic Silky cleamacry liccopolymer emulsion paint which is APEO & HCHO free, durable Smooth Silk finish water based emulsion paint of the approved colour. Paint shall have an excellent smooth silk finish with scrubs resistance of 5000 cycles and good washability. Paint shall be applied on smooth and uniform surface prepared by 2coats of Cement base putty of Jotun or approved equivalent. This surfaces should be primed with water based low VOCPVA sealer/primer. Rate shall inclusive of necessary surface preparation, filling to erecting and dismantling of scaffolding, finishing the surface etc. with all leads and lifts at all levels etc. complete, as per instructions of Engineer. Please refer to special conditions of contracts for VOC limits manufacturer's specification.

5.87 SANITARY ,PLUMBING & WATER SUPPLY

(a) European Water Closet with accessories

Supply, checking, storing and fixing in position European water closet comprising of Wall hung /Floor Mounted European W.C. Pan Make HINDWARE/ KOHLER/ JAQUAR or Equivalent in white colour, or approved type of chairs, Metropole Flush Valve Dual Flow 32mm Size (Concealed Body) with Exposed Shut Off Provision (3.9/1.95 LPF Lts. Per Flushing) JAQUAR-FLV-CHR-1085NG. C.P health faucet make HINDWARE/ KOHLER/ JAQUAR with required length of flexible tube, clamp and bracket for fixing to wall, 15 mm C.P. brass heavy quality angle stop cocks Model No.HINDWARE-Q503195520 /KOHLER- 80158IN-9-CP / JAQUAR-OPP CHR-15053PM for flushing cistern. brass 2-way bib cock Model No. HINDWARE-Q507455120 / KOHLER-16094IN-4-CP / JAQUAR-OPP-CHR-15041PMGD
Toilet paper holder Model HINDWARE-Q363194120/ KOHLER-5633IN CP / JAQUAR-ACNCHR-

1153S. Solid bakelite water closet cover and seat with C.P. hinges and rubber buffers, Fixing W.C. unit with brackets and accessories in position, Necessary pipe connection to PVC / PP / CI soil pipe, Painting bracket with two coats of white enamel paint over a coat of primer.

Supply, checking, storing & fixing straight/offset type Macfit single body push fit type WC Pan Connector Model No. kohler-K-16093IN-4-CP / Jaquar-ZPS-WHT-VB01 with factory supplied spring loaded seal guard with integrated single mould sealing fins made of flexible EVA Body, including bush/adaptor for use with CI Pipe as supplied with Pan Connector (For European water closet)

(b) Urinals with accessories

Supply, Checking, Storing and fixing vitreous Large flat back urinals Model No. HINDWARE-Q257610210 / KOHLER-26475IN-ER-0 / JAQUAR-URS-WHT-13255 with Conceal automatic flushing system Model No. HINDWARE-Q257102210 / KOHLER- 24199IN-C03-CP / JAQUAR-SNR-CHR-51097G Flow rate:2.47 LPF (Liter Per Flush) in white colour with concealed type wall hanger or special bracket in wall and hinged type C.P. dome gratings. C.P. flush pipes from manual / auto flush, spreaders, full bore inlet caps as necessary made to measure. waste pipe and Spreader under each urinal pan, leading to the CP bottle trap Model No. HINDWARE-Q503195220 / KOHLER-7314IN-CP / JAQUAR-ALD-CHR-769L300*190 below and painting with two coats of white enamel paints and cutting and making good the walls wherever require.

(c) Wash hand basin with accessories

Supply, checking, storing and fixing wash hand basin Model No. HINDWARE-Q177110210 / KOHLER-2211IN-0 / JAQUAR-CNS WHT- 701 with central / Side tap hole on counter comprising of for Concealed type brackets fixed to wall with adjustable clamp to push against counter rim and cutting and making good the walls wherever require, 32 mm heavy plated C.P. waste coupling fitting Model No.KOHLER-45432IN-CP/HINDWARE-Q503191520/ JAQUAR-ALD-CHR-705 with or without popup, 32 mm heavy plated C.P. bottle trap Model No. HINDWARE Q503195220 / KOHLER-7314IN-CP/JAQUAR-ALD-CHR- 769L300*190 with cleaning eye with extension piece and wall flange, Painting brackets with two coats of white enamel paint over one coat of primer, CP Pillar cock Model No. JAQUAR-OPP-CHR- 15011BPMGE Flow rate: 5.2 LPM (Liter Per Minute) or Equivalent with 15 mm C.P. brass heavy grade flexible inlet connection with C.P. nut (minimum length 450 mm) made to measure.

Providing and fixing C.P. brass chain and rubber plug complete for sink or wash basin

(d) S S Sink with accessories

Supply, checking, storing and fixing S. S. sink, single bowl with tap point on wall / counter comprising of (Main Kitchen Sink Part of the kitchen scope) Concealed type brackets fixed to wall with adjustable clamp to push against counter rim,40 mm heavy plated C.P. waste coupling fitting KOHLER-45432INCP/HINDWARE-Q503191520 / JAQUAR-ALD-CHR- 705 with or without pop-up,40 mm heavy plated C.P. bottle trap Model No. HINDWARE-Q503195220 / KOHLER-7314 IN-CP / JAQUAR-ALD-CHR-769L300*190 or Equivalent with cleaning eye with extension piece and wall flange, Painting brackets with two coats of white enamel paint over one coat of primer,15 mm Sink Cock with Regular Swinging Spout (Wall Mounted Model) with Wall Flange Model No. Jaquar-FLP-CHR-5347PM Flow rate: 5.2 LPM (Liter Per Minute) or Equivalent table mounted / wall mounted. (Kitchen sink with drain board) (model Franke RS X610-56(22 X 18), hindware, Nirali or equivalent)

(e) Angular Stop Cock

Providing and fixing Angular Stop Cock with Wall Flange of approved quality :

15 mm nominal bore Model No. JAQUAR-OPP-CHR-15053PM or equivalent complete including cost of all labour, material, T & P, lead, lift, taxes etc. as per instruction & satisfaction of Client.

(f) Looking Mirror

Providing and fixing 6mm thick frame less mirror of approve make in any shape and sizes as per drawing Mirror shall be fixed on 6mm thick cement bonded particle board (Bison panel) backing. Cement bonded particle board shall be fixed to wall with approved SS 304 fastener. All edges of glass shall be sharp grinded, cute corner and polished. Glass shall be fixed with approved adhesive/ 3M tape etc. complete at all floors/all levels/ all heights as directed by Engineer. Installed area of mirror shall be considered for payment without wastage.

(g) Towel ring

Supply, checking, storing & fixing C.P. brass towel ring Round Model No. HINDWARE F880007 / KOHLER-5631IN-CP / JAQUAR-ACN-CHR-1121Bn or Equivalent to PVC cleats with C.P. brass screws including cutting and making good the walls wherever required .

(h) Soap Dispenser

Supply, checking, storing & fixing manual CP soap dispenser Model No. / KOHLER 10712D-CP / JAQUARCAN-1137N with liquid soap (including one time soap fill) including cutting and making good the walls, wherever required complete as per instructions of the engineer.

(i) Hand dryer

SAINLESS STEEL HAND DRYER WITH SENSOR TAP-
CODE NO: DAHD0066-DOLPHY MAKE.

(j) Surface mounted panel

SILVER 3 IN 1 STAINLESS STEEL SURFACE MOUNT PANEL WITH HRT ROLL DISPENSER
– CODE NO : DWCB0015- DOLPHY MAKE

(k) Touch LED mirror

Code no : DTLM0003 make : Dolphy

(l) Bathroom Mat

Code no : DBMT0003 make : Dolphy

(m) Floor traps / grats.

1. Providing and fixing 600mm Long Tile Insert Drain with Cockroach Trap Complete including cost of all labour, material, T & P, lead, lift, taxes etc. as per instruction & satisfaction of EIC.
2. Supply, checking, storing & fixing of Heavy class S.S. Grating Model No. Chilly-CCT-SFC-127 / NEER-NRG 7009 (SS) / Camry CCR-SHCGH- 101 or Equivalent with Mosquito /Cockroach proof S.S. strainer of approved design by Interior including setting in floor with cement motor to match with floor finish as per architect requirement suitable for FD (Floor drain) and FT (Floor trap). Note : Size of trap is vary as per final Product Selection.

(n) SS Bin

STAINLESS STEEL BIN 5 LTR (Black) -CODE NO: DWBN0018-B-MAKE: DOLPHY

(o) PODIUM

HOTEL BANQUET PODIUM- (MDF WITH STEEL PANEL) -CODE NO: DHSD0003 – MAKE :DOLPHY.

(p)CENTRIFUGAL PUMP

Supply, installation, testing and commissioning of Monoblock, self-priming, single-stage centrifugal pump, capable of 8.45 LPS discharge at 23 MWC head, 5 HP pump having cast iron casing, enclosed type dynamically balanced cast iron impeller, carbon steel pump shaft, gland packed sealing, deep groove ball bearings, etc. with SPDP squirrel cage induction motor having class 'B' insulation, IE3 efficiency, conforming to IS 12615: 2018 and suitable for operation on 3-Ph, 415 V \pm 10%, 50 Hz AC supply, base plate, mounting channel frame, accessories and fittings, viz. pressure gauges, drains, coupling, coupling guard, vibration isolation arrangement by means of spring / rubber type mounting along with accessories complete all as specified and directed by engineer-in-charge. (1 W + 1 S) Note :- [i] Necessary civil work viz. foundation for placement of pump and accessories shall be covered in the scope of work.

(q) PUMP PANEL

Supply, installation, testing and commissioning of factory made, CPRI type tested, indoor cubical compartmental type PUMP HOUSE PANEL of suitable size, having both sides openable with hinged double doors and locking arrangement, IP 43 protection made out of 2.0 mm thick mild steel CRCA sheet, supported and fixed on structural frame of angle iron of 40 x 40 x 6 mm size, including earthing stud, labelling, painting to all internal & external exposed steel surfaces with powder coating paint (7 tank process), duly fixed in ground with PCC foundation (1:2:4) type B1, with danger notice plate of 3.15 mm thick mild steel vitreous enamelled with letters, figures and conventional skull and bones in signal red colour suitable for 3- Phase, 4 Wire system, 500 V grade with necessary wiring, PVC sheathed stranded copper conductor of appropriate length and size, including fixing lugs, bolts, screws, etc. complete as specified and directed by engineer-in-charge. Domestic

5.88 GLASS DOOR

Providing and fixing 10 mm thick frameless toughened glass door shutter of approved brand and manufacture, including providing and fixing top & bottom pivot & spring type fixing arrangement and making necessary holes etc. for fixing required door fittings, all complete as per direction of Engineer-in-charge (Door handle, lock and stopper etc.to be paid separately).

5.89 GLASS FACADE.

- a) Design, Supply and Installation of Vertical Fin Glazing system consisting of Super Durable Powder coated aluminum and glass of approved make, aluminum frame work fabricated out of heavy duty Aluminum extruded profile powder coated with Super durable powder coating by electrostatic spraying and hard stoved to not less than 60 micron thickness to comply with AAMA 2604 standard as per approved shade. The system shall be a all mullion system with horizontal aluminium members at Slab level only. Horizontal members at corners shall be bended to suit the curvature. The mullion depth shall be max. 185mm size. The glass will be supported on Dead load brackets. The Wind load brackets shall be equally spaced (Not less than 800mm) between dead load brackets. The wind pressure shall be 2.7 Kpa; the top brackets shall be dead load brackets with lower brackets as slider brackets.
- b) All groves shall have gasket with non-bleed silicon.
- c) The aluminum members shall be protected with protections tapes all around the profile

for safety against external scratches at site. (Protection tape shall be removed only at a time of handing over as per the instructions of project management.). The anchoring /bracing of the glazing to the RCC slabs /beams /columns shall be done with required number of hot dip galvanized extended brackets of approved design (Hot Dip Galvanizing to be done conforming to 80-100 microns thickness) with approved Stainless steel-316 anchor fasteners. The anchoring system has been design to withstand the dead load of structural wall as well as stresses due to wind pressure etc. All the joints of the structural glazing system and the periphery of glass shall be properly sealed with specified non staining weather silicon.

d) The System must accommodate Wind load, dead load, Thermal movements due to thermal expansion and contraction and Seismic Movements.

e) EPDM gasket of suitable profile to accommodate glasses in all vision areas shall be provided at all glazing area to make the glazing water and air tight. EPDM gaskets to be micro cured.

f) All screws, washers used shall be only stainless steel 316 grades and through, Bolts, Nuts and Anchors used shall be only stainless steel of 316 grades etc. (The Structural Calculation & System drawings shall be provided by Consultant / approved specialized agency.)

i. Extruded aluminum sections shall be of 6005 T6 / 6063 T6 / 6061 T6 alloy to be as per structural calculations.

ii. Coating of aluminum section will be powder coated with Super durable powder coating by electrostatic spraying and hard stoved to not less than 60 micron thickness to comply with AAMA 2604 standard.

5.90 STONE CLADDING

SANDSTONE CLADDING

Providing and fixing dry stone cladding (ventilated facade) at all levels with 30 mm thick sand stone Red / Beige color (machine cut edges) cut to size of uniform colour and module size up to 10 Sft say 1200mm x 900 mm, Ideal size fixed to RCC walls with Blick's S.S Undercut A4 316 ETA approved Anchors and Aluminium 6061-T6 frame system. The undercut anchor to be installed on sandstone should be fixed only by using impact free setting tool so that the sandstone isn't damaged by the impact while trying to expand/deform the anchor. The frame work to install the sandstone should be able to accommodate the overhang as per requirement of consultants norms so that the dry stone cladding meets the requirements of a proper ventilated facade. The system should be capable to accommodate overhang between the RCC and the sandstone. The system proposed for approval should be able to take care of adjustments in X, Y, Z axis so that the facade plumb/line level is properly maintained and is easy to install. The frame work connected to the RCC Slab to slab using Aluminium brackets should be installed with anchor fasteners of A4 316 ETA approved. The contracts scope shall be including cutting, making recesses in stone slab, drilling holes, rubbing, polishing, curing, water based transparent coating to be completed in the required pattern as per drawing and as directed by engineer in charge. The installation, Testing and the setting instructions should be strictly followed. All structural calculations & reports regarding substructure to be furnished by contractor with shop drawings, which has to be considered as a package inclusive of Design , Engineer , furnish deliver, complete to with stand wind pressure as per IS 875 (part - 3 Code) and as per seismic zone.

GRANITE CLADDING

Providing and fixing dry stone cladding (ventilated facade) at all levels with min 20 mm thick granite stone of approved shed, color, finish, polish, texture from architect cut to size of uniform colour and module size up to 10 Sft say 900mm x 750 mm, Ideal size

fixed to brick/RCC/AAC block walls with Aluminium Blick's Kerf, Anchors and Aluminium 6061-T6 frame system. The kerf has to be done in granite stone. The frame work to install the stone should be able to accommodate the overhang as per requirement of consultants norms so that the dry stone cladding meets the requirements of a proper ventilated facade. The system should be capable to accommodate overhang between the RCC/AAC and the sandstone. The system proposed for approval should be able to take care of adjustments in X, Y, Z axis so that the facade plumb/line level is properly maintained and is easy to install. The frame work (T profile 60x100x2.2) connected to the RCC slab to Slab using brackets should be installed with anchor fasteners of A4 316 ETA approved. The contracts scope shall be including cutting, making recesses in stone slab, drilling holes, rubbing, polishing, curing, water based transparent coating to be completed in the required pattern as per drawing and as directed by engineer in charge. The installation, Testing and the setting instructions should be strictly followed. All structural calculations & reports regarding substructure to be furnished by contractor with shop drawings, which has to be considered as a package inclusive of Design, Engineer, furnish deliver, complete to with stand wind pressure as per IS 875 (part - 3 Code) and as per seismic zone

5.91 FLOORING

Supply & installation of 100% commercial grade nylon carpet tile of min 750 x750mm/roll as per design intent of solution dyed nylon 6.6 quality or equivalent, Machine Gauge 1/10" or more and having properties of Soil Guard or more, total height of 6 to 8 mm, smoke density(ASTM E 662) less than 450, anti-static less than 1.0kv, electrostatic propensity – maximum average 0.5kv (AATCC 134) Color fastness to light- rating 5.0= No change (AATCC 16) critical Radiant flux –(ASTM E 648) Class 1 average CRF 0.48 / cm2 or approved equivalent.

5.92 Furniture

1. Manufacturing, Supplying & Installation of APPROVED make Table for Teachers, Table Made with superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with on Mobile Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Table Size: 1500 mm Width * 750 mm Depth * 750 mm Height.
2. Manufacturing and Supplying Approved Make Medium Back revolving Chair with Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.
3. Manufacturing, Supplying & Installation of APPROVED make Side Table, Made with superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides. Table top 25 mm Thick Under Structure made of 18 mm Thick. All Hardware of Hettich/Ebco. Table shall be provided with Flip top box for wiring and data. Design as per Architect / Engineer in charge. Table Size: 1200 mm Width * 600 mm Depth * 750 mm Height.

4. Manufacturing, Supplying and installation of Approved Make Revolving Tip up Chair. Chair Structure made of Horizontal beam structure of 80mm x 40mm x 3mm and Hollow section pedestal with base plate 8mm thickness. Seat made of Injection moulded co-polypropylene UV Resistant. Seat and Back male-female system for upholstery cushion pads.
 - Seat pad is constructed of injection moulded polypropylene inner with moulded polyurethane foam cushion and upholstered in fabric as per Approval Color as per Demand.
5. Manufacturing and Supplying Approved Make 5 Seater Sofa Waiting Lounge. Sofa Frame made of combination of SS/Chrome Square pipe, Wood and Zig-Zag Spring. Sofa shall be provided with leatherette Upholstery with 32 density High Quality Foam with Quilting design in seat and back. SS legs. Color as per Demand.
6. Manufacturing and Supplying Approved Make Three Seater Sofa Waiting Lounge. Sofa Frame made of combination of SS/Chrome Square pipe, Wood and Zig-Zag Spring. Sofa shall be provided with leatherette Upholstery with 32 density High Quality Foam with Quilting design in seat and back. SS legs. Color as per Demand.
7. Manufacturing, Supplying & Installation of APPROVED make Rectangular Coffee Table. Table made of SS/302 Grade with PVD/60~65 micron Powder Coated MS CRC, Square pipe frame with Nylon buffers in legs. Table top and Shelve made of 17 mm thick Commercial ply with 4~6 mm thick teak Veneer with Melamine Natural Polish. Overall Size: 1200 mm * 800 mm Width * 450 mm Height. Color as per demand.
8. Manufacturing, Supplying & Installation of APPROVED make Round Corner Table. Table made of SS/302 Grade with PVD/60~65 micron Powder Coated MS CRC, Square pipe frame with Nylon buffers in legs. Table top and Shelve made of 17 mm thick Commercial ply with 4~6 mm thick teak Veneer with Melamine Natural Polish. Overall size: 750 mm Dia * 450 mm Height. Color as per demand.
9. Manufacturing, Supplying & Installation of APPROVED make CUSTOMISED C- SHAPE RECEPTION TABLE. Table made of superior quality BWP grade 17 mm thick plywood/HDF duly finished with 4~6 mm thick Veneer with polish and under structure with Lamination Sunmica on both sides finish. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with two Mobile Pedestal of 2 Dowels and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Engineer in charge. Overall Size: 3600 mm * 7400 mm * 3600 mm Length * 1300 mm Width * 750/1050 mm Height. Color as per Demand.
10. Manufacturing, Supplying & Installation of APPROVED make CUSTOMISED decorative wall made of superior quality BWP grade 17 mm thick plywood/HDF duly finished with 4~6 mm thick Veneer with polish. Overall Size: 7400 mm Length * 100 mm Thick * 3000 mm Height. Color as per demand.
11. Manufacturing and Supplying Approved Make Medium Back revolving Chair with Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.

12. Manufacturing and Supplying Approved Make U SHAPE Conference table. Table made of superior quality BWP grade 17 mm thick plywood/HDF duly finished with 4~6 mm thick Vineear with polish and under structure with Lamination Sunmica on both sides finish. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with Fourteen numbers of Flip top Box having 2 Power Sockets, One for Data, One Internet, One Mike Port, one USB Port, One HDMI (Note: Wiring and Equipments not in scope). Overall Size: 7565 mm * 2 * 3150 mm Width * 750 mm Depth. Color as per Demand.
13. Manufacturing, Supplying and Installation of Approved Make Conference Table for Meeting Table. Entire Table made of superior quality BWP grade 17 mm thick commercial plywood/HDF with 4~6 mm thick Teak Vineear with polish Finish. Table shall be provided with 8 numbers of Flip top Box having 2 Power Sockets, One for Data, One Internet, One Mike Port, one USB Port, One HDMI (Note: Wiring and Equipments not in scope). Overall Size: 5400 mm Length * 1350 mm Depth * 750 mm Height. Color as per approvals.
14. Manufacturing, Supplying and Installation of Approved Make Round Table for Meeting. Entire Table made of superior quality BWP grade 17 mm thick commercial plywood/HDF with 4~6 mm thick Teak Vineear with polish Finish. Table shall be provided with 2 numbers of Flip top Box having 2 Power Sockets, One for Data, One Internet, One Mike Port, one USB Port, One HDMI (Note: Wiring and Equipments not in scope)- Overall Size: 2400 mm Dia * 750 mm Height. Color as per approvals.
15. Manufacturing and Supplying Approved Make Medium Back revolving Chair with Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.
16. Manufacturing and Supplying Approved Make Medium Back Cantilever Chair with SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with 14 Gauge 25 mm Dia SS/Chrome pipe base frame. Color as per demand.
17. Manufacturing, Supplying & Installation of APPROVED make Corner Table, Table Made of 2 Year Seasoned Solid Wood with Melamine Polish. Corner Table Size: 300 mm Dia * 500 mm Height. Polish Color as per Demand.
18. Manufacturing and Supplying Approved Make Storage Cabinet. Cabinet made of superior quality BWP grade 17 mm thick commercial plywood/HDF with Approved color Sunmica. 2 mm thick PVC Edge banding tape on aal exposed edges. Overall Size: 3150 mm Length * 350 mm Depth * 850 mm Height. Color as per demand.
19. Manufacturing and Supplying Approved Make Storage Cabinet. Cabinet made of superior quality BWP grade 17 mm thick commercial plywood/HDF with Approved color Sunmica. 2 mm thick PVC Edge banding tape on aal exposed edges. Overall Size: 4300 mm Length * 450 mm Depth * 850 mm Height. Color as per demand.
20. Manufacturing, Supplying & Installation of APPROVED make 5 SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic . Sofa shall be provided with leatherette/Fabric Upholstery with 32 density High Quality Foam with Quilting design in seat and back shall be provided with Pillows in back.. Polished Solid wood legs. Color as per Demand.

21. Manufacturing, Supplying & Installation of APPROVED make 2 SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic . Sofa shall be provided with leatherette/Fabric Upholstery with 32 density High Quality Foam with Quilting design in seat and back shall be provided with Pillows in back.. Polished Solid wood legs. Color as per Demand.
22. Manufacturing, Supplying & Installation of APPROVED make Rectangular Coffee Table. Table made of SS/302 Grade with PVD/60~65 micron Powder Coated MS CRC, Square pipe frame with Nylon buffers in legs. Table top and Shelve made of 17 mm thick Commercial ply with 4~6 mm thick teak Vineear with Melamine Natural Polish. Overall Size: 1200 mm * 800 mm Width * 450 mm Height. Color as per demand.
23. Manufacturing, Supplying & Installation of APPROVED make Round Corner Table. Table made of SS/302 Grade with PVD/60~65 micron Powder Coated MS CRC, Square pipe frame with Nylon buffers in legs. Table top and Shelve made of 17 mm thick Commercial ply with 4~6 mm thick teak Vineear with Melamine Natural Polish. Overall size: 750 mm Dia * 450 mm Height. Color as per demand.
24. Manufacturing, Supplying & Installation of APPROVED make Rectangular shape Meeting Table. Entire table made of superior quality BWP grade 17 mm thick commercial plywood/HDF with 4~6 mm thick Teak Vineear with polish Finish. Table shall be provided with 2 numbers of Flip top Box having 2 Power Sockets, One for Data, One Internet, One Mike Port, one USB Port, One HDMI (Note: Wiring and Equipments not in scope)- Overall Size:2800 mm Length * 1050 mm Depth * 750 mm Height. Color as per Demand.
25. Manufacturing, Supplying & Installation of APPROVED make Low Height revolving Chair. Chair made of MS rod & Stripe inserted PU Foam Mold seat and back structure. chair shall be provided with Leatherette/Fabric Upholstery. Chair shall be provided with Four Metal Legs with Fixed type mechanism. Color as per demand.
26. Manufacturing, Supplying & Installation of APPROVED make Folding Round Table. Table top made of superior quality BWP grade 17 mm thick commercial plywood/HDF with 4~6 mm thick Teak Vineear with polish Finish. Under Structure made of combination of 50 mm Dia & 40 mm Dia 16 Gauge SS-304 Grade/ 60~65 micron Powder coated MS pipe with fine fielding on joints. Table shall be provided with Nikhil polished wheels. Overall Size: 900 mm Dia * 750 mm Height. Color as per Demand.
27. Manufacturing and Supplying Approved Make Medium Back revolving Chair (TOKRI CHAIR) with Fixed mechanism. Chair shall be made of MS rod & Stripe inserted PU Foam Mold seat and back structure. chair shall be provided with Leatherette/Fabric Upholstery. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.
28. Manufacturing, Supplying & Installation of APPROVED make Round Table. Table made of 2 Year seasoned solid wood Under Structure with melamine polish. with pvc buffers in legs. Table top shall be provided with 12 mm thick Toughened clear glass with rubbed edges. Overall Size: 800 mm Dia * 750 mm Height. Polish Color as per Demand.
29. Manufacturing, Supplying & Installation of APPROVED make Round Table. Table made of 2 Year seasoned solid wood Under Structure with melamine polish. with pvc buffers in legs. Table top shall be provided with 12 mm thick Toughened clear glass with rubbed edges. Overall Size: 900 mm Dia * 750 mm Height. Polish Color as per Demand.

30. Manufacturing, Supplying & Installation of APPROVED make Rectangular Cafeteria Table. Table top made of superior quality BWP grade 17 mm thick commercial plywood/HDF with Approved color Sunmica. Table top shall be provided with 30 * 25 mm Thick Bidding around the top made of 2 Year seasoned solid wood with melamine polish. Under Structure made of 50 mm Dia 16 Gauge SS-304 Grade Hollow twin with 10 mm thick Base plate of size: 1000 mm Length * 450 mm Width for sturdiness. Overall size: -1800 mm Length * 750 mm Depth * 750 mm Height. Color as per demand.
31. Manufacturing, Supplying & Installation of APPROVED make Cafeteria Chairs. Chair made of 2 year seasoned sheesham wood with melamine polish. Seat and back upholstered with Leatherette /Fabric over 32 density foam. Chair shall be provided with pvc buffers in legs.
32. Manufacturing, Supplying & Installation of APPROVED make Table, Made with superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with on Mobile Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Architect / Engineer in charge. Table Size: 1350 mm Width * 750 mm Depth * 750 mm Height.
33. Manufacturing and Supplying Approved Make Medium Back revolving Chair with Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.
34. Manufacturing and Supplying Approved Make Low Back revolving Chair with Synchro Tilt mechanism. Chair shall be made of 12~ 15 mm thick Moulded ply seat and back frame with Leatherette/Fabric Upholstery with 32 Density Foam. Arms rest made of Solid wood with Polish/Paint with Chrome Arms. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.
35. Manufacturing, Supplying & Installation of APPROVED make 2 SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic . Sofa shall be provided with leatherette/Fabric Upholstery with 32 density High Quality Foam with Quilting design in seat and back shall be provided with Pillows in back.. Polished Solid wood legs. Color as per Demand.
36. Manufacturing, Supplying & Installation of APPROVED make Round Corner Table. Table made of SS/302 Grade with PVD/60~65 micron Powder Coated MS CRC, Square pipe frame with Nylon buffers in legs. Table top and Shelve made of 17 mm thick Commercial ply with 4~6 mm thick teak Veneer with Melamine Natural Polish. Overall size: 800 mm Dia * 450 mm Height. Color as per demand.
37. Manufacturing, Supplying & Installation of APPROVED make Wall Fixed Table for Cafeteria. Table top made of superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides. Table top 25 mm Thick Under Structure made of 18 mm Thick with both side Matching Sunmica. Overall size: 5750 mm Length * 600 mm Depth * 750 mm Height.
38. Manufacturing, Supplying & Installation of APPROVED make Low Height revolving Chair. Chair made of MS rod & Stripe inserted PU Foam mold seat and back structure. chair shall be provided with Leatherette/Fabric upholstery. Chair shall be provided with Four Metal Legs with Fixed type mechanism. Color as per demand.

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| 39. Manufacturing, Supplying & Installation of Approved Make Service Platform Counter :
Under Structure made of SS304 grade square pipe with SS 304 Grade Sheet Metal. Size: 5000 mm Width * 600 mm Depth * 800 mm Height. Pantry Table shall be provided with Burners. Pantry table design as per demand. |
| 40. Manufacturing, Supplying & Installation of Approved Make Service Platform Counter :
Under Structure made of SS304 grade square pipe with SS 304 Grade Sheet Metal. Size: 1350 mm Width * 600 mm Depth * 800 mm Height. Pantry Table shall be provided with Burners. Pantry table design as per demand. |
| 41. Manufacturing, Supplying & Installation of Approved Make Service Platform : Under
Structure made of SS304 grade square pipe with SS 304 Grade Sheet Metal. Size: 5000 mm Width * 600 mm Depth * 1350 Ht Pantry Table with Burners. |
| 42. Manufacturing, Supplying & Installation of Approved Make Service Platform : Under
Structure made of SS304 grade square pipe with SS 304 Grade Sheet Metal. Size: 2100 mm Width * 600 mm Depth * 1350 Ht Pantry Table with Burners. |
| 43. Manufacturing, Supplying & Installation of Approved Make Service Platform Counter :
Under Structure made of SS304 grade square pipe with SS 304 Grade Sheet Metal. Size: 2700 mm Width * 600 mm Depth * 1350 Ht Pantry Table with Burners. |
| 44. Manufacturing, Supplying & Installation of Approved Make Storage for Kitchen Store.
Storage rack made of 16 Gauge 40 mm * 40 MM SS Square Pipe Structure with 1 mm thick ss 304 grade sheet metal Shelve, Storage having 3/4 Open shelve. Hard Rubber Boots in Legs. Overall Size: 1200 mm Width * 600 mm Depth * 1500 mm Height. |

45. Manufacturing, Supplying & Installation of Approved Make Storage for Kitchen Store. Storage rack made of 16 Gauge 40 mm * 40 MM SS Square Pipe Structure with 1 mm thick ss 304 grade sheet metal Shelf, Top and doors below the storage top. Storage shall be provided with swing doors till 800 height from floor and one Open shelf. Hard Rubber Boots in Legs. Overall Size: 2400 mm Width * 600 mm Depth * 800/1500 mm Height.
46. Manufacturing, Supplying & Installation of APPROVED make Modular Kitchen. Kitchen Made of 1 mm thick ss 304 grade sheet metal. Kitchen made of combination of Swing doors with single shelf below and above the kitchen top with Burners and lpg gas controls. as per demand. some Kitchen lower modules shall be provided with Dowers below or near the burners.
- (a) Pantry Counter With Sink Unit & Over Head Units : 5000 * 600 * 2100
- (b) Pantry Counter With Burner Provision Over Head Units : 2800 * 600 * 2100
- (c) Pantry Counter With Burner Provision Over Head Units : 3200 * 600 * 2100
47. Manufacturing, Supplying & Installation of APPROVED make CUSTOMISED C- SHAPE LIBRARY RECEPCTION TABLE. Entire Table made of superior quality BWP grade 17 mm thick plywood/HDF duly finished with 4~6 mm thick Vineear with polish and under structure with Lamination Sunmica on both sides finish. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with two Fixed Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Engineer in charge. Overall Size: 3300 Width * 750 mm Depth * 750/1050 mm Height; 4800 Width * 750 mm Depth * 750/1050 mm Height; 1950 Width * 750 mm Depth * 750/1050 mm Height;
48. Manufacturing and Supplying Approved Make Medium Back revolving Chair with Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.
49. Manufacturing, Supplying & Installation of APPROVED make CUSTOMISEDSEMI semicircular Open Book shelves for Library. Book rack s made of superior quality BWP grade 17 mm thick plywood/HDF duly finished with 4~6 mm thick teak Vineear with Melamine polish. Book rack shall be provided with both side usable with 4 equal shelves. OVERALL SIZE: 4200 mm Width * 2100 Width * 900 Depth * 2050 mm Height. Color as per demand.
50. Manufacturing, Supplying & Installation of APPROVED make CUSTOMISEDSEMI Round reading table for Library. Table top made of superior quality BWP grade 17 mm thick plywood/HDF duly finished with 4~6 mm thick teak Vineear with Melamine polish. Under structure table's pole made of 60~65 micron powder coated 65 mm Dia 16 gauge MD CRC Pipw with 10 mm thick ss 304 grade 500 mm dia round Plate. Overall size: 800 mm Dia * 760 mm Height..
51. Manufacturing, Supplying & Installation of APPROVED make Low Height revolving Chair. Chair made of MS rod & Stripe inserted PU Foam mold seat and back structure. chair shall be provided with Leatherette/Fabric Upholstery. Chair shall be provided with Four Metal Legs with Fixed type mechanism. Color as per demand.
52. Manufacturing, Supplying and Installation of Approved Make Rectangular Table for Reading in Library. Entire Table made of superior quality BWP grade 17 mm thick commercial plywood/HDF with 4~6 mm thick Teak Vineear with polish Finish. Overall Size: 2200 mm Length * 1700 mm Depth * 750 mm Height. Color as per Demand.

53. Manufacturing, Supplying & Installation of APPROVED make 2 SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic . Sofa shall be provided with Leah rete/Fabric Upholstery with 32 Density High Quality Foam with Quilting design in seat and back shall be provided with Pillows in back. Polished Solid wood legs. Color as per Demand.
54. Manufacturing, Supplying & Installation of APPROVED make Single SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic. Sofa shall be provided with Leah rete/Fabric Upholstery with 32 Density High Quality Foam with Quilting design in seat and back shall be provided with Pillows in back. Polished Solid wood legs. Color as per Demand.
55. Manufacturing, Supplying & Installation of APPROVED make Corner Table, Table Made of 2 Year Seasoned Solid Wood with Melamine Polish. Corner Table Size: 500 mm Dia * 500 mm Height. Polish Color as per Demand.
56. Manufacturing, Supplying and Installation of Approved Make Coffee Table for Principal Room. Entire Table made of superior quality BWP grade 15 mm thick commercial plywood/HDF duly finished with 3~5 mm thick Vineear with melamine polish. Table shall be provided with Drower with Cane mesh on front of the Drower. Size: 800 mm Width * 400 MM Depth * 450 mm Height. Color as Per Demand.
57. Manufacturing, Supplying and Installation of Approved Make Triangle Table for Reading in Library. Entire Table made of superior quality BWP grade 17 mm thick commercial plywood/HDF with 4~6 mm thick Teak Vineear with polish Finish. Overall Size: 1450 mm Dia/Each Diagonal * 750 mm Height. Color as per approvals.
58. Manufacturing, Supplying and Installation of Approved Make Rectangular Table for Reading in Library. Entire Table made of superior quality BWP grade 17 mm thick commercial plywood/HDF with 4~6 mm thick Teak Vineear with polish Finish. Overall Size: 2700 mm Width * 1050 mm Depth * 750 mm Height. Color as per approvals.
59. Manufacturing, Supplying & Installation of APPROVED make Low Height revolving Chair. Chair made of MS rod & Stripe inserted PU Foam mold seat and back structure. chair shall be provided with Leatherette/Fabric Upholstery. Chair shall be provided with Four Metal Legs with Fixed type mechanism. Color as per demand.
60. Manufacturing, Supplying & Installation of APPROVED make Library Rack for Library. Rack made of solid wood and 17 mm thick Commercial ply with 4~6 mm thick teak Vineear with Polish on entire table . Color as per Approvals.
(a) Library Open Rack Size: 2400 mm Length * 450 mm Depth * 2050 mm Height
(b) Library Open Rack Size: 3100 mm Length * 400 mm Depth * 2050 mm Height
(c) Library Open Rack Size: 1800 mm Length * 400 mm Depth * 2050 mm Height
(d) Library Open Rack Size: 7800 mm Length * 400 mm Depth * 2050 mm Height
(e) Library Open Rack Size: 7600 mm Length * 400 mm Depth * 2050 mm Height
(f) Library Open Rack Size: 3700 mm Length * 400 mm Depth * 2050 mm Height
(g) Library Open Rack Size: 5800 mm Length * 400 mm Depth * 2050 mm Height
(h) Library Open Rack Size: 2500 mm Length * 400 mm Depth * 2050 mm Height
61. Manufacturing, Supplying & Installation of APPROVED make Storage Cabinet Made of solid wood and superior quality 17 mm thick BWP grade plywood/HDF duly finished with 4~6 mm thick Vineear with melamine polish on both sides along with Shelves. All Hardware of Hettich/Ebco. Design as per Architect / Engineer in charge.

(a) Library Open Rack Size: 4700 mm Length * 450 mm Depth * 2050 mm Height

(b) Library Open Rack Size: 1400 mm Length * 450 mm Depth * 2050 mm Height

62. Manufacturing, Supplying & Installation of APPROVED make Table, Made with superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with on Mobile Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Architect / Engineer in charge. Table Size: 1700 mm Width * 900 mm Depth * 750 mm Height.

63. Manufacturing, Supplying & Installation of APPROVED make Table, Made with superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with on Mobile Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Architect / Engineer in charge. Table Size: 1350 mm Width * 750 mm Depth * 750 mm Height.

64. Manufacturing and Supplying Approved Make Medium Back revolving Chair with Synchro Tilt Mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.

65. Manufacturing, Supplying & Installation of APPROVED make Executive Table. Table's Exposed Surface made of superior quality BWP grade 17 mm thick plywood/HDF duly finished with 4~6 mm thick Vineear with polish and under structure with Lamination Sunmica on both sides finish. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with One Mobile Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Engineer In charge. Executive Table Size: 1800 mm Width * 800 mm Depth * 750 mm Height Side Table: 1000 mm Width * 350 mm Depth * 750 mm Height. Color as per Approvals.

66. Manufacturing, Supplying & Installation of APPROVED make Executive Table. Table's Exposed Surface made of superior quality BWP grade 17 mm thick plywood/HDF duly finished with 4~6 mm thick Vineear with polish and under structure with Lamination Sunmica on both sides finish. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with One Mobile Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Engineer in charge. Executive Table Size: 2200 mm Width * 1000 mm Depth * 750 mm Height Side Table: 1200 mm Width * 750 mm Depth * 750 mm Height.

67. Manufacturing, Supplying & Installation of APPROVED make Back Storage. Storage made of superior quality BWP grade 17 mm thick plywood/HDF duly finished with 4~6 mm thick Vineear with polish. Storage shall be made combination of With door and open shelves. All Hardware of Hettich/Ebco. Overall size: 3795 mm Width * 450 mm Depth * 2050 mm Height. Color and Design as per Demand.

68. Manufacturing and Supplying Approved Make High Back revolving Bucket Chair with Synchro Torchan Bar mechanism. Chair shall be made of 12~15 mm thick moulded ply structure of Seat and back in single ply. Chair shall be provided with Leatherette Upholstery with 32 Density Foam and Extra cushion on head rest and back rest for extra lumbar support. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand..

69. Manufacturing and Supplying Approved Make Medium Back revolving Bucket Chair with Synchro Torchan Bar mechanism. Chair shall be made of 12~15 mm thick moulded ply structure of Seat and back in single ply. Chair shall be provided with Leatherette Upholstery with 32 Density Foam and Extra cushion on back rest for extra lumber support. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.
70. Manufacturing, Supplying & Installation of APPROVED make Three SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic. Sofa shall be provided with leatherette/Fabric Upholstery with 32 density High Quality Foam with Quilting design in seat and back. Sofa shall be provided with Pillows in back.. Polished Solid wood legs. Color as per Demand.
71. Manufacturing, Supplying & Installation of APPROVED make SINGLE SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic. Sofa shall be provided with Leah rete/Fabric Upholstery with 32 density High Quality Foam with Quilting design in seat and back. Sofa shall be provided with Pillows in back.. Polished Solid wood legs. Color as per Demand.
72. Manufacturing, Supplying & Installation of APPROVED make Coffee Table, Table Made of 2 Year Seasoned Solid Wood with Melamine Polish. Corner Table Size: 550 mm Dia * 500 mm Height. Polish Color as per Demand.
73. Manufacturing, Supplying & Installation of APPROVED make Coffee Table, Table Made of 2 Year Seasoned Solid Wood with Melamine Polish. Corner Table Size: 750 mm Dia * 500 mm Height. Polish Color as per Demand.
74. Manufacturing, Supplying & Installation of APPROVED make Table, Made with superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with on Mobile Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Architect / Engineer in charge. Table Size: 1600 mm Width * 900 mm Depth * 750 mm Height.
75. Manufacturing and Supplying Approved Make Medium Back revolving Chair with Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.
76. Manufacturing, Supplying & Installation of APPROVED make Three SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic . Sofa shall be provided with Leah rete/Fabric Upholstery with 32 density High Quality Foam with Quilting design in seat and back shall be provided with Pillows in back.. Polished Solid wood legs. Color as per Demand.
77. Manufacturing, Supplying & Installation of APPROVED make 2 SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic . Sofa shall be provided with Leah rete/Fabric Upholstery with 32 density High Quality Foam with Quilting design in seat and back shall be provided with Pillows in back.. Polished Solid wood legs. Color as per Demand.

78. Manufacturing, Supplying & Installation of APPROVED make Single SEATER SOFA. Entire Sofa Frame made of combination of Solid Wood with Zig-Zag Spring and Elastic . Sofa shall be provided with Leah rete/Fabric Upholstery with 32 density High Quality Foam with Quilting design in seat and back shall be provided with Pillows in back.. Polished Solid wood legs. Color as per Demand.

79. Manufacturing, Supplying and Installation of Approved Make Corner Table for Principal Room. Table Made of 2 Year Seasoned Solid Wood with Melamine Polish. Size: 500 * 500 MM Square * 450 mm Height. Color as Per Demand.

80. Manufacturing, Supplying and Installation of Approved Make Coffee Table for Principal Room. Entire Table made of superior quality BWP grade 15 mm thick commercial plywood/HDF duly finished with 3~5 mm thick Vineear with melamine polish. Table shall be provided with Drower with Cane mesh on front of the Drower. Size: 1100 mm Width * 800 MM Depth * 450 mm Height. Color as Per Demand.

81. Manufacturing, Supplying and Installation of Approved Make Coffee Table for Principal Room. Entire Table made of superior quality BWP grade 15 mm thick commercial plywood/HDF duly finished with 3~5 mm thick Vineear with melamine polish. Table shall be provided with Drower with Cane mesh on front of the Drower. Size: 800 mm Width * 400 MM Depth * 450 mm Height. Color as Per Demand.

82. Manufacturing, Supplying & Installation of APPROVED make Table for PA, Table Made with superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with One Fixed Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Architect / Engineer in charge. Table Size: 1700 mm Width * 900 mm Depth * 750 mm Height.PA Table-1550 * 600 * 750 Side Table: 900 * 400 * 750. Color as per Demand.

83. Manufacturing, Supplying & Installation of APPROVED make Table for PA, Table Made with superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides. Table top 25 mm Thick Under Structure made of 18 mm Thick. Table shall be provided with One Fixed Pedestal of 2 Dowers and One filling Cabinet. All Hardware of Hettich/Ebco. Design as per Architect / Engineer in charge. Table-1800 * 800 * 750 Side Table: 1000 * 400 * 750

84. Manufacturing and Supplying Approved Make High Back revolving Chair with Headrest and Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.

85. Manufacturing and Supplying Approved Make Medium Back revolving Chair with Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.

86. Manufacturing, Supplying & Installation of APPROVED make Storage Cabinet Made with superior quality 17 mm thick BWP grade plywood/HDF duly finished with 4~6 mm thick Vineear with polish on both sides along with Shelves and Locks. All Hardware of Hettich/Ebco. Design as per Architect / Engineer in charge. Storage Cabinet Size: 2550 mm Width * 400 mm Depth * 2100 mm Height.

(a)Storage Cabinet Size: 2550 mm Width *400 mm Depth * 2100 mm Height.

(b)Storage Cabinet Size: 9687 mm Width *400 mm Depth * 2100 mm Height.

(c)Storage Cabinet Size: 1600 mm Width *400 mm Depth * 2100 mm Height.

(d)Storage Cabinet Size: 8400 mm Width *450 mm Depth * 2100 mm Height.

(e)Storage Cabinet Size: 2400 mm Width *400 mm Depth * 2100 mm Height.

(f) Storage Cabinet Size: 4400 mm Width *400 mm Depth * 2100 mm Height.

87. Manufacturing, Supplying and installation of Plus shape Modular Workstation. Workstation's main spine made of 60 mm thick Powder coated Aluminium Alloy. Spine shall be provided with double raceway for Electrical and Data Lines with Lamination tile below the worktop and Half pin board and half Glass board in screen above the worktop. Table top made of superior quality 17 mm thick BWP grade plywood/HDF duly finished with 4~6 mm thick Veneer with polish on both side. Workstation shall be provided with one Mobile pedestal with two drawers and one filling cabinet. Pedestal shall be provided with Nylon Wheels with locks. Module having Socket set above the worktop on main spine. Workstation module shall be provided with CPU trolley and Key board tray. Overall Size: 3320 * 3320 * 750.1200 mm Height. (Each Seat Size: 1680 * 1680 Width * 750 mm Depth * 750/1200 mm Height. Color as per Demand.

88. Manufacturing, Supplying and installation of Semi Circular Table along with Plus shape workstation. Table top made of superior quality 17 mm thick BWP grade plywood/HDF duly finished with 4~6 mm thick Veneer with polish on both side. Under structure Made of 2 year seasoned Solid wood/Metal Legs. Overall size: 1800 mm Dia * 870 mm D * 750 mm Height. Color as per demand.

89. Manufacturing and Supplying Approved Make High Back revolving Chair with Headrest and Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.

90. Manufacturing and Supplying Approved Make Medium Back revolving Chair with Synchro Tilt mechanism. Chair shall be made of SS 304 grade steel frame with Leatherette Upholstery with 32 Density Foam. Arms rest with Leatherette Upholstered cushion. Chair shall be provided with class -4 Gas lift with SS / Chrome Base with Twin wheels nylon castors. Color as per demand.

91. Manufacturing and Supplying Approved Make 7 Body 2 bay Mechanical Compactor., Fixing Type:- Ist Body of each body static Two unit both side open Back units Movable, Last Body both side shelves one Itterside Open and outer side with swing doors. Entire bodies moves on rails with mechanical wheels. Construction: All bodies made of .8 mm thick 60~65 micron powder coated Galvanized MS CRC sheet Metal. and shelves made of 1 mm thick 60~65 micron powder coated Galvanized MS CRC sheet Metal Each body having slots for fixing Marking slips. Each Body size: 1200 mm Width * 400 mm Depth * 2050 mm Height. Color as per demand.

92. Manufacturing and Supplying Approved Make 7 Body 3 bay Mechanical Compactor., Fixing Type:- Ist Body of each body static Two unit both side open Back units Movable, Last Body both side shelves one Itterside Open and outer side with swing doors. Entire bodies moves on rails with mechanical wheels. Construction: All bodies made of .8 mm thick 60~65 micron powder coated Galvanized MS CRC sheet Metal. and shelves made of 1 mm thick 60~65 micron powder coated Galvanized MS CRC sheet Metal Each body having slots for fixing Marking slips. Each Body size: 1200 mm Width * 400 mm Depth * 2050 mm Height. Color as per demand.

93. Manufacturing, Supplying & Installation of APPROVED make Modular Kitchen Made with superior quality BWP grade plywood/HDF duly finished with Lamination Sunmica on both sides along with Shelves and Cutlery Baskets. All Hardware of Hettich/Ebco. Design as per Architect / Engineer in charge. Pantry Counter With Sink Unit & Over Head Units : 3500 * 600 * 800

5.93 **INFRASTRUCTURE**

(a) Providing and fixing factory made precast RCC perforated drain covers, having concrete of strength not less than M-25, of size 1000 x 600x50 mm, reinforced with 8 mm dia. four nos. longitudinal & 9 nos. cross sectional T.M.T. hoop bars, including providing 50 mm dia. perforations @ 100 to 125 mm c/c, including providing edge binding with M.S. flats of size 50 mm x 1.6 mm complete, all as per direction of Engineer in-charge.

(b) Providing, Fixing and installation of 20 KLD STP of MBR Technology as per the specifications.

Design Parameters

The plant is designed to treat sewage generated having following characteristics

Design Consideration	
Nature of waste water	Sewage
Flow	20 m3/day
Operating hours	24 Hours

Characteristics of the Raw and Treated sewage water		
	Raw Sewage Water (At inlet of MBR System)	Treated Water (At outlet of MBR System)
pH	6.5 – 8.5	6.5 -7.5
COD	≤ 1000 ppm	≤ 50 ppm
BOD	≤ 600 ppm	≤ 10 ppm
TSS	≤ 300 ppm	≤ 10 ppm
Oil & Grease	≤ 50 ppm	≤ 5 ppm
N-NH3	≤ 50 ppm	≤ 10 ppm

Sr. No	Equipment Description	Quantity
1.	BAR SCREEN MOC: SS 304 Fine screen mesh size: 6 mm Type: Manual	1 No
2.	OIL & GREASE TRAP MOC: RCC Type: baffle Type	1 No
3.	RAW SEWAGE PUMP Type: Non clog Submersible Cutter Type Make: Kirloskar/ KDS Pump/ V-Guard/ equivalent Head: 10 m Flow: 1 m ³ /hr HP: 1 HP Phase: Single / Three Phase	1W+1S
4.	FLOW METER Type: Online float type Rota meter Capacity: 0-1600 LPH Make: CWC/Flowtus	2
5.	MBR MODULE Type of membrane: Submerged Hollow fiber membrane Pore size: 0.02 to 0.04 micron MOC of fiber: Reinforced PVDF MOC of membrane stand: SS – 304 Make: Suez(GE)/ MOWS/Mitsubishi/Blufox	1 Set
6.	MEMBRANE FILTRATION PUMP Type: Centrifugal pump Make: Kirloskar/ KDS Pump/ V-Guard/ equivalent Head: 15 - 18 m Flow: 1 m ³ /hr HP: 0.5 to 1 HP Phase: Three Phase/Single Phase	1W+1S
7.	MEMBRANE BACKWASH PUMP Type: Centrifugal pump Make: Kirloskar/ KDS Pump/ V-Guard/ equivalent Head: 15 - 18 m Flow: 1m ³ /hr (As per Recommended by MBR OEM)HP: 0.5 to 1 HP Phase: Three Phase/Single Phase	1W+1S
8.	Air Blower Type: Twin Lobe Root Make: Airvak/Everest Capacity: As per Final MBR OEM Pressure: 0.45 kg/cm ² Note: Flow & Pressure can be change based upon final height of tank and MBR OEM Recommendation.	1W+1S

9.	<p>ANOXIC MIXER</p> <p>Type: Motor, Gear Box with Impeller MOC: SS 304</p> <p>RPM: 20 RPM</p> <p>HP: 1 HP</p>	1 No
10.	<p>Recirculation Arrangement</p> <p>Air recirculation only through Blower air Flow: 1 m3/hr</p> <p>Arrangement MOC: uPVC</p>	1 Set
11.	<p>AIR PIPING</p> <p>Non submerged piping: MSEP / GI/ uPVC</p>	1 lot
	<p>Submerged piping: uPVC</p> <p>Make of UPVC: Finolex/ Astral/ Supreme Make of MSEP/ GI: Standard available</p>	
12.	<p>LIQUID PIPING</p> <p>Non submerged piping: uPVC - Sch - 40Submerged piping: uPVC - Sch - 40 Make: Finolex/ Astral/ Supreme</p>	1 lot
13.	<p>CONTROL PANEL</p> <p>Type of panel: Automatic panel of micro controller base</p> <p>Housing: MS with Powder Coating Mode of operation: Automatic / Manual Make of panel: Enviro Engineers</p> <p>Size of HMI: 7"</p> <p>All Contactor: C&S/ ABB/ Schneider Real Time Operation</p>	1
14.	<p>SKID MOC</p> <p>MOC of skid: SS 304</p> <p>Dimension if Skid: As per final size of membrane</p>	As per design
15.	<p>DISINFECTANT DOSING SYSTEM</p> <p>Dosing pump make: Verito/ Milton Roy/aavolateCapacity of Dosing pump: 0 - 4 LPH</p> <p>Dosing tank make: Sinon / EquivalentDosing tank capacity: 50 Lit</p> <p>Dosing tank MOC: LDPE</p>	1
16.	<p>CEB/CIP DOSING SYSTEM</p> <p>Dosing pump make: Milton Roy / Verito Capacity of Dosing pump: 0 - 4 LPH Dosing tank make: Sinon / Equivalent</p> <p>Dosing tank capacity: 50 Lit</p> <p>Dosing tank MOC: LDPE</p>	As per Recommended by MBR OEM
17.	<p>DIFFUSER</p> <p>Type: Disc membrane diffuser</p> <p>Make: Pure Aqua / Vision/ equivalent Size: 600 x 63 or 12"</p> <p>MOC: Silicon</p>	6 Nos
18.	<p>SOLENOID VALVE</p> <p>Type: ON/ OFF type, NC Valve</p>	2 Nos

	MOC: Nylon/ SS – 304 Make: Torque / Equivalent/ uFlow Line Size: 1"	
19.	PRESSURE GAUGE Range: 0 - 7 kg/cm ² X 1 Nos Range: 0 – 1 kg/cm ² x 3 Nos Make: Brinda/ Vision/ La/ equivalent Type: Bottom mounted	4 Nos
20.	VACUUM GAUGE Range: 0 – -1 kg/cm ² Make: Brinda/ Vision/ La/ equivalent Type: Bottom mounted	1 No
21.	CENTRIFUGE Make: Maruti/ Equivalent MOC: SS 304 Size: 12 mm Dia Solid Handling: 30 Kg/Day	1 No
22.	LEVEL SENSOR Type: Ultrasonic Type Make: Truemen/ Accumax/ Equivalent Depth range: 1m to 5m Output Type: 4-20 mA	1
23.	LEVEL CONTROLLER Type: Float type level sensors Cable Length: 3m	4 Nos
24.	Flow Transmitter cum Totalizer Type: Magnetic Type Flow Meter Line Size: 1" Make: Accumax/ Equivalent Output: 4 to 20 mA	2 Nos

Volume of Units:

Sr.No	Unit Description	Capacity
1.	Collection Tank MOC: RCC/ Brickwork	1 No
	Capacity: 10,000 Lit	
2.	Anoxic Tank Capacity: 2 KL	MS having 5 mm sheet with 3 mm FRP Inside and double coat Epoxy or PUPaint Outside
3.	Aeration Tank Capacity: 5 KL	
4.	MBR Tank	

	Capacity: 1.5 KL (As per MBR OEM)	
5.	Treated Water Tank Capacity: 5 KL LLDPE Readymade Tank Make: Sinon/Sintex	1 Nos

5.94 **LANDSCAPPING**

SPRINKLER & DRIP IRRIGATION SYSTEM

Irrigation system-outside plot

1. Providing, laying & jointing in position PVC pipe conforming to ISI S : 4985 / 2000 and suitable for the respective 10kg/cm² working pressures with all fittings and accessories e.g. couplings, tees, bends, reducers, screwed adapters, flanged tail pieces etc. jointing as per manufacturers' instruction, etc. item complete.
2. PVC pipe 75mm-6 kg/cm² with PVC fittings & Assembly (10Kg)
3. PVC pipe 63mm-6 kg/cm² PVC fittings & Assembly(10Kg)
4. PVC pipe 50mm-6 kg/cm²PVC fittings & Assembly(10Kg)
5. PVC pipe 50mm-6 kg/cm²PVC fittings & Assembly(10Kg)
6. Soft Soil Trenching & Backfilling for Irrigation Pipes , minimum trench depth upto 300mm

SPRINKLERS & ACCESSORIES (Providing & Fixing)

1. Providing & fixing of Stream Type Rotating Sprinkler having 4" Riser Height and upto 9 mtr Radius of Coverage &The Spray Head body shall be constructed of heavy-duty, ultraviolet resistant plastic and stainless steel spring.
2. Providing & fixing of Gear Driven Rotor covering 14.0-18.0m Having 4" Riser Height. The Spray Head body shall be constructed of heavy-duty, ultraviolet resistant plastic and stainless steel spring with multifunctional wiper seal with small exposed cover. etc. item complete.
3. Providing & Fixing of , 1/2" Pop up Connecting Four Elbow Swing joint Assembly. The fittings shall be made of UV resistant thermo plastic. Etc. item complete.
4. Providing & Fixing of , 1" Pop up Connecting Four Elbow Swing joint Assembly. The fittings shall be made of UV resistant thermo plastic etc. item complete.
5. Providing and fixing of PVC /HDPE service saddle of varying size.1/2' &3/4" etc. item complete.

DRIP IRRIGATION & ACCESSORIES (Providing & Fixing)

1. Supply and fixing of Brown Layered Cylindrical Inline Pressure compensating polytube 16 mm dia., having 4 LPH Emitting Device with tees, elbows, end caps, GTO etc. as required and specified complete.
2. Providing & fixing of lateral hoding stakes GI Coated 8" Long Rod.

Valves, Valve Boxes (Providing & Fixing)

1. Providing & fixing of Butterfly Valve 75mm with PP Flanges & GI Nut bolts, Valve body shall be of Engineering plastic PVC Body with Large Plastic Handel.
2. Providing & fixing of PVC Ball Valve 63 MM- Double Union.

3. Providing & fixing of Brass Quick coupling valve 3/4" made up of solid brass with locking cover corrosion resistant and stainless steel spring. Including service saddle and riser assembly. etc. item complete.
4. Providing & fixing of Brass Key threads into top of QCV to provide water access And Brass Swivel Elbow. Etc. item complete.
5. Providing & fixing of a double acting 1" Air release valve, The Air release valve shall be capable of both releasing and admitting air from and into the line. The working pressure shall be 5 bar. Including service saddle and riser assembly
6. Providing & fixing of 10"Round box with green lid and corrugated structure with unique shovel access slot and bolt hole knockout. etc. item complete.
7. Providing & fixing of 6"Round box with green lid and corrugated structure with unique shovel access slot and bolt hole knockout. etc. item complete.
8. Providing and fixing of PVC /HDPE service saddle of varying size 90mm/75mm/63mm etc. item complete.

HEAD UNIT (Providing & Fixing)

1. Supply, installation, testing and commissioning of Semi Auto backwash Filter Unit with Header Assembly having 3" inlet/outlet and 28 Cub. Meter Flow Rate Complete Set with Required Fittings Assembly.
2. Supplying, Fixing, Testing & Commissioning of Vertical Submersible Multistage Pumping System 5 HP with accessories as per the following specification and comprise of Having total capacity 6-9 Lps Discharge @ 53-58 Mtr. head,. complete With Start Panel and Required Fittings & Accessories.
3. Providing & fixing of Non Return Valve to prevent back flow 3" size with necessary fittings & accessories etc. complete
4. Providing & fixing of Hydraulic Pressure Release valve 2" with necessary fittings & accessories etc. complete.

AUTOMATION UNIT (Providing & Fixing)

1. Irrigation Controller up to 12 Station, Out Door, 230 VAC Unit, Capable of running 4 Independent Programs with Power Back up Lithium Coin-Cell Battery
2. Customized Automation Electrical Control Panel having M.S. Powder coated Outdoor Box with Auto /Manual Operation , Relay, Contactors, Stabilizer, Volts-Amp. Meter ETC
3. 2" Solenoid Valve BSP Female Threaded, Pressure - 1 to 10 24V AC Coil
4. 12"Rectangular Valve box with greenlid and corrugated structure with unique shovel access slot and bolt hole knockout. etc. item complete.
5. Double Seathed Fire Proof Direct Barrier Irrigation Automation Cable 1.5 Sq.mm
6. Conduit Pipe for Cables 20mm to 50mm OD
7. Weather Proof Cable Connection

5.95 MISCELLANEOUS

- (a) Providing and fixing stainless steel (SS316) TACTILE warning indicators (studs of (dimension 35mm x 25mm x 4.5mm, stem : 6mm x 12mm) surface design : skid proof circle. The layout shall be got approved by EIC before execution. Providing and fixing stainless steel (SS316) TACTILE directional strips of dimension 280mm x 35mm x 5mm, stem : 6mm x 12mm) surface design : skid proof diamond. The layout shall be got approved by EIC before execution. The TACTILE directional strips shall be fixed in 6mm dia & 12mm deep holes in granite flooring / tile flooring / other with epoxy glue all complete as per direction &

satisfaction of EIC. The rate is inclusive of drilling, cleaning & applying glue in the hole for fixing stud, transportation, loading / unloading, taxes etc. nothing extra will be paid.

- (b)** Expansion Joint For Internal Wall Providing and Fixing of Wall Flat Covers from approved make for Expansion Joints, having solid all metal expansion joint cover. maintenance- free, hard wearing and long-lasting. The cover must be design in such a way that there should be 65mm visible aluminium flange in the sides and no requirement of any gasket or sealant should be there. The centre plate can be individually designed to match the adjacent surface and can be printed in same adjacent wall texture. The bar construction ensures easy installation of the centring system. The Exp. Joint System have three-dimensional movement absorption, easy to install with optimized design allows for easy and safe installation of the centring bar. Alloy to be used 6063 T66 for better tensile strength. Connection pins to ensure even installation with respect to both, height and width. For Precise Transitions the system should be installed by the way of positive connection between each single length by the way of the connecting pins that should ensure a level and precise transition.
- (c)** Expansion Joint For External Wall Providing and Fixing of Exp. Covers from approved make, FA 25/7 Model, for 200 mm Expansion Joints having flexible high quality electrometric inserts. The Inserts should be hard wearing and temperature resistance (- 30 C to + 120 C Degree). The total Movement should be 50 mm (+/- 25 mm). The system should be in 6063 alloy T66 in Mill finish and the total exposed surface of the profile should not be more than 282 mm (+/- 5 mm) and the installation height should be of 12 mm. Expansion Joint covers/ Profile insert should have a double protection from water due to its double sliding of sealing insert within metal profiles. The Side Profile should have a MULTI HOLE mounting bracket allowing for secure fixing and flexible anchoring and excellent bonding with given slab surface/masonry/epoxy bedding. For Precise Transitions the factory supplied connection pieces should be used during the installation of the cover system.
- (d)** Providing and laying terra medium duty doormat of colour as approved, coil type open loop design with vinyl foam backing, with removing of dry dust by wiping action, Suitable for medium traffic areas, 3M or approved equivalent.
- (e)** Providing and locating at site a to the scale (1:100 or as instructed by Eng in charge) 3D model made up of acrylic sheet of appropriate thickness and as per the design drawing made available including strong base with wooden framing and covered with transparent acrylic/glass sheet with lighting and illumination i.e. night view complete inclusive of all material, labour, T & P, loading, unloading, taxes etc. as per the instruction and satisfaction of EIC.
- (f)** Supply of Video DVD of 180 minutes duration comprising one master copy and one extra copy showing the progress of works and methodology and at interval as directed by Engineer and as per Technical Specifications.
- (g)** Existing top layer of 150mm thk. (Fertile Soil) to be stacked at site Removing excavated existing top fertile soil and stacking the same at a location as approved by EIC including lead up to 250m and lift up to 1.50m. This fertile soil shall be used for landscaping purpose.
- (h)** Providing Wheel washing facilities of Appropriate Size at site as per the specifications and design Drawing The rate includes cost of construction of the wheel washing facilities including mud pump as specified in the specification but excludes water pipeline works Complete including cost of all labour, material, T & P, lead, lift, taxes etc. as per instruction & satisfaction of EIC.

- (i) Hire and running charges of crane 20 tonne capacity Complete including cost of all labour, material, T & P, lead, lift, taxes etc. as per instruction & satisfaction of EIC.
- (j) Disposal of excavated earth / moorum/building rubbish/ malba/ similar unserviceable, dismantled or waste material by mechanical transport including loading, transporting, unloading for all lifts, complete as per directions of Engineer, by Contractor at his own cost. The Contractor is allowed to dispose the excavated material as per his arrangement.
- (k) Implementation of building information modelling (BIM) from start of design to construction period to create 3D modelling of all members, asset etc., level of development of construction documents and information to LOD-350, BIM Modelling in dimensions-3D,4D as per special conditions and details in section 5 of tender document.
- (l) Electric stage curtain Molar Main Stage Curtain (Commissioning of a velvet curtain with horizontal sliding, including rails, brackets, motorized operation, track, mounting hardware, pulley, hooks, and motor for both directions, ensuring a smooth and draped stop. Minimal overlap at the centre when closed, maximizing usable space.)

Special note:

If any items shown in BoQ not specified here or anywhere in this document shall be executed as per its relevant IS codes/CPWD/Indian railway specifications. In case, if there is no relevant codes/specifications for the item is available, then the item shall be executed as per direction of Engineer in charge. The decision of engineer in charge in this regards shall remain final and binding to the contractor.

<u>LIST OF APPROVED MAKE</u>		
Sr. No.	Description	Approved Brand
1.	Paint, Primer,	Asian, ICI, Nerolac
2.	Putty	Birla, Asian, Nerolac
3.	Polish	MRF, Asian, ICI
4.	Hardware	Kitch, Durex, Palladium, Dorma, ozone
5.	Adhesive	Fevicol, Kitcol, Araldite, Dr. fixit, Myk Laticrete, Bronco
6.	Anchor fastener / bolts	Fischer, Hilti, Klimas,URP.
7.	Floor spring	Hemco, Hyper, Sterling, Godrej, Ozone. Dorma
8.	Door closer	Efficient Gadget, Godrej, Ozone. Dorma
9.	Aluminum sections	Jindal, Blick, Bhoruka, Gujrat, Avirat
10.	Aluminum Finish	25-micron colour anodized – contractor should provide the micron thickness measuring equipment at site throughout the work progress for checking the anodizing thickness, visibly should looks uniform as per standards.
11.	All Aluminum anodized fittings	EP & PW,HIVIK,RAPCHIK
12.	SANITARY WARES	TOTO, AMERICAN STANDARD, KOHLER, SIMPOLO, PARRYWARE,JAQUAR

13.	CP FIXTURES AND ACCESSORIES	1) JAQUAR 2) HANSGROHE 3) GROHE 4) AMERICAN STANDARD 5) KOHLER
14.	GI PIPES	1) TATA 2) JINDAL
15.	APVC & CPVC PIPES & FITTINGS	1) FINOLEX 2) SUPREME 3) PRINCE 4) ASTRAL 5) ASHIRWAD
16.	STONEWARE PIPES AND FITTINGS	1) APPROVED MAKE ISI
17.	SS SINK	1) AMC 2) KRISHNA 3) NIRALI 4) FRANKE 5) JAYNA
18.	CEMENT	OPC/PPC Ambuja, Ultratech, Birla Plus.
19.	White Cement	Birla, J. K.
20.	TMT – Fe-500/500 D Ribbed bars	TATA, SAIL, VIZAG.
21.	Structural Rolled Steel sections – beams, channels, tee, flats, angles, bars, (round, square, hexagonal)	TATA, SAIL, RINL, JINDAL, ESSAR.
22.	Structural Hollow steel sections (Square and Rectangular)	Tata, SAIL, Asian, Appolo.
23.	PEB Manufacturer	Everest, Pennar, Kirby, Rashian, Zameel, Interarch, Rishikesh
24.	Coarse Aggregates 6 mm to 40 mm sizes	Approved quarry by EIC
25.	Stone Rubbles & Gravels	Approved Quarry by EIC
26.	Shuttering plywood	Kitply, Anchor7, Green, Pragati.
27.	Marine Grade plywood IS-710	Green, Kitply, Duro, Century, Anchor, Merino
28.	Commercial plywood – IS – 303	Green, Kitply, Duro, Century, Anchor, Merino
29.	Decorative ply (Veneer)	Green, Century, Kalachandra, Archid, Merino
30.	Prelam particle board	Novapan, Bhutan
31.	Laminate sheet	Greenlam, Alfa-Ica, Decolam, Neoluxe, Century, Stylam, Merino
32.	Cement bonded particle board	NCL (Bison board), Everest (Eternite), Ecopro
33.	Calcium silicate board	Hilux, Gyptech, Gyproc, Anutone, Evershine
34.	Flush door – decorative / non decorative	Green, Anchor, Century, Merino, Furncept
35.	Locks	Godrej, EPPW, Dorset, Ozone

36.	Float Glass/Mirror/Wired Glass	Modi Guard, Saint gobain, Asahi, ASI
37.	Tiles	Kajaria, Nitco, Asian, Simpolo, Vermora
38.	Construction chemicals	Fosroc, M.C. Bauchemie, Pidilite, MYK Arment, Pedilite
39.	Bricks	NR/NK (Ahmedabad)
40.	False Ceiling	Gyproc, Gyptech Hilux, Knauf Danoline, Anutone, Evershine designs & furnishers
41.	Water Proofing Below Foundation (Water Proofing For Foundation)	Asian Paint /Pidilite/MYK Arment/Kerakoll/Bronco
42.	1.GFRC/GFRP Façade 2.Dry Stone Cladding 3.Glass facade	1.Everest Composites (ECPL), Sanisha, Birla White 2. Blick or equivalent 3. Jindal or equivalent
43.	Wooden Fibre panel	Gyproc, Geenlam, Century or equivalent.
44.	Bib cock & Concealed Stop Cock	Jaquar / Hindware / Kohler or Equivalent
45.	Raw Sewage Pump	Kirloskar/ KDS Pump/ V-Guard/ equivalent
46.	Flow Meter	CWC/Flowtus
47.	MBR Module	Suez(GE)/ MOWS/Mitsubishi/Blufox
48.	Membrane Filtration Pump	Kirloskar/ KDS Pump/ V-Guard/ equivalent
49	Furniture & interiors	Godrej, Spacewood, Methodex, Evershine designs & furnishers, Furncept
50	Grouting	Pedilite, sikka, MYK Arment, Bronco
51	Sealants	Pedilite, sikka, MYK Arment, Bronco
52	Admixtures – Plasticizers / Super plasticizers	Pedilite, BASF / SIKKA, Asian, Bronco
53	UPVC /Aluminium Windows	Fenesta/weather seal/AIS windows/veka /Jindal/Prominanace
54	Mechanical Couplers	Unitech / Utracon / Moment /Dextra or equivalent

Note:- All the materials/makes other than as specified above shall be ordered and used only after obtaining prior written approval from the Engineer-in-charge.

SECTION 6

**SPECIFICATIONS AND SPECIAL CONDITIONS FOR
ELECTRICAL WORKS, FIRE FIGHTING, FIRE ALARM,
HVAC, ELV SYSTEMS.**

SPECIAL CONDITIONS FOR ELECTRICAL WORKS

1. In the event of dimension figures upon a drawing differing from those obtained by measuring drawings shall be referred to the Chief Mechanical Engineer, whose decision shall be final and binding upon the Contractor.
2. The Contractor shall submit the colored three sets Hard copy of approved drawing of cable routes, circuit diagram of LT installation layout, plans of wiring with technical literature and soft copy and also three sets of as made drawing on completion of work along with tracing.
3. While carrying out the work of electrical nature, the Contractor shall adhere to the provisions of the Indian Electricity Rules, 1956 and as amended from time to time and shall not violate any Regulations, which he will be solely responsible.
4. While crossing the rail/road, damaged caused to it should be set right by Tenderers to the Satisfaction of the Executive Engineer (P), Deendayal Port Authority. Before laying the new cables at existing route through Road/ rail / jetty, contractor shall take written permission from Engineering –In-Charge, in this regard contractor shall make earmarked drawing in two set, which will clear indicated the whereas cable will pass and take permission from Construction-I/Project Division.
5. The work shall be programmed in such a way that the electric supply to the existing installations is not disturbed to the extent possible keeping in view of the work of cutting existing cables, making straight joints and terminating cable ends in the feeder pillar, switchgear etc. shall be carried out within the shortest possible shut down periods to instruction.
6. Armouring of the PVC-A-PVC / XLPE armoured cables shall be effectively earthed at the termination glands and connecting to the nearest earth point. The tail end shall be taped with PVC adhesive tape appropriate colour.
7. The cable to be supplied by the Contractor shall be in standard drum length and straight joint shall be avoided as far as possible. In case same cannot be avoided the Contractor shall supply the requisite number of straight joints complete with jointing materials and accessories shall carry out the jointing work at their cost.
8. Necessary marking and lettering giving details of the circuits, cables etc. shall be carried out on the pedestal and LT panels as per the directions given.
9. All the supporting framework of the DB/LLP and other equipment shall be painted with two coats of primer and two coats of finishing paints of grey shade no 631 of IS: 5 after proper surface Cleaning, degreasing, chemical cleaning as per the recommendation of the manufacturer.
10. Caution board vitreous enamelled written in three languages, one being the regional language, shall be fixed or displayed to indicate danger and supply pressure according to the Indian Electricity Rules 1956 wherever the supply is at 440 Volts and above.
11. Necessary cable route indicators and cable joint indicators shall provide at an interval of 100 Meters approximately.
12. The Contractor has to provide the materials and equipments of following make as per the approved list attached.
13. The contractor shall study the local working conditions at the site of work before tendering and no claim what-so-ever shall be entertained.
14. The work shall be carried out in accordance with the best standards of workmanship and to the entire satisfaction of the Engineer-in-Charge.
15. The electrical installation shall confirm to all currently applicable ISI specification such as IS: 732, IS: 3043, IS: 2309, IS: 3045 etc. with up to date amendments including relevant IEC regulation and Indian Electricity rules 1956 with up to date amendment.
16. Necessary earthing of wiring, Load Panel, etc. set will be carried as per the IE rule & Act.
17. For laying the new supplied cable, contractor shall take route approval in drawing from EIC same will be send to Civil Department for permission through proper channel for Civil Item like Road/Rail/RCC Crossing,
18. For High Mast, Foundation work shall be carried out under supervision of Civil Engineering Department. Necessary Drawing & Material for foundation shall be approved from civil Engineering Department.
19. The Tenderers shall quote the rate for cable lying, which shall include the, cable tagging, dressing, end termination, appropriate size of glands & ferrule work as per requirement etc.
20. All wiring, shall be concealed/Surface as per specification & LED fittings will be surface mounted Bulk Head, hence at the time of CIVIL work, firm shall be planed accordingly & continues touch with EIC, For concealed wiring / Points/ sub Ckt. /location of LED fitting, LPP/Meter/DB, otherwise firm shall be responsible for any untoward situation & no claim what-so-ever shall be entertained.

21. Queries about the Technical Data

22. The Engineer-in-Charge will clarify queries on the Technical Data.

23. Instructions

The contractor shall carry out all instructions of the engineer or his nominee which comply with applicable laws where the site is located

24. Safety

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

25. Quality Control Identification of Defects

The Engineer-in-Charge or his nominee shall check the work carried out by Contractor and notify the Defects found if any. The Engineer-in-Charge or his nominee may instruct the Contractor to rectify the Defect.

26. Employer's right of Rejection:

The employer shall reserve the right to reject a part portion or consignment thereof within a reasonable time after actual delivery thereof at the place of destination, if consignment is not in all respects in conformity with terms & conditions of the contract whether on account of any loss, deterioration or damage before dispatch or delivery or during transit or otherwise whatsoever

27. Removal of Rejected goods:

Rejected goods shall under all circumstances lay at the risk of the contractor from the moment of rejection and if such goods are not removed by the contractor within 21 days from the date of intimation from the Engineer-in-Charge. Engineer-in-Charge may either return to the contractor at the risk and cost of the contractor by such mode of transport as the Engineer-in-Charge may select or dispose off such material at the contractor's risk on his account and retain such portion of the sale proceeds as may be necessary to recover any expenses incurred in such disposals.

28. Deviations:

The bidder must read the tender document carefully and prepare the bid for submission. It is important to note that deviations, if any, must be brought out clearly in the technical offer, which shall be examined by DEENDAYAL PORT AUTHORITY. If the deviation statement submitted by the bidder does not contain any item, then it shall be construed that the bidder has accepted the same and no request from the Contractor, for any change, shall be accepted by DPA at a later stage. In any case, no change in specifications given in the tender agreement shall be permitted. However, only in unavoidable circumstances, DEENDAYAL PORT AUTHORITY may consider such requests from the Contractor, provided the Contractor submits its request with adequate justification.

29. Approvals:

The Engineer-in-Charge shall give specific approval in writing within 7 Days to Contractor after written submission regarding Makes of Material to be used for the Contract and Drawings, if any to be furnished by the Contractor to Engineer-in-Charge for approval. Any corrections to be suggested by Engineer-in-Charge in drawings, the days taken for rectification in drawings shall be in account of the Contractor.

30. Engagement of 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.

31. Registers to be maintained at site.

1. Site order Book:

A site order book is to be maintained by the contractor at the site. The work orders and instructions written in the site order book shall be deemed to have been legally issued to the contractor shall sign each entry in the site order book as a token of his having seen the same. The site order book shall be property of the Board and shall be handed over to the Engineer-in-charge of the work in good condition on the completion of the work or whenever required by the Engineer- in-charge or his authorized representative.

2. Hindrance Register:

Every type of hindrance arising during the execution of work should be invariably recorded in the hindrance register. The Hindrance Register is to be maintained by the Engineer In Charge

at the site. The contractor shall sign each entry in the hindrance Register as a token of his having seen the same. The Hindrance Register shall be property of the Board.

32. Labour License:

The contractor will have to obtain License from Assistant Labour Commissioner (ALC), Gandhidham/Gopalpuri/Adipur, in case he is engaging ten or more workers on any day during execution of work.

33. Payments Terms for Electrical Part:

All payments shall be made in Indian rupees unless specifically mentioned.

- (i) 70% of supply item rate against receipt of material at site in good condition, after obtaining insurance cover as per tender condition and after inspection & certification of the same by Third Party Inspection Agency (if required) and after inspection & acceptance of material by DPA for item covering supply of material and also supply & erecting / Providing and fixing laying together
 - (ii) 20% of supply item rate after completion of erection, installation, testing and commissioning for item covering supply of material and also supply & erecting / Providing and fixing laying together etc. and 90% of item rate for item covers only laying/fixing etc. (TPI appointed then after inspection; certification of the same by Third Party Inspection Agency).
 - (iii) 10% will be released after successful completion of whole work (TPI appointed then after inspection & certification of the same by Third Party Inspection Agency) and handing over to DPA.
- Extra Substituted and Deviated Items of Work is applicable as clause no.3.40 of section-3 & clause no. 5.60 of section-5

34. Valid Electrical Contractor license: The Contractor shall have valid Electrical Contractor's license for carrying out Electrical work of the nature involved in this tender obtained from Chief Electrical Inspector I.M. & P Department, Government of Gujarat without which the tender shall not be accepted. The Contractor shall submit certificate and copy of the license in lieu of the same for consideration. The Contractor shall also have a valid Electrical Supervisor's Certificate of competency issued from the Chief Electrical Inspector, I. M. & P. Department, Government of Gujarat or equivalent authority from the other States/Central Government.

35. In case of manufacturer/ Authorized dealer/ civil contractor who do not have valid electrical contractor license, they have to provide, their employee having electrical supervisory certificate while carrying out electrical works or The whole electric work carried out by the Sub Contractor should have electric license & having experience of the work carried out in Government / PSU or any industries, in this case firm shall take prior approval from Chief Mechanical Engineer, Deendayal Port Authority.

36. The defect liability period for the subject work is 24 months. However, the contractor shall be responsible for maintenance of the asset during defect liability period as per standard practices which includes regular inspections, routine unkeep, repairs and renovations to ensure the building remains in good condition and serves its intended purpose at his own cost, failing which same will be rectified by the Engineer in charge and amount will be recovered from the performancesecurity.

SPECIAL CONDITIONS FOR FIRE FIGHTING, FIRE ALARM, HVAC, ELV SYSTEMS.

• FIRE FIGHTING SYSTEM SPECIAL CONDITIONS

1. Notwithstanding the below method statements/ installation procedure, the execution of project shall, in general, conform to relevant Codes & standards, guidelines/ compliance issued by the authority having jurisdiction, standard industrial practice and OEM's recommendation over and above the method statement/ installation procedure.

2. HEALTH & SAFETY:

Contractor must follow Safety norms as per Deendayal port authority safety guide.

2.1 WORK PERMIT

- All Workers have valid Gate Pass till project completion.
- Proper induction of all workers shall be completed before starting their defined work.
- Necessary JRA and work permit shall be issue before starting the work.
- All welders shall be certified welder and need to submit their certificate.

2.2 BARRICADE AND WORK AT HEIGHT

- Temporary barricades shall be provided around the working area prior to commencement of site work.
- Safety signboards, warning tape and signs, cones shall be provided around the working area confirming the safety of working area.
- The fabrication area shall be neat and tidy at all times. Fabrication should be done above MS sheet to protect the flooring.
- All unwanted materials / debris shall be transported to approve dumping site on daily basis.
- Only approved scaffoldings & safety belts should be use whenever working at heights exceeding 1.5Mtrs.
- Ladders must be checked to ensure correct length, type and condition before use
- The ground base for the ladder must be firm and level. Damaged ladders will be broken up or removed from site
- The ladder must be of sufficient length to extend 1m above the step-off point when used as access to scaffold.

2.3 ELECTRICAL TOOLS

- All Electrical tools shall be tag as per safety standard before starting work. Tag shall be renewing time to time.
- All hand and portable power tools to be used shall be of good order and be used by approved industrial sockets.
- Ensure that all tools and equipment are thoroughly inspected, and all are in proper working conditions.
- Power tools must be 230 V with socket and insulated cables.

2.4 LIFTING MATERIAL

- Lifting of any material or equipment should be done only by means of approved chain / Electric hoists /Jacks with appropriately support.

2.5 FIRE EXTINGUISHERS

- Application of Paints, primers, thinners varnishes etc. should be carried out at ventilated places only.
- Fire extinguisher shall be positioned at Material Store Area and in the event where welding work is in progress on workplace.
- Ensure adequate lighting and ventilation whenever working in confined spaces.
- Ensure that working is have provision of entrance and exit

2.6 PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Wear Goggles of adequate visibility, whenever using gas torches, grinders, cutting machines, or doing

- chipping, drilling etc. Do not use goggles with scratched glasses or of poor visibility.
- During manual handling of Material all workers have to wear safety gloves and make sure they are protective against trip hazards and sharp edges.
- All appropriate safety personal protective equipment shall be worn by workmen such as
 - ☐ Earing protection, Earmuff or Plugs
 - ☐ Helmet, Hand Gloves (Leather or Cotton)
 - ☐ Face Shield (for grinding/cutting activities), Dust Mask respiratory protection.
 - ☐ Safety Glasses, Safety Shoes

3. INSTALLATION PROCEDURE

3.1 PRE-INSTALLATION PROCEDURE FOR PIPE LAYING

- Permit to Work (PTW) shall be raised before starting the work.
- Check the Welding Work area is enough far away from other utilities i.e. Gas Line, Electrical Cables, Water Line or other Utilities.
- Ensure the working area at any confined space is free from any Hazardous Gas by proper Gas testing using the Gas testing instrument.
- Ensure that the work area is ready and safe to start the installation of Piping Work.
- Check and ensure that approved drawings, the correct size and type of Pipe & accessories are ready with Pipe Installation / Fabrication team.
- Assign sufficient banks men, helpers and supervisors at the site prior to start of work.
- Ensure that M.S Pipe and its accessories received from site store for the installation are free from rust, corrosion & damages

3.2 PIPE HANGER / SUPPORT INSTALLATIONS

- Make piping Installation Route / layout as per the approved shop drawings, combined services drawings and site coordination with other services.
- Piping Route will be the as per most advantageous manner possible with respect to headroom, valve access, opening and equipment clearance, and clearance for other work.
- The Line layout should be verified from Site in charge.
- After marking the pipe routes, the anchoring points will be drilled according to the required support spacing as shown on the approved shop drawings.
- Mark out the location of hanger thread rods for pipe installation as per the approved construction drawing.
- Fasteners and fully threaded rods shall be used for installing the pipe supports. The size of pipe supports, and installation shall be in accordance with manufacturer's recommendations.

Pipe Diameter (mm)	Maximum Hanger Spacing (mm)	Rod Size (mm)
25	2000	8

32	2500	8
40	2500	8
50	2500	8
65	2500	10
80	2500	10
100	2500	12
150	3000	12
200	3000	12

- For Single pipes of size 100 mm and above, with the prior approval 50xx50xx6 mm MS Angle iron and for Double Pipe 75x75x6mm with U Clamp with Fastener may be used for Supporting horizontal Pipe from ceiling.
- Drill the marked position for hangers and supports by using the drill bit of appropriate size.
- Fix the unfix anchor at drilled position by gentle and uniformly hammering.
- Fix the threaded rod of appropriate diameter and size & length in the anchor by twisting by turning.
- After fixing the threaded rod, insert a washer of appropriate size into the rod.
- Finally fix the washer near to the slab by tightening a nut over it, this will improve the strength and load bearing capacity of threaded rod.
- For installing pipes vertically or horizontally inside the building standard pipe supports of reputed make shall be used. Following supports shall be used.

a. Clevis Hangers or MS Chancel for horizontal supports to adjust varying heights.

The Pipe route should be min 500mm away from wall. Supports will be arranged as near as possible to pipe joints and any change in direction.

b. Vertical Riser Support:

Risers shall be supported by pipe clamps or by hangers located on the horizontal connections within 24 inches (0.6 Meter) of the centre line of the riser.

3.3 PIPE WELDING /FABRICATION

3.3.1 WELDING MACHINE

- Welding machines shall be in good working condition and shall have proper control for regulating current.
- Location of welding machines and the distribution boards to be connected with them shall be verified by site electrical Team to avoid overloading of the distribution boards, cables and electrical power sources.
- All welding Machine, other Electrical Tools, the electric cables, distribution boards and connections for machines shall be carefully checked once a Month to maintained it in a good working condition.
- Welding cables used shall have proper insulation throughout the length. The cables shall be carefully examined and repaired as necessary every day.

3.3.2 WELDING ELECTRODES

- Electrodes used for welding should comply with IS:814, 1991.
- Generally, all welding shall be performed using Shielded metal arc welding (SMAW) process using cellulosed-coated electrode (E6013 type) for root run and subsequent passes

3.3.3 STORING OF WELDING ELECTRODES

- Welding electrodes shall be stored in indoors free from moisture.

- Qualified and certified welders only shall do welding.
- No welding shall be done if there is impingement of any rain, or high winds

3.3.4 FABRICATION OF PIPE (BUT WELDING)

- The welding of pipes in the field should comply with IS:816, 1969.
- All pipes and fittings shall be cleaned of Dust, Mud from inside and outside before Welding.
- All pipe, fittings shall be smooth, clean and free from blisters, loose mill scale, sand and dirt prior to the installation.

3.3.5 EDGE PREPARATION

- Before welding, the ends shall be cleaned by wire brush, filing or grinding and making "V" on edge of both pipes.

3.3.6 WELDING OF ROOT RUN

- Primary Welding shall be done by E6013, 2.5mm Welding Rod (90 to 90A, 18 to 25V) of approved make.

3.3.7 CHIPPING AND CLEANING OF ROOT RUN

- Each weld- Root run shall be thoroughly cleaned to remove the slag, irregularities and any defects, before the next run is deposited.

3.3.8 FINAL WELDING RUN

- Final Welding shall be done by E6013, 3.5mm Welding Rod (80 to 140A, 20 to 25V) of approved make.
- Chipping and Cleaning of Final Run: Each Final weld shall be thoroughly cleaned to remove the slag, irregularities and any defects.

3.4 PIPE INSTALLATION

- Installation of pipe shall be co-ordinate with architectural, structural and MEP work for a fit for purpose installation. Any deviation shall be intimated to the engineer for approval.
- Cut all pipes accurately to measurement determined at the site. After cutting the pipe, ream it and remove all burrs.
- Run all piping as direct as possible, avoiding unnecessary offsets and conceal piping in finished rooms.
- Install all piping close to walls, ceilings and columns so piping will occupy the minimum space, but Proper space will be provided for covering and removal of pipe, special clearance, and for offsets and fittings.
- Pipe work will be installed not closer than 200 mm to electrical conduits, lighting, and power cables.
- Pipes will be spaced in ducts, ceilings, voids and plant areas, such as adequate access is permitted to any pipe for maintenance or removal without disturbance to the remaining pipe work and other services.
- Pipes will not be solidly built into walls or plaster. Pipe joints will not be positioned within the thickness of walls, floors or in any other inaccessible position. Pipes passing through walls and floors will be sleeved.

- Couplers, unions and fittings will be screwed up to the reduced depth of the thread, such that no more three-turns are showing when pulled up tight.
- All pipes, valves and fittings and connected equipment will be thoroughly cleaned of rust, sand and dust, scale and other foreign matter before erection and before any initial fill water for hydraulic testing.
- After completion of pipe end connection, fix / tight the support clamps properly to make the pipe straight and level as per the layout.

SUPPORT DETAILS			
nominal pipe diameter	spacing between supports	clevis rod diameter	clevis strip Size (X width)
25 mm			25
50 mm			25
80 mm			30
100 mm			30
125 mm			30
150 mm			30
175 mm & above			30
If Site Requirement Fabrication Support may be used.			

- Check the levels of pipe work with spirit levels and measuring tape.
- The Spacing of fire pipe supports for sprinkler / clevis hanger shall not be more than that specified below
- All lines shall be suitably supported to provide rigidity and avoid vibrations.
- Proper lines and levels shall be maintained while installing exposed pipes.
- All lines less than 50 mm NB size can be socket welded to matching rating fittings.
- All lines above 50mm NB size shall be butts welded with full penetration welds.
- **All bolts, nuts and washers used shall be of GI.**

TYPE 'A' IS: 2016 TABLE II			
BOLT-SIZE (MM)	WASHER MATERIAL: MILD STEEL		
	INTERNAL - DIA MM	EXTERNAL - DIA MM	THICKNESS (MM)
M1.6	1.8	4	0.4
M1.8	2.1	5	0.4
M2.0	2.4	5	0.4
M2.2	2.6	6	0.5
M2.5	2.9	6.5	0.5
M3.0	3.4	7.0	0.5
M3.5	4.0	8.0	0.5
M4.0	4.5	9.0	0.8
M4.5	5.0	10.0	1.0
M5.0	5.5	10.0	1.0
M6.0	6.6	12.5	1.6
M7.0	7.6	14.0	1.6
M8.0	9.0	17.0	1.6

M10.0	11.0	21.0	2.0
M12.0	14.0	24.0	2.5
M14.0	16.0	28.0	2.5
M16.0	18.0	30.0	3.15
M18.0	20.0	34.0	3.15
M20.0	22.0	37.0	3.15
M22.0	24.0	39.0	3.15
M24.0	26.0	44.0	4.0
M27.0	30.0	50.0	4.0
M30.0	33.0	56.0	4.0
M33.0	36.0	60.0	5.0

- Extra supports shall be provided at the bends and at heavy fittings like valves to avoid undue stress on the pipes.
- Open ends of piping shall be blocked as soon as the pipe is installed to avoid entrance of foreign matter.
- Pipes must be of Heavy grade M.S. pipe conforming to IS 1239. The pipes, fittings and installation shall be hydraulically tested to a pressure of 15 Kg/Sq.cm. or 1.5 times the working pressure whichever is higher.

FLANGES

- Mild steel flanges shall be in accordance with Table - 17 of IS: 6392 i.e. "Plate Flanges for Welding" and flange thickness shall be as under. Gasket thickness shall not be less than 3 mm.
- Check the flange size and specification according to pump size and valve size,

FLANGE DETAILS		
PIPE DIA.	FLANGE THICKNESS	NO. HOLES
200 mm	24 mm	12
150 mm & 125 mm	22 mm	8
100 mm & 80 mm	20 mm	8
65 mm	18 mm	4
40 mm & below	16 mm	4

- All hardware items such as Nuts, Bolts, and Washers shall be of appropriate size.
- Washers shall be used on both sides of the bolt.

SLEEVES

- The branch lines will be hanged to the proper level and will be connected to the cross main. Where piping is embedded or passing through masonry or concrete, sleeves will be provided as per specification mostly of MS or GI material.
- Pipe sleeves of diameter larger than the pipe by least 50 mm shall be provided wherever pipes pass through walls and the annular spaces shall be filled with felt and finished with retaining rings.

SEALANT

- After the removal of the concrete forms and installation of the pipeline, the annular space between the sleeve and the pipe shall be filled with caulking material leaving enough space at both ends of the sleeve for sealing.

PAINTING

- All pipes & fittings above ground and in exposed locations shall be painted with two coat of zinc chromate primer and two or more coats of synthetic enamel of fire red colour paint.

(A) Clean the MS / GI Pipe

- Clean the black pipe with cotton rag to remove any dust or grease on the pipes before painting.

(B) Fabrication of Pipe:

- After Cleaning, fabrication work of Sprinkler network shall be completed on ground level.

(C) Paint the Pipe with 1st Coat Red Oxide (Before Fabrication)

- After Fabrication of MS Pipe, paint the black pipes with one coat of approved Red-oxide Primer will be applied as per Manufacture's film thickness or Microns measured as per Sample paint.
- Please ensure both sides (top & bottom) are painted evenly.
- Put the painted pipes in a good ventilation condition for 24 hours for the paint dry.

(D) Paint the Pipe with 2nd Coat Red Oxide

- After completion of 1st Coat apply, 2nd coat of Red oxide shall be applied of as per Manufacture's film thickness or Microns measured as per Sample paint.
- Put the painted pipes in a good ventilation condition for 24 hours for the paint dry.

(E) Install the Pipe

- After drying the 2nd Coat of Red Oxide Paint, install the pipes.

(F) Paint the Pipe with 1st Coat of Enamel Paint:

- After Installation of Pipe Networks, 1st Coat of Enamel Paint will be applied on Pipe with as per Manufacture's film thickness or Microns measured as per Sample paint.
- Please ensure both sides (top & bottom) are painted evenly.
- Put the painted pipes in a good ventilation condition for 24 hours for the paint dry.

(G) Paint the Pipe with 2nd Coat of Enamel Paint:

- After Completion of Hydro Test, 2nd Coat of Enamel Paint of Approved make of as per Manufacture's
- film thickness or Microns measured as per Sample paint.
- Please ensure both sides (top & bottom) are painted evenly.

3.4.1 VERTICAL RISERS

- Vertical risers shall be parallel to walls and column lines and shall be straight and in plumb. Risers passing from floor to floor shall be supported at each floor by MS angle with clamp as per specification of pipe support.
- The space in the floor cut outs around the pipes work may be closed using cement concrete (1:2:4 mix) or steel sheet, from the fire safety considerations, taking care to see that a small annular space is left around the pipes to prevent transmission of vibration to the structure.
- Riser shall have suitable supports at the lowest point.

3.4.2 DRAIN PIPING OF THE SYSTEM

- Fittings will be of the eccentric pattern to ensure proper drainage and the elimination of air pockets wherever necessary.
- In Sprinkler Network at far end Drainpipe shall be provided on last Sprinkler to remove Air from Sprinkler Network.

3.4.3 UNDERGROUND PIPING

- Where mild steel pipes are to be buried under ground the same shall be treated anti corrosion treatment. The top of the pipes shall be not less than 100 cm below the ground level.
- Where this is not practicable, permission of the Engineer-in-charge shall be obtained for burying the pipes at lesser depth.
- After the pipes have been laid, the trench shall be refilled with the excavated soil and rammed and any extra soil shall be removed from the site of work by the contractor.
- Underground pipe shall be laid at least 1 meter away from the face of the building preferably along the roads and foot paths.
- As far as possible lying of pipes under road, pavement and large open spaces shall be avoided.
- To facilitate detection of leak and isolation of defective portion of pipe, valves shall be provided in underground pipe at suitable locations.
- As far as possible such valves shall be provided over ground or at Basement. If the valves are to be provided below ground, suitable masonry chamber with cover plate shall be provided.
- Locations where vehicles can pass shall be avoided for provision of valve below ground

Anti-Corrosive Protection on Under Ground Pipe

- Corrosion protection tape shall be wrapped on M. S. Pipes to be buried in ground.
- 2 No's of corrosion protection tape minimum 4 mm thick shall comprise of coal tar/asphalt component supported on fabric of organic or inorganic fiber and conform to requirement of IS 10221 Code of practice for coating and wrapping of underground mild steel pipeline.
- Before application of corrosion protection tape all foreign matter on pipe shall be removed with the help of wire brush and suitable primer shall be applied over the pipe thereafter.
- The primer shall be allowed to dry until the solvent evaporates, and the surface becomes tacky.
- Both primer and tape shall be furnished by the same manufacturer. Corrosion protection tape shall then be wound around the pipe in spiral fashion and bounded completely to the pipe.
- There shall be no air pocket or bubble beneath the tape. The overlaps shall be 15 mm, and 250 mm shall be left uncoated on either end of pipe to permit installation and welding.
- This area shall be coated after the pipeline is installed. The tapes shall be wrapped in accordance with the manufacturer's recommendations.
- If application is done in cold weather, the surface of the pipe shall be pre- heated until it is warm to touch, and traces of moisture are removed and then primer shall be applied and allowed to dry.

3.5 FIRE HOSE REEL / FIRE HOSE CABINET INSTALLATION

- Check cabinets are approved size and dimension. Inspect for signs of damage.

- Locate exact location of these Cabinets as per approved shop drawings and with careful measure of elevation and plumb.
- Fix cabinet using recommended anchor and bolts. Proceed with installation of accessories, lock shield valve, landing valves, etc. taking in consideration of approval for these devices.
- Prior to the installation Foreman will read, understand and strictly follow the manufacturer's instructions.
- Examine the location of the hose reel cabinets and ensure that opening is sufficient for fixing all equipment and the mounting height of the hose valve and hose racks is as per the approved shop drawings and to the requirements. Hose reel, hose valves and fire extinguishers are of approved type and have the correct rating.
- The cabinet (without the equipment) will be installed where applicable. Branches to the hose rack (reel) / hose valve will be installed on site to ensure actual entry point to the cabinet. Location of Pipe sleeves shall be as per approved drawings.
- Hose reel & valve will be installed as per the manufacturer's instructions at the correct mounting height.
- Keep fire extinguisher inside the cabinet along with the hose rack. Ensure that the top of the wall mounted extinguisher do not exceed from the levels as per approved drawing and specification.

3.6 FIRE DEPARTMENT CONNECTIONS

Fire Brigade inlet (4 Way) to Hydrant Ring mains / Hydrant Riser:

- Gun Metal four-way fire brigade tank filling connection having 63 mm dia instantaneous type inlet and 150 mm dia. flange outlet conforming to IS: 904 with blank cap and chain with necessary 150 mm dia. MS (heavy duty pipe) and flanges, nuts and bolts etc.
- The inlet assembly shall be in glass fronted wall box and size of wall box shall be adequate to allow hose to be connected to the inlets, even if the door cannot be opened and the glass has to be broken.
- Each box shall have fall of 25 mm toward the front at its base and shall be glassed with wired glass with "FIRE SUPPLY" painted on the inner face of the glass in 50 mm size block letter.
- Each such box shall be provided with a steel hammer with chain for breaking the glass.

Tank Filling Connection:

- Gun Metal four-way fire brigade tank filling connection having 63 mm dia. instantaneous type inlet and 150 mm dia. flange outlet conforming to IS: 904 with
- blank cap and chain with necessary 150 mm dia. MS (heavy duty pipe) and flanges, nuts and bolts etc.
- The inlet assembly shall be in glass fronted wall box and size of wall box shall be adequate to allow hose to be connected to the inlets, even if the door cannot be opened and the glass has to be broken.
- Each box shall have fall of 25 mm toward the front at its base and shall be glassed with wired glass with "FIRE SUPPLY TO TANK" painted on the inner face of the glass in 50 mm size block letter.
- Each such box shall be provided with a steel hammer with chain for breaking the glass.
- The inlets shall be provided with ABS quality plastic blank caps with chain.

3.7 INSTALLATION & COMMISSIONING OF FIRE FIGHTING PUMPS

- Pump shall be stored on a flat surface in well-ventilated storage area. Inlet and outlet flange blanks shall not be removed until ready for connection to pipe work.
- Manufacturer's instructions shall be strictly followed as applicable for storage of fire pumps.

3.7.1 PREPARATION OF WORKS

- The foundations designed to meet the vibration and sound control requirements shall be provided by main contractor. Check and ensure that the shop drawings used are latest and approved for construction.
- Concrete, (reinforced as necessary or required) is most widely used for the foundation of fire pumps, in most cases it provides rigid support, which minimizes deflection and vibration. It may be located on soil, structural steel or building floors, provided the combined weight of the pumping unit.
- While completing the civil works MEP contractor will co-ordinate the location of foundation as per Check the piping support locations and cable tray routing locations in co-ordination with pump and\ piping layout and ensure these are not obstructing the space around pump.
- Ensure availability of easy access and sufficient clearance for servicing and maintenance i.e. for replacement of pump, motor.
- Select a location for the pumping unit (pump, base plate, coupling and driver) that will be clean, well ventilated, properly drained and provide accessibility for inspection and maintenance (see outline drawing for dimension), outdoor installations may require protection from the elements particularly freezing.
- The suction supply system must provide the pump i.e. the suction tank location with its base or above the same elevation of the pump.

3.7.2 METHOD FOR FIRE PUMP INSTALLATION

- Mark the locations of the pump base frame and hole locations. The pump and motor are assembled on the base frame by suitable flexible coupling arrangement.
- Check and ensure free rotation of the shaft. Position the pump frame assembly on the foundation and fix the anchor fasteners.
- Ensure proper coupling guards are provided. Complete the piping and valve package installation as per approved drawings. Remove the end caps fixed on the inlet flange.
- Install the electrical control panel and power connections as per approved drawings. Incoming and outgoing cables shall be tested for insulation resistance/continuity.
- Provide and connect earth wiring as per approved drawings/manufacturers instruction. After completion of the fire pump installation and piping connections, the same shall be checked and certified by the pump supplier.
- Inspection request for pump installation shall be raised for consultants' inspection and approval.

3.7.3 FIRE PUMP MOUNTING ON FOUNDATIONS

- Use qualified personnel (riggers) to lift or move unit at any time. Do not lift the pump unit using hooks or slings on shafts.

- Never place eyebolts in tapped holes except for removal of a part to perform service work.
- When the unit is received with the pump and the driver mounted on the base plate, it should be placed on the foundation and the coupling halves disconnected.
- Coupling should not be reconnected until the alignment operations have been completed.
- The base plate should be supported on rectangular metal blocks and shims or on metal wedges having a small taper.
- Support pieces should be placed close to the foundation bolts on large units, small jacks made of cap screws and nuts are very convenient to use.
- In each case the supports should be directly under the part of the base plate carrying the greatest weight and spaced closely enough to give uniform support.
- Adjust the metal supports or wedges until the shafts of the fire pump and driver are level.
- Check the coupling faces as well as the suction and discharge flanges of the pump for horizontal or vertical position by means of a level.
- Correct the positions, if necessary, by adjusting the supports or wedges under the base plate as required. Firefighting Pumps and drivers mounted on a common base plate are accurately aligned before shipment.
- Realignment is necessary after the complete unit has been levelled on the foundation and again after the grout has set and foundation bolts have been tightened.
- The alignment must be checked after the unit is piped and rechecked periodically. To facilitate accurate field alignment, do not dowel the pumps or drivers on the base plates before shipment.

3.7.4 SUCTION & DISCHARGE PIPING CONNECTIONS

- The suction and discharge piping should be arranged for the simplest, most direct layout, to be of sufficient size and be internally free of foreign material.
- The piping must never be pulled into position by the flange bolts. It must be independently fixed and arranged.
- The suction piping, if not installed properly, is a potential source of faulty operation.

To achieve best pump performance:

- The suction lines, when operation must be kept absolutely free from air leaks.
- A strainer should be installed in suction line. The screen must be checked and cleaned periodically. The opening in the screen must be smaller than the sphere size allotted for the impeller.
- Piping should be cleaned mechanically and chemically and flushed prior to installing the pump. A large number of pump packing, mechanical seal and seizure troubles are due to improperly cleaned systems.
- The Pump should also be inspected internally for foreign matter that may have entered the pump.
- The suction pipe shall be sized such that pump capacity and minimum distance to be maintained from suction pump flange.

3.7.5 PRE-COMMISSIONING CHECKS

FOR ELECTRICAL FIRE PUMP & DIESEL PUMP:

- Check and inspect the installation of fire pump set is complete and as per drawings

- Ensure adequate clearance is available for service and maintenance of pumps and motors.
- Check all nuts, bolts, screws fasteners etc. fixed and tightened as required.
- Check alignment is OK (verification for any minor changes.).
- Rotate the pump manually and ensure free and smooth rotation.
- Ensure piping is pressure tested.
- Check and ensure piping are flushed and clean
- Verify the water levels in tanks O.K
- Adjust desired cut in and cut off pressure as per requirement.

FOR JOCKEY PUMP:

- Foundation bolts through the base plate into the concrete plinth for tightness.
- Mechanical seal for leaks when water has been supplied to the Jockey pumps.
- Check gland packing and adjust for correct leakage rate.
- Electrical motor wiring between control panel and motor that the correct phase connections have been made.
- Check all motor wires and control panel wires are tight.
- Control fuses in control panel are in working Condition
- Check panel lights in working condition.
- Ensure pressure switch is wired to control panel.
- Check pump suction valve is opened and water in pump.
- Auto start function by dropping the pressure on the initiation pipe work.
- Check emergency start on control panel.

FOR FIRE PUMP ROOM EQUIPMENTS:

- Ensure that all pressure gauges are installed.
- All accessions of firewater tanks [limit switches, overflow and vents] are complete.
- Ensure that power supply cables to all pump controllers are complete.
- All isolation valves, check valves / drain valves are installed and are in the normal operation position.
- Ensure that water is filled in the firewater tanks and are ready for operation.
- Pressure relief valves are set to the required set pressure.
- Ensure that flow meters are installed
- Ventilation system for fire pump room is complete and is ready for operation.

Electrical Check's

- Check all powers cabling and control wiring is completed and dressed neatly.
- Power isolator is fixed close to the pump motor for emergency stop and power isolation.
- Check all terminations are completed and tightened as required.
- Grounding connections are completed.

3.7.6 FIRE PUMP TESTING & COMMISSIONING ACCEPTANCE TESTS

Controller Acceptance Test

- Fire pump controller shall be tested in accordance with the manufacturer recommended test

- procedure. Ensure that the automatic operation sequence of the controller shall start the pump from all
- provided starting features this shall include the pressure switches.

The steps involved in field acceptance test of controller shall be as follows:

- Ensure suction gate valves are opened.
- Check and ensure that all air content in the pump has been allowed to escape through the air release valve.
- Compress packing evenly with gland (Gland nut should be finger tight)
- Pressure switch (senses discharge pressure) shall be set lower to prevent pump from starting
- Place the main disconnect switch in on position
- Place circuit breaker in on position and check if power on light is illuminated. Open the system valve gently and slowly.

Start the pump

- Slowly open the flow meter isolation valve
- Check the general operation of fire pumps unit, watch for vibration leaks unusual noise and general operation.
- Regulate the discharge valve to achieve various flow readings
- Important test points are at 150 % rated capacity and shut off, Intermediate points shall be taken to help to develop pump performance curve.
- Record the following data of each test point
 - Pumps suction pressure
 - Pump discharge pressure
 - Flow
 - Pump RPM
 - Ampere's & Volts
- On completion of test, the calculated reading are used to plot a graph of the test points and are compared with the manufacturers pump characteristic curves a study of these curves will show the performance picture of the pump as it was tested. Field acceptance
- Test for Electrical Driven pump set
- Authorized representative shall be present for the field acceptance test.
- Authorities having jurisdiction shall be notified as to the time and place of the field acceptance test.
- All the electrical wiring to the controllers intended shall be completed and checked by the electrical contractor prior to the initial startup and acceptance test.
- A Copy Of the manufacturers certified pump test characteristic curves shall be available for comparison of the results of the field acceptance test.
- The fire pumps as installed shall the performance as indicated on the manufacturers certified shop test characteristic curves within the accuracy limits of the test equipment.
- The fire pumps shall equal perform at minimum rated and peak loads without objectionable over heating of any components.

Starting the Pump

Automatic start

- Isolate Jockey pump controllers
- Open the drain valve to start pump
- After 2-3 minutes close the drain valve and shut down the electric motor by (off) push button

Manual start

- Press manual start button on the controller
- Ensure that electric motor starts

SETTING OF PRESSURE SWITCHES / OPERATING CONDITIONS FOR FIRE PUMPS:

- The fire pumps shall operate on drop of pressure in the mains as given under clause below. The pump operating sequence shall be arranged in such a manner to start the pump automatically but should be capable of being stopped manually by stop push buttons only.

OPERATING CONDITIONS FOR ELECTRICAL PUMPS:

The Pressure Switches mounted on the pressure vessel would be set as under, it is thus to be noted that;

i) Jockey Pumps shall start and stop automatically through pressure switches.

ii) Jockey Pump shall stop when main pumps start.

iii) Main/Diesel Engine driven fire pumps shall start automatically when pressure falls below the above specified limits, but stopping shall be manual.

INTERLOCKING:

- The following inter- locking between the two main fire pumps (i.e. wet riser pump & sprinkler pump), the jockey pump and the diesel engine driven pumps will be followed.
- Only one category of pumps will work at a time i.e. either jockey pump or main fire pumps (Sprinkler/Hydrant pumps can come up at a time) and/or diesel driven pump.

	Jockey Pump	Electrical Pump	Diesel Pump

3.7.7 TESTING OF FIRE FIGHTING SYSTEM

Flushing, Cleaning of Piping and Equipment:

- After piping is erected, all piping systems including main header line and branch line will be cleaned to remove all mill, welding scale, oil, corrosion, and other construction debris.
- Prior to hydraulic testing, all pipe work systems including valves, strainers and fittings will be washed thoroughly. Any washing of the piping systems will be carefully carried out where there are isolation valves or equipment are employing.
- Any stoppage due to foreign matter or air lock which is found to impede the flow of fluid will be removed, either before or after the systems are in operation.
- Do not operate pumps or equipment until debris has been removed from the respective system has been flushed out.

- Flushing of the system can be done from a pumping source with minimum flow rate to provide a velocity of 3 m/ sec.
- Flush the piping system until all debris is removed and clean water comes out.
- Automatic devices which can become clogged during the cleaning process will be disconnected and will not be connected permanently until the cleaning process is complete.
- Enough draining points will be left for this purpose. These points will be the lowest point of the area/zone and the water supply point.

Testing of Fire Fighting System:

(A) Initial Pressure Testing (24 Hour Test)

- After completion of the work, all valves/ fittings shall be installed in position and entire system shall be tested for 24 hours at a pressure of 1.5 times of operating pressure
- Plug all the openings
- Close all the drain valves.
- Fill complete pipeline with water avoiding any air column. (For this purpose, keep the drain valve at the highest elevation slightly open, while filling water when line is completely filled with water close the valve)
- By a pressure pump pressurize the line to an intermediate pressure 1.5 time of Operating pressure of Wait for 24 Hours.
- Check all major joints for any visible leak.
- The drop of pressure up to 0.5 kg/cm² shall be accepted.

(B) Hydrostatic Testing of Pipe Work

- Make available a highlighted drawing of area intended for hydrostatic pressure testing. Indicate on the
- drawing the location of vent/drain valve, plugged connections and water pressure pump connection.
- Make sure the test witness timing and pressure duration are agreed by the client/consultant.
- Place safety warnings at all points where personnel may pass through within the vicinity of testing.
- Make sure that all equipment item such as sprinklers; valves etc. are subjected to the pressure test.
- Attach the pressure pump to the desired location through an isolation valve, by pass valve and calibrated pressure gauge to indicate the pressure on the pipe work.
- The entire pipe work shall be hydrostatically tested for not less than 2 hours at 15 bars (or 1.5 times the working) pressure without leak.
- Physically check and ensure that all pipes undergoing test is strongly supported and addition of pipe work will not introduce undue stress on any support.
- Make sure that all pipe works are suitably plugged.
- Connect a calibrated and approved pressure gauge and fix an isolation valve just below the pressure gauge.
- Apply pressure gradually until it reaches the test pressure. The test pressure will be as per agreed terms and as per requirements.

- All piping shall be tested to hydrostatic test pressure of at least the 1.5 times of operating pressure, but not less than 15 kg./sq.cm. For a period not less than 24 hours. All leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Engineer-in-Charge.
- Piping repaired subsequent to the above pressure test shall be re-tested in the same manner.
- The Engineer-in-charge shall take the first reading and mark the pressure gauge by signing on the masking tape. The engineer-in-charge shall open the masking tape and check the pressure drop.

(C) Final Testing (Automation of the system)

- After completion of Hydro Test, all operation checks shall be carried out for automatic operation of the systems. For this purpose, landing valves may be opens at different locations. The exercise shall be repeated couple of times to ensure trouble free operation of the system.
- Flow Test: The design flow of pumps shall be checked. The pump shall be operated after opening a number of landing valves at different locations. Design pressure is be maintained in the pump house.
- Water discharge is to be Measured by drop in level in UG tank for a certain period. All pumps shall be tested one by one. The flow rate shall be not less than as specified while maintaining the design pressure in pump house.

3.7.8 PIPE IDENTIFICATION INSTALLATION

- After the pipe layout hydrostatically tested and finally painted, install pipe identification as per Site Requirements.
- Background Colour –Red.
- Letter Colour –White.
- Lettering Size –as per Size of Pipe or Equipment.
- Flow –Direction Arrows –integral with piping-system

FIRE ALARM SYSTEM SPECIAL CONDITIONS

1. Notwithstanding the below method statements/ installation procedure, the execution of project shall, in general, conform to relevant Codes & standards, guidelines/ compliance issued by the authority having jurisdiction, standard industrial practice and OEM's recommendation over and above the method statement/ installation procedure.

2. Health & Safety:

2.1 WORK PERMIT

- All Workers have valid Gate Pass till project completion.
- Proper induction of all workers shall be completed before starting their defined work.
- Necessary JRA and work permit shall be issue before starting the work.
- All welders shall be certified welder and need to submit their certificate.

2.2 Barricade and Work at Height

- Temporary barricades shall be provided around the working area prior to commencement of site work.
- Safety signboards, warning tape and signs, and cones shall be provided around the working area confirming the safety of the working area.
- The fabrication area shall always be neat and tidy. Fabrication should be done above MS sheet to protect the flooring.
- All unwanted materials / debris shall be transported to the approved dumping site daily.
- Only approved scaffoldings & safety belts should be use whenever working at heights exceeding.
- 1.5Mtrs.
- Ladders must be checked to ensure the correct length, type and condition before use.
- The ground base for the ladder must be firm and level. Damaged ladders will be broken or removed from site.
- The ladder must be of sufficient length to extend 1m above the step-off point when used as access to scaffold.

2.3 Electrical Tools

- All Electrical tools shall be tag as per safety standard before starting work. Tag shall be renewed from time to time.
- All hand and portable power tools to be used shall be of good order and be used by approved industrial sockets.
- Ensure that all tools and equipment are thoroughly inspected, and all are in proper working conditions.
- Power tools must be 230 V with socket and insulated cables.

2.4 Lifting Material

- Lifting of any material or equipment should be done only by means of approved chain / Electric hoists /Jacks with appropriate support.

2.5 Fire Extinguishers

- Application of Paints, Primers, thinners varnishes etc. should be carried out at ventilated places only.
- Fire extinguisher shall be positioned at Material Store Area and in the event where welding work is in progress on workplace.
- Ensure adequate lighting and ventilation whenever working in confined spaces.
- Ensure that working is provision of entrance and exit.

2.6 Personal Protective Equipment (PPE)

- Wear Goggles of adequate visibility, whenever using gas torches, grinders, cutting machines, or chipping, drilling etc. Do not use goggles with scratched glasses or poor visibility.
- During manual handling of Material all workers have to wear safety gloves and make sure they are protective against trip hazards and sharp edges.

- All appropriate safety personal protective equipment shall be worn by workmen such as
 - Earing protection, Earmuff or Plugs
 - Helmet, Hand Gloves (Leather or Cotton)
 - Face Shield (for grinding/cutting activities), Dust Mask respiratory protection.
 - Safety Glasses, Safety Shoes

3. Installation Procedure:

1.1 Preliminary Activities/Approvals

- Submit to the Engineer for approval the materials, equipment's and shop drawings to be used for the Installation, Termination and Testing of Fire Alarm System Submit for approval Method Statement & Risk Assessment.
- Identify quantity and ensure all risks are managed in this method statement and residual risks are acceptable.

1.2 Installation of Fire Alarm system

- Ensure approved documents like approved shop drawing, electrical room layout approved load schedules are available with the installation team.
- Fire Alarm Control Panel shall be installed as per the specification, approved shop drawing, manufacturer recommendations and Local Civil Defence requirement.
- Approved Model, Size & Type of Fire alarm Control Panel shall be installed as per approved shop drawings.
- Coordination with other MEP shall be done for installing Fire Alarm Control Panel.
- Check the Wall surface is ready to install Fire Alarm Control Panel.
- Orientation of Fire Alarm Control Panel shall be checked before and after installation.
- Fire Alarm Control Panel shall be installed directly inside the block wall as per approved shop drawing and site conditions.
- Fire Alarm Control Panel Height from finish floor shall be maintained as per approved drawings.
- Raise request for inspection for installation of Fire Alarm Control Panel, by consultant.
- Upon the inspection and approval of installation of Fire Alarm Control Panel, Cables shall be installed as per specification and manufacturer recommendations.
- Approved Trunking shall be installed above the false ceiling and Fire Alarm Cables will be drawn through concealed PVC conduits to the Fire Alarm Control Panel.
- All knockouts made on the panel covers shall be provided with PVC adaptor to avoid contact of cables with sharp edges of the knockouts.
- All Fire Alarm Control panel shall be provided with proper earthing connections as per manufacturer recommendations.
- Doors of all Fire Alarm Control Panel shall be earthed.
- Identification shall be done for Fire Alarm Control Panel as per specification with approved materials.
- Raise request for inspection for installation of Fire Alarm Control Panel along with termination, by consultant.

1.3 Installation of photo electronic smoke detector/ Multi sensor Detector

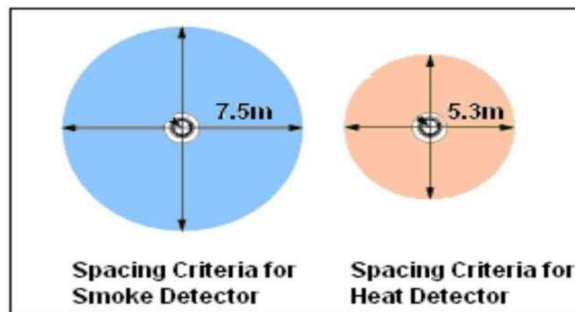
- Photo Electric Smoke Detectors shall be installed as per the specification, approved shop drawing, manufacturer recommendations and Local Civil Defence requirement.
- Approved Model & Type of Photo Electric Smoke Detectors shall be installed as per approved shop drawings and manufacturer recommendations.
- Coordination with other False Ceiling Layout shall be done for installing Photo Electric Smoke detectors.
- Check the False ceiling is ready to install Photo electric Smoke Detectors.
- Photo Electric Smoke Detectors shall be installed directly on the false ceiling tiles / Gypsum ceiling boards by using PVC butterfly rowel plug as per approved shop drawing.
- False ceiling tiles / gypsum board shall be marked and drilled with appropriate drill bit to suit the PVC butterfly rowel plug to match the Base of Photo Electric Smoke detector mounting holes.
- Raise Request for inspection of installation of Photo Electric Smoke Detectors, by consultant.

1.4 Installation of Heat detector

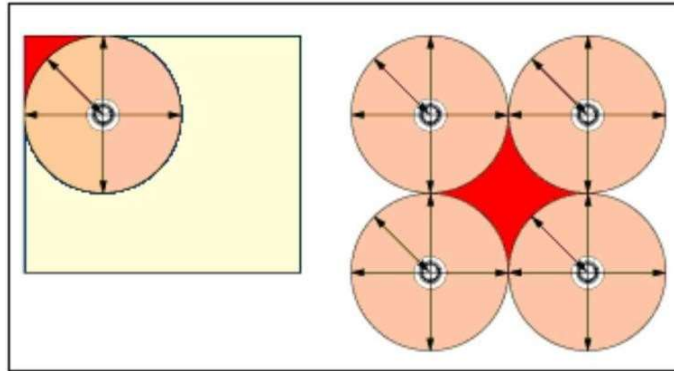
- Heat Detectors shall be installed as per the specification, approved shop drawing, manufacturer recommendations and Local Civil Defence requirement.
- Approved Model & Type of Heat Detectors shall be installed as per approved shop drawings and manufacturer recommendations.
- Coordination with other False Ceiling Layout shall be done for installing Heat detectors.
- Check the False ceiling is ready to install Heat Detectors.
- Heat Detectors shall be installed directly on the false ceiling tiles / Gypsum ceiling boards by using PVC butterfly rowel plug as per approved Shop Drawing.
- False ceiling tiles / gypsum board shall be marked and drilled with appropriate drill bit to suit the PVC butterfly rowel plug to match the Base of Heat detector mounting holes.
- Raise Request for inspection of installation of Heat Detectors, by consultant.

General Guidelines for smoke / heat detector:

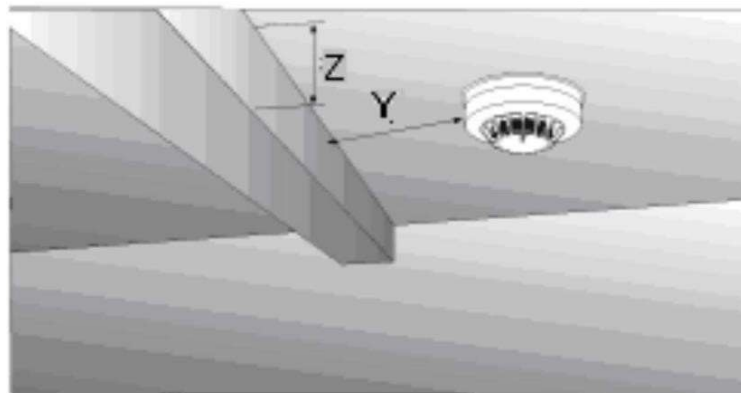
- For general areas, the spacing between any point in a protected area and the detector nearest to that point should not exceed 7.5 m for a smoke detector and 5.3 m for a heat detector. Please check with NFPA and mention the clause.



- The above are the maximum areas that can be covered by an individual detector. To ensure that coverage is provided into the corners of rooms and to ensure that there is no gap at the junction point of multiple detectors, spacing's must be reduced.



Beams and Other Similar Ceiling Obstructions: Fire detectors should be mounted at least 500 mm away from walls or ceiling obstructions greater than 250 mm deep and at least twice the depth of obstructions less than 250 mm deep. They should also be mounted at least 3 ft (1 m) away from any forced air inlet. Where the obstruction is greater than 10% of the height of an area, it should be considered as a wall. Similarly, a floor mounted obstruction (such as racking) should be considered a wall if it comes to within 300 mm of the height of the detector.



For obstructions of less than 250 mm Y should be at least $2 \times Z$

Lift Shafts: Where detection is required in vertical shafts, such as stairwells, a detector should be mounted at the top of the shaft and within 1.5 m at each level.

1.5 Installation of Manual Pull Station:

- Manual pull stations shall be installed as per the specification, approved shop drawing, manufacturer recommendations and local civil defense requirement.

- Approved model & type of manual pull stations shall be installed as per approved shop drawing and manufacturer recommendations.
- Coordination with other MEP services shall be done for installing manual pull station.
- Ensure location and elevation of manual pull station are as per approved shop drawing and site conditions.
- The back plate & covers of manual pull stations shall be installed using appropriate fasteners provided by the manufacturer.
- Raise request for inspection of installation of manual pull station, by consultant.

General Guidelines on the Manual Call points:

- The height of the manual fire alarm boxes shall be a minimum of 42 inches (1067 mm) and a maximum of 54 inches (1372 mm) measured vertically, from the floor level to the activating handle or lever of the box. Manual fire alarm boxes shall be red in colour.
- Manual call points should be located on escape routes, at all exits from each floor at the stair and corridors.
- Manual fire alarm boxes (pull station) should be located not more than 5 feet (1524 mm) from the entrance to each exit.
- Manual call points should be located at each door opening to the exterior of the building.

1.6 Installation of Alarm Speakers

- Fire alarm speakers shall be installed as per the specification, approved shop drawing, manufacture recommendation and local civil defense requirement.
- Approved model & type of fire ceiling layout shall be installed as per approved shop drawing and manufacturer recommendations.
- Coordination with false ceiling layout shall be done for installation fire alarm speakers.
- Check the false ceiling is ready to install fire alarm speakers.
 - Fire smoke detectors shall be installed directly on the false ceiling / gypsum ceiling boards by using PVC butterfly rowel plug as per approved shop drawing.
 - False ceiling tiles/ gypsum board shall be marked and drilled with appropriate drill bit to suit the PVC butterfly rowel plug to match the base of fire alarm speaker mounting holes.
 - Raise request for inspection of installation of fire alarm speakers, by consultant.

1.7 Installation of Alarm Bells

- Fire alarm bells shall be installed as per the specification, approved shop drawing, manufacturer recommendations and local civil defense requirement.
- Approved model & type of fire alarm bells shall be installed as per approved shop drawings and manufacturer recommendations.
- Coordination with other MEP services shall be done for installing fire alarm bells.
- Fire alarm bells shall be installed directly on the walls after finishing the final paints.
- Ensure location & elevation of fore alarm bells are as per approved shop drawing & site conditions.
- Raise request for inspection of installation of fire alarm bells, by consultant.

Special Submittal regarding IT & Network Integration

- A. Mentioning Make and Model Number of offered products in each category.
- B. Network/Schematic Diagram of proposed Network Solution.
- C. Schematic and Line Diagrams of proposed Back Bone Connectivity Solution of each proposed Solution.
- D. Detailed Support Escalation Matrix, Maintenance and SLA details.
- E. Certification/Undertaking document from the OEM for providing ongoing product.
- F. Authorization to bid from all original Equipment Manufacturer.
- G. The bidder must submit all ELV product technical compliance documents on the OEM's official letterhead along with the technical bid. Failure to submit this document shall result in rejection of the bid without any prior notice.

Following Shall be Considered for Passive Components:

- All copper & Fiber components should be from a single OEM as per the makes given in the tender documents.
- All passive components should be RoHS (Restriction of Certain Hazardous Substances) complied with. Declaration-RoHS should be clearly mentioned on the datasheet of each Passive Component.
- There should be a minimum of 30 years 'Performance Warranty for all supplied components.
- Bidder/subcontractor should have adequate facilities, manpower and staff for installation testing and commissioning and can provide after sales services. OEM must authorize their System Integrator in this regard stating that they will Support the solution through their SI Certification need to produce to engineer in charge if required.
- Redundancy shall be maintained at each level right from structured cabling to final distribution switches.
- All the Data devices will consist of data jacks, wired with Category 6A, unshielded twisted pair cable in Heavy Duty

Following Shall be Considered for Active Components

- All components must comply with RoHS (Restriction of Hazardous).
- A RoHS compliance declaration should be explicitly mentioned on the datasheet of each active component.
- The bidder must submit an authorization letter from the OEM specific to this work.
- Bids submitted without such authorization will be rejected.
- The bidder must provide comprehensive training to end-user personnel after successful installation.
- Deliverables such as configuration files, user IDs, passwords, installation manuals, and CDs must be handed over during site handover.
- The bidder must have sufficient facilities, manpower, and staff for installation, testing, commissioning, and after-sales services.
- The OEM must authorize their System Integrator (SI) for this project and provide a certification ensuring support for the solution.
- A service level ensuring a 99.9% uptime is required.
- A draft SLA and an escalation matrix must be submitted with the bid document.
- The OEM must have valid ISO 9000 and ISO 14000 certifications.
- Copies of these certifications must be included in the technical bid.
- Compliance with tender requirements must be submitted on the OEM's letterhead.
- The latest datasheet of all offered products must accompany the tender.
- Contractors or system integrators must employ at least one AV network system integrator with ITIL certification and a minimum of 12 years of experience.
- All active components, such as switches, access points (AP), and small form-factor pluggable modules (SFP), must be from the same manufacturer.
- These components must be covered under the same backup guarantee to ensure full compatibility.

- The bidder must adhere to the CIA (Confidentiality, Integrity, and Availability) guidelines as per Indian ICT Infrastructure standards.

Confidentiality:

- Ensure that sensitive data is accessible only to authorized users.
- Implement encryption, access controls, and secure communication protocols.

Integrity:

- Ensure data remains accurate, complete, and unaltered during storage or transmission.
- Utilize checksums, digital signatures, and other data integrity measures.

Availability:

- Ensure that network resources remain operational and accessible when required.
- Employ redundancy, fault-tolerant systems, and disaster recovery planning.

Authentication:

- Verify the identity of users, devices, and systems before granting access.
- Use methods such as passwords, biometrics, and two-factor authentication.

Authorization:

- Control access to network resources based on user or device roles.
- Implement role-based access control (RBAC) and permissions.

Auditing and Accountability:

- Monitor and track network activity to identify security incidents and enforce compliance.
- Use logging systems, intrusion detection systems (IDS), and security information and event management (SIEM) tools.

Non-Repudiation:

- Ensure that users or systems cannot deny their actions within the network.
- Use digital signatures, transaction logs, and audit trails to achieve this.

In case the same is not available in the market or in case of change in trade name, equivalent makes/redesignated manufacturer then an equivalent shall be used with the approval of Tender Authority / PMC. The complete system and installation shall also be in conformity with applicable codes and standards and tender specifications. If any item Specification/brands names missing in, make list bidder need to take approval before supply or install those items.

Specification/brands names of materials to be used as per the scope of work are listed here. The efforts should be made by the contractor to use indigenous products. The contractor should also consider the availability of spare parts/components for maintenance purposes while proposing any brand/manufacturer. The materials of any other brand/manufacturer may be proposed for use by the contractor in case the brands specified below are not available in the market and/or agency intends to use some other brand better than the brands mentioned in this list. The alternate brand can be used only after the approval of consultant technical compliance of active and passive network equipment, fire detection systems, CCTV surveillance, access control solutions, audio-visual systems, Building Management Systems (BMS), and other components is of utmost importance. This compliance should be confirmed and authenticated by the respective Original Equipment Manufacturers (OEMs) to guarantee that the specified standards are met without compromise

Project Consultant shall give the approval of a manufacturer only after review of Technical Compliance, mock-up. In case the same is not available in the market or in case of change in trade name, equivalent makes/redesignated manufacturer then an equivalent shall be used with the approval of Project Consultant. The complete system and installation shall also be in conformity with applicable codes and standards and tender specifications. If any item Specification/brands names missing in, make list bidder need to take approval before supply or install those items.

Specification/brands names of materials to be used as per the scope of work are listed here. The efforts should be made by the contractor to use indigenous products. The contractor should also consider the availability of spare parts/components for maintenance purposes while proposing any brand/manufacturer. The materials of any other brand/manufacturer may be proposed for use by the contractor in case the brands specified are not available.

- **PAYMENT TERMS FOR ELV SERVICES, HVAC, FIRE FIGHTING.**

- All payments shall be made in Indian rupees unless specifically mentioned.

All payments shall be made in Indian rupees unless specifically mentioned.

- (i) 70% of supply item rate against receipt of material at site in good condition, after obtaining insurance cover as per tender condition and after inspection & certification of the same by Third Party Inspection Agency (if required) and after inspection & acceptance of material by DPA for item covering supply of material and also supply & erecting / Providing and fixing laying together
 - (ii) 20% of supply item rate after completion of erection, installation, testing and commissioning for item covering supply of material and also supply & erecting / Providing and fixing laying together etc. and 90% of item rate for item covers only laying/fixing etc. (TPI appointed then after inspection; certification of the same by Third Party Inspection Agency).
 - (iii) 10% will be released after successful completion of whole work (TPI appointed then after inspection & certification of the same by Third Party Inspection Agency) and handing over to DPA.
 - Extra Substituted and Deviated Items of Work is applicable as clause no.3.40 of section-3 & clause no. 5.60 of section-5
 - Name of Party NOTE: The payment shall be made through RTGS /NEFT and the Contractor should be furnished following details: - Bank Payment Agreement Form Account No. Branch Name Branch Station IFSC code of the bank MICR co Accepted for: - NEFT payment or RTGS payment Declaration by the party I/We hereby declare that the above information furnished by me is correct and DPA is requested to pay my / our dues to this account for this work is concerned. Signature of the party with the seal Declaration by the bank It is hereby informed that the details mentioned by the party is correct as per our records and any payment made by DPA to this account will be accepted either by RTGS/NEFT. Signature of the bank manager with the seal.
- The defect liability period for the subject work is 24 months. However, the contractor shall be responsible for maintenance of the asset during defect liability period as per standard practices which includes regular inspections, routine unkeep, repairs and renovations to ensure the building remains in good condition and serves its intended purpose at his own cost, failing which same will be rectified by the Engineer in charge and amount will be recovered from the performance security.

TECHNICAL SPECIFICATIONS FOR FIRE FIGHTING SYSTEM, ELECTRICAL WORK, IT/ELV WORKS.

Sr. No	Item Description	Qty.	Unit
	PART-E : FIRE FIGHTING SYSTEM		
1	Supplying, installation, testing and commissioning of electric driven terrace pump suitable for automatic operation and consisting of following, complete in all respects, as required: (Terrace Pump)		
	(a) Horizontal type, multistage, centrifugal, split casing pump of cast iron body & bronze impeller with stainless steel shaft, mechanical confirming to IS : 1520		
	b) Suitable HP squirrel cage induction motor TEFC type suitable for operation on 415 volts, 3 phase, 50 Hz, AC supply with IP55 class of protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS-325.		
	(c) M.S. fabricated common base plate, coupling, coupling guard, foundation bolts etc.as required.		
	(d) Suitable cement concrete foundation duly plastered and with anti vibration pads.		
	900 lpm at 35 m Head	1.000	Set
2	Providing, laying, testing & commissioning of 'C' class heavy duty MS pipe conforming to IS 3589/IS 1239 including Welding, fittings like elbows, tees, flanges, tapers, nuts bolts, gaskets etc. and fixing the pipe on the wall/ceiling with suitable clamp/support frame and painting with two or more coats of synthetic enamel paint of required shade complete as required :		
	100 mm dia.	286.000	MTR.
3	Supplying and fixing single headed internal hydrant valve with instantaneous Gunmetal/Stainless Steel coupling of 63 mm dia with cast iron wheel ISI marked conforming to IS 5290 (Type -A) with blank Gunmetal/Stainless Steel cap and chain as required :		
	Single headed Gunmetal	2.000	Set
4	Supplying, fixing, testing and commissioning of butterfly valve of PN 1.6 rating with bronze/gunmetal seat duly ISI marked complete with nuts, bolts, washers, gaskets conforming to IS 13095 of following sizes as required :		
	100 mm dia.	3.000	Set
5	Supplying and fixing orifice plate made out of 6 mm thick stainless steel (Grade 304) with orifice of required size to be fitted between flange & landing valve of external and internal hydrants to reduce pressure at the outlet to the level of 3.5 kg/cm2 complete as required.	2.000	NO

6	Providing, installation, testing and commissioning of non-return valve of following sizes confirming to IS: 5312 complete with rubber gasket, GI bolts, nuts, washers etc.as required :		
	100 mm dia	3.000	Set
7	Providing, installation, testing and commissioning of stainless steel Y-strainer fabricated out of 1.6 mm thick stainless steel, Grade 304, sheet with 3 mm dia holes with stainless steel flange.		

	100 mm dia	1.000	Set
8	Supplying and fixing 63 mm dia, 15 m long RRL hose pipe with 63 mm dia male and female couplings duly bound with GI wire, rivets etc. conforming to IS 636 (type-A) as required :		
(A)	Gun- Metal	8.000	Set
(B)	Stainless Steel (Grade 304)	16.000	Set
9	Supplying and fixing first-aid Hose Reel with MS construction spray painted in post office red, conforming to IS 884 complete with the following as required.		
	20 mm nominal internal dia water hose thermoplastic (Textile reinforced) type -2 as per IS: 12585		
	20 mm nominal internal dia gun metal globe valve & nozzle.		
	Drum and brackets for fixing the equipments on wall. Connections from riser with 25 mm dia stop gun metal valve & M.S. Pipe and socket.		
	30 Mtr	8.000	Set
10	Supplying & fixing 63 mm dia gun metal short branch pipe with 20 mm nominal internal diameter size nozzle conforming to IS 903 suitable for instantaneous connection to interconnect hose pipe coupling as required :		
	Stainless Steel (Grade 304)	8.000	NO
11	Supplying and fixing of fire brigade connection of cast iron body with gun metal male instantaneous inlet couplings complete with cap and chain as reqd. for suitable dia MS pipe connection conforming to IS 904 as required :		
	2 way-100 mm dia M.S. Pipe	2.000	Set
12	Supplying and fixing air vessel made of 250 mm dia, 8 mm thick MS sheet, 1200 mm in height with air release valve on top and flanged connection to riser, drain arrangement with 25 mm dia gun metal wheel valve with required accessories, pressure gauge and painting with synthetic enamel paint of approved shade as required.	2.000	Set
13	Providing & fixing of pressure switch in M.S. pipe line including connection etc. as required.	2.000	NO
14	Providing, installation, testing and commissioning of gun metal valves of following sizes as required.		

	25 MM Dia	9.000	NO
15	Providing and fixing hose cabinet of size 900x600x500mm made of 2 mm thick MS sheet with 4 mm thick float glass doors in front painted "FIRE" in red paint i/c necessary locking arrangement suitable to accommodate external hydrant with butterfly valve 2 nos. 15m Long hose pipe, 1 no branch pipe mounted on wall or raised brick platform& duly painted with post office red externally and white internally with synthetic enamel paint complete in all respects for external hydrant, as	9.000	NO

	directed by Engineer-in- Charge.		
16	Providing, fixing, testing and commissioning of Air release valve with isolating valve. 25 mm dia.	3.000	NO
17	Supply, Installation, Testing, and Commissioning (SITC) of Microprocessor based Networkable Analogue Addressable Fire Alarm Control Panel. The Panel shall be compliant with EN54-2, EN54-4 and approved by LPCB. The Fire Alarm Control Panel shall have inbuilt 6 loops and expandable capacity upto 8 loops. The Panel must have Full colour 800 x 480 LCD with resistive touch screen and automatic backlight dimming. The Panel must also have the capability to take Addressable Intelligent Wired and Wireless Devices on same loop. Each loop shall have a capacity of 127 analogue Addressable devices and 127 Base sounders/Base Sounder Beacons. The panel shall have an event log of minimum 10,000 events @ 1 second resolution, Filterable and Printable. The Panel shall have Three access levels. Panel shall support upto 5000 Cause & Effects entries, with upto 20,000 inputs controlling & 20,000 Controlling outputs across the network. The Panel shall have capability for Peer to Peer networking through RS485 network card. The Panel must have 4 inbuilt programmable sounder circuits, each circuit rated at 2.5A. The Panel must have inbuilt 3 programmable inputs and 5 inbuilt programmable relay outputs. The Panel shall have up to sub-addressable 512 programmable Inputs/Outputs via optional RS485 COMMS serially connected expansion cards. The Panel shall have 240 V AC power supply along with automatic Battery Charger. The Panel shall be fully expandable via common plug in loop driver boards. The user shall have a choice of using the panel with 5.25 Amp or 10.25 Amp power supply unit which is inbuilt in the FACP and should be approved to EN54-4. The Panel shall have configurable via USB port to PC or memory stick. The Panel shall have dedicated RS232 serial port for optional printer. Approved by LPCB Continued	1.000	NO

	<p>supplies in the required quantities as per site requirements for all types of field devices to make the system fully operational. The FAS shall be supplied with necessary hardware and software so as to ensure networking of all panels. This shall include all devices such as modules and interfaces for providing fiber-optics based connectivity between panels and any licenses, as applicable. All the panels of FAS system shall be monitored and controlled from industry standard computer system that shall be supplied with necessary application software having a user-friendly graphical user interface. The software and all licenses for the same shall be supplied by OEM in the name of the client. The FAS system shall be supplied with all functionality including hardware, software and licenses for integration with a third party IBMS system for real-time monitoring, supervision and control. The necessary interfaces and functionality for such networking protocols as BACnet/IP shall be provided by the OEM. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load. The fire alarm control panel (FACP) shall be the central processing unit of the system, receiving and analyzing signals from fire sensors, providing audible and visual information to the user, initiating automatic alarm response sequences and providing the means by which the user interacts with the system. User interaction with the system will be by means of an intuitive full colour 800 X480 LCD with resistive touch screen and automatic backlight dimming graphical display. User permissions to access the FACP panel menu and control options will be provided by means of a key switch or a 5 or 6 digit passcode. The FACP shall be certified as meeting the requirements of EN54-2 and EN54-4 by a suitable, notified body. A certificate of product approval and certificate of constancy of performance shall be made available for inspection as evidence of certification. Continued</p>		
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	<p>The FACP shall be easily configurable to meet the exact detection zone and output mapping requirements of the building. 2000 detection zones shall be capable of being configured, each with an 80 character location message. For networked systems, it will be possible to map any detection zone to more than one panel, to allow vertical risers (stairwells) to be easily configured and supported. The FACP shall be microprocessor based. Operating programs and configuration data shall be contained in re-configurable non-volatile memory. Retention of the memory shall not rely on any form of battery or capacitor back-up device. The FACP shall incorporate separate processors for loop processing and central processing. The detection loops will continue to work autonomously and will audibly and visually report a fire with the minimum requirements of EN54-2, in the event of a failure of the main display and user interface. Up to 8 detection loops will be supported on a single panel, by means of a number of 2-loop plug in cards. The FACP will have a comprehensive event log, which has a capacity of 10,000 events stored in non-volatile memory, with a time stamp of 1 second resolution. This log will be maintained in the event of a total loss of power and can be downloaded into csv file format using the panel configuration software. Provision shall be made for each addressable loop to be sub-divided into geographical zones. The section of wiring corresponding to each zone circuit shall be protected from faults in other sections by line isolator modules. In order to facilitate re-configuration and system extension, the allocation of addresses to devices shall be independent of their physical arrangement on the loops. Up to 250 individually addressed standard devices shall be configured on each addressable loop. Loop powered sounders incorporated as a sensor bases shall be available. The FACP shall have the capability to support sub-addressing of addressable. Inputs and Outputs should be controlled independently. It shall be possible to fit a 40-column thermal printer to the FACP which will print system events automatically and logged data upon request. The FACP shall incorporate a real-time clock to enable events to be referenced against time and date. In networked systems, a master clock panel will synchronize all panel clocks every 24 hours. Additional Components It shall be possible to fit the FACP with a network board to allow up to 128 control panels and repeater panels to communicate with each other. The network shall be fully fault tolerant and shall continue to function normally under any single fault condition. Continued</p>		
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	<p>It shall be possible to fit the FACP with plug-in communication board to allow remote monitoring of a network of control panels. This board will support IP, RS485 and RS232 interfaces and will act as a firewall, to prevent malicious attempts to remotely control the FACP and fire system. This communication board will enable connectivity to the fire alarm PC based graphics system. It shall be possible to fit up to thirty-two, sixteen-way input/output modules, relay modules, sounder modules or conventional zone modules or any combination thereof to each control panel. Modules will directly plug into available spare expansion slots within the panel, or via a remote boxed I/O enclosure with backplane assembly and optional power supply unit. It shall be possible to perform configuration updates on site using a portable personal computer and a Microsoft Windows® based configuration utility. This facility shall allow the following parameters to be set: Produce a configuration file which contains data for up to 128 panels or repeaters connected together as a network. Set cause and effect tables for any combination of devices or zones of devices to operate devices, zones of devices or functions on any panel or panels connected to the network. Upload and view graphically the configuration from a single panel or entire network of panels. Control Panel name (network identity, 30 characters minimum). Configure up to 64 user login accounts with up to 28 different profile variations. Select sounder ringing mode as common, zonal or two stage. Select the global first and second stage delay times for any delayed output to between 0 and 10 minutes. Set number of loops on panel as 2 through to 10, in increments of 1 / 2 loops. Set number of zones on panel as 48 or 144. Set the four onboard sounder outputs to either Class A (loop) or Class B (spur with end of line) operation. For each two-loop card. Set loop sounder volume globally Select tone patterns for different event types. Specify the daily calibration time for detection devices. Specify the master clock panel for networked systems. Set start and end times for day night mode for each day of the week. Zones Allocate an 80 character zone location message Detectors Allocate a zone (0-2000) Set a delay before the panel responds to a fire signal from (0-180 seconds) Indicate pre-alarm Bypass any output delays when activated to fire Set day sensitivity and night sensitivity separately. Address loop powered base sounders. Allocate an 80 character location text message. Call points Allocate a zone (0-2000) Continued</p>		
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	<p>Allocate an 80 character location text message Switch units (input) o Allocate a zone for each input and the device itself (0-2000) o Define input action as fire, faulty, pre-alarm, evacuation, alert, security alarm, silence alarm, reset, transparent, disablement or test mode. o Change the input action message from the default to any one of the above or to any one of a user defined library of 10 additional action messages. Set a delay before the panel responds to a fire signal (0-180 seconds) Select whether the input requires the control panel to be reset or is self-clearing upon removal of the input. Bypass any output delays when activated Allocate an 80 character location text message Relay or sounder units (output) Allocate a zone for each input and the device itself (0-2000) o Define whether the device responds to evacuate inputs, alert inputs, as a sounder (default ringing) and switches off when the Silence Alarms control is operated Permit the output to operate on any pre-alarm, technical alarm, security or fault event. Has a delay before operating (0 to 10 minutes in two stages) Allocate an 80 character location text message Loop powered sounders Allocate a zone (0-2000) Permit the output to operate on any pre-alarm, technical alarm, security or fault event. Has a delay before operating (0 to 10 minutes in two stages) Allocate an 80 character location text message. Cause and Effects 2000 cause and effect entries 40000 inputs or outputs can be allocated to these 2000 entries including Zones Input devices Outputs devices All cause and effects operate network wide, allowing any combination of inputs across the network to control any combination of outputs on any panel Network Default to a "peer-to-peer" system, where all events are displayed and processed on all other panels on the network To permit each panel to be configured to display and process selected event types from any other panel on the network Permit each panel to be configured with sequential / unique loop numbers for instances where several panels protect a single building Support daily time synchronisation from a master clock panel, to ensure that all panels event logging information is accurate Panel Construction The housing containing the FACP shall be of metal construction and shall be capable of being surface or semi-flush mounted. It shall be complete with cable knocks-outs in sufficient quantity to accommodate all likely cabling requirements. The housing shall afford a minimum ingress protection to IP30 and it shall not be possible to open the FACP without the use of a special tool or key. Continued</p>		
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	<p>The panel will be constructed in a way that ensures that any complex electronic circuit boards can easily be replaced without the need to disrupt the field wiring connections. All field cable terminations will be made into a passive backplane assembly. The ability to support a family of plug-in addition cards will be provided, so that the product can easily be modified with additional sounder outputs, conventional zone interfaces, plant control relays or switch monitor/indicator driver interfaces.</p> <p>Panel Indications The FACP shall monitor the status of all devices on the addressable loops for fire, short-circuit fault, open-circuit fault, incorrect addressing, unauthorised device removal or exchange, pre-alarm condition and contaminated detector condition. The FACP shall also monitor the status of internal connections and interfaces including charger and batteries.</p> <p>Display In addition to the indications above, the FACP shall have an integral full colour 7" VGA display with resistive touch screen. The display shall incorporate a backlight. An ambient light sensor will be provided to allow automatic adjustment of the display backlight to ensure clear visibility across variable light conditions. A configuration option will be available to maintain the light at maximum brightness unless the panel only being supplied from the standby batteries. The display shall be capable of simultaneously indicating the number of outstanding events and their types as well as the current event.</p> <p>Panel Controls The panel shall be provided the following manual controls via the resistive touch screen</p> <p>Buzzer Silence Silence Alarms / Re-sound Alarms Reset System Activate Controls / Logout Delays Control Only the available controls will be displayed, depending on the panel state and login permissions</p> <p>Support for 24 user defined programmable soft buttons will be provided. These can be configured to be displayed only for selected user login accounts.</p> <p>Remote Monitoring Signals The FACP shall contain at least three programmable inputs to allow interconnection to other systems. The FACP shall contain at least two programmable outputs to allow interconnection to other systems. The FACP shall be capable of monitoring and controlling remote site devices, such as relays for the control of plants and ampers directly from the addressable loops.</p> <p>Continued</p>		
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	<p>he FACP shall be capable of monitoring fire doors such that, in the event of a fire alarm condition, an event is generated to warn of the failure of a fire door to close. Output to Fire and Fault Routing The FACP will provide monitored outputs to signal to Fire and Fault Routing equipment. Monitored inputs will be provided to signal receipt of the Fire/Fault routing signals from the remote location. A Fire Routing indication will be provided by a separate LED indicator on the panel fascia when the fire routing signal has been operated.</p> <p>Software The FACP shall have, as a standard software enhancement, the ability to annunciate a pre-alarm condition designed to give the earliest possible warning of potential fire condition without raising the full alarm condition. The FACP shall have, as a standard software enhancement, the ability to automatically adjust the alarm threshold levels to compensate for changes in detector sensitivity due to contamination over a period of time. The FACP shall have, as a standard software enhancement, the ability to verify any alarm conditions in accordance with EN54-2 Clause 7.12 Dependency (Type A, B and C) requirements. The FACP shall have, as a standard software enhancement, the ability to provide an indication that a detector is nearing a level of contamination, which requires that it be replaced or serviced. The FACP shall have, as a standard software enhancement, the ability to provide automatic warning that a detector has reached a level of contamination, which requires that it be replaced or serviced. The FACP shall have, as a standard software enhancement, the ability to synchronise loop data transmission to eliminate the possibility of data corruption due to cross-talk or similar effects.</p> <p>Sounder Connections The FACP shall provide the necessary outputs to separately operate a minimum of two monitored circuits of common system sounders. The sounder outputs can be configured as 2 x Class A (loop monitored), 4 x Class B (end of line monitored) or 1 x Class A and 2 x Class B combinations. o Each output shall be capable of driving a sounder load of up to 2.5A. The FACP shall be capable of providing a two-stage alarm sounder facility that can be programmed, either on a zonal basis or common system basis, to meet the requirements of the fire authority. Sounder outputs shall be available as follows Alert, Continued</p>		
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	<p>intermittent pulsed tone Evacuate, continuous tone The FACP shall have the facility to change the tones of addressable sounders to provide different tones for different event types. Fault Reporting The FACP shall monitor all critical system components and interconnections, internal and external, such that a failure, which would prevent the correct operation of the alarm functions, causes the GENERAL FAULT indicator to light and a message to be given on the full colour touchscreen display within 100 seconds of occurrence. The following faults shall be reported in the manner described above Loop Short Circuit Loop Open Circuit Unexpected Device Disconnected Device Addressable Device Failure Incorrectly Configured Device Type Double Address Type System Fault (Processor) Low Battery Charger Failure Earth Fault Monitoring Battery Fault Mains Failure Sounder Wiring Open Circuit (Per Circuit) Sounder Wiring Short Circuit (Per Circuit) To help fault finding and repair, the FACP shall provide text messages to indicate the location of where a fault has occurred in the system. System Management The FACP shall incorporate the following system management facilities: Isolate/re-connect individual outputs or inputs of addressable points Isolate/re-connect individual zones (include/exclude call points) Isolate/re-connect individual sounder circuits Isolate/re-connect all sounder devices Isolate/re-connect all volt-free contacts individually Isolate/re-connect any output defined as a plant control output Walk-test of a selected zone to verify detectors and sounders (silent and audible) System Information status information View the event log with filtering of Between dates Event types Selected zones, loops and addresses Print the selected event log on the panel printer View the addressable point status Set date and time Access to the facilities describe above shall be restricted to authorised persons by means of a key switch or 5- or 6-digit passcode. The FACP shall have an event log capable of storing the last 10,000 events that have occurred. It shall be possible to view the content of the log via the graphical display. Events shall be displayed in chronological order with the newest events first. It shall be possible to filter the event log by event type, between selected dates, by zone, loop and addresses. The FACP shall be designed so that, for each type of analogue addressable detector, the overall response time including the sensor, the signal transmission system and the fire decision algorithm, meets the requirement of European Standards. The FACP shall be capable of isolating a group of selected detectors in areas of the building where maintenance work is carried out. END.</p>		
18	<p>Supply, Installation, Testing, and Commissioning (SITC) of Analogue Addressable Multi- Sensor which is fully compatible with Analogue Addressable Protocol, having removable high performance chamber with Twin fire LED's allow 360 degree viewing, User selectable sensitivity modes 1% to 4.5% obs/m, Incorporate Optical and dual Heat elements, lock mechanism (sensor to base), Electronically addressed, Pulsing/non-pulsing controlled from panel. Approved by LPCB & VdS.</p>	593.000	NO

19	Supply, Installation, Testing, and Commissioning (SITC) of Analogue Addressable Multi- Heat Sensor which is fully compatible with Analogue Addressable Protocol, having removable high performance chamber with Twin fire LED's allow 360 degree viewing, User selectable sensitivity modes 0 to 88 degree celsius, Incorporates Fixed Temperature and Rate Of Rise Heat elements, lock mechanism (sensor to base), Electronically addressed, Pulsing/non-pulsing controlled from panel. Approved by LPCB (EN54: Part 5)	3.000	NO
20	Supply, Installation, Testing, and Commissioning (SITC) of Optical Beam Detector with transmitter and receiver set. The detector shall have 5 - 100 m range, Automatic compensation, Maximum coverage 1500m2, Automatic Signal strength adjustment, Emitter unit can be powered directly from zone (or loop), Features a Latching or Non- Latching fault relay, Full line continuity options, Approved by LPCB & VdS	2.000	NO
21	Supply, Installation, Testing, and Commissioning (SITC) of Analogue Addressable Single Zone Module with integral Short Circuit Isolator which allow Support single independent zones Up to 6 Conventional Detectors. fully monitored for short/open circuit. Addressing via DIL switches, Approved by LPCB.	2.000	NO
22	Supply, Installation, Testing, and Commissioning (SITC) of sensor common mounting base, includes stainless steel contacts, slim profile - only 8mm, quick connection via square cable clamps, facility for remote indicator, Approved by LPCB	564.000	NO
23	Supply, Installation, Testing, and Commissioning (SITC) of sensor common mounting base, Features integral Short-Circuit isolator, slim profile, Approved by LPCB	32.000	NO
24	Supply, Installation, Testing, and Commissioning (SITC) of Response Indicator	270.000	NO
25	Supply, Installation, Testing, and Commissioning (SITC) of Analogue Addressable Manual Call Point with Integral Short Circuit Isolator, Analogue Addressable Protocol having, Bi-coloured status LED (red for alarm, amber for (short-circuit), Non-frangible element fitted as standard (conforms to EN54), pulsing/non-pulsing can selectable via panel, Electronically addressed, Approved by LPCB.	11.000	NO
26	Supply, Installation, Testing, and Commissioning (SITC) of Intelligent Loop Powered Wall Sounder Beacon, Variable Sound Output 90 ~ 102 dB(A) (± 2 dB(A)) output at 1 metre, High Intensity LED technology, 51 User-Selectable Tones (all tones EN54-3 compatible). Approved by LPCB & VdS	11.000	NO
27	Supply, Installation, Testing, and Commissioning (SITC) of Analogue Addressable Single Input Module. which Includes a single monitored input, flying leads for easy installation. Electronically addressed, Approved by LPCB & Vds.	10.000	NO

28	Supply, Installation, Testing, and Commissioning (SITC) of Analogue Addressable Single Output Module . which Includes a single output, flying leads for easy installation. Electronically addressed, Approved by LPCB & Vds.	10.000	NO
29	Supply, Installation, Testing, and Commissioning (SITC) of Juntion Box for Detectro , Hooter etc...	675.000	NO
30	Supply, Installation, Testing, and Commissioning (SITC) of Portable emergency telephone handset jacks shall be flush mounted on stainless steel plates as indicated on plans. Handset jacks shall be approved for emergency telephone system application.o Insertion of a remote handset plug into a jack shall send a signal to the fire command center which shall audibly and visually indicate the on-line condition, and shall sound a ring indication in the handset.The two-way emergency telephone system shall support thirty five (35)handsets on line without degradation of the signal.Remote Telephone Handset shall be capable of making paging announcement across all the zones in the system. End	16.000	NO
31	Supply, Installation, Testing, and Commissioning (SITC) of telephone cabinet shall be painted red and clearly labeled emergency telephone. The cabinets shall be located where shown on drawings.The handset cradle shall have a switch connection such that lifting the handset off of the cradle shall send a signal to the fire command center which shall audibly and visually indicate its on-line (off-hook) condition. the two-way emergency telephone system shall support thirty five (35) handsets on line (off hook) without degradation of the signal. Remote Telephone Handset shall be capable of making paging announcement across all the zones in the system. End	16.000	NO
32	Supply, Installation, Testing, and Commissioning (SITC) of Master to remote and remote to master calling facility Fully monitored for open and short circuit cable failures Remotes connected via 2 core radial. Complies with BS5839 Pt.9 2002 Conference call facility Primary power 220VAC Secondary power 24VDC Battery size 2 X 12V, 7AH DC output 24V @ 100mA Max Max no of Zones 8 Operating Temperature 0 - 49° C / 32-120° F. Relative Humidity 93 ± 2% RH (non-condensing)at 32 ±2° C / 90 ±3° F Compliance Compliance Need to be submitted on OEM Latter head need to Submitted Before Installtion Without this material is not accepted on site End	1.000	NO
33	Supplying ,installation, testing and commissioning of 2 core x 1.5 sqm fire survival armoured cable	10000.000	MTR.

Sr. No.	Item Description	Quantity	Unit
	PART-F : ELECTRICAL PART		
	PART-1: WIRING AND CONDUITING		
1	Point wiring (excluding metallic switch box & sheet but including switches, sockets, lamp holders/ceiling roses etc) with 1.5sq. mm. PVC insulated cable FRLSOH / FR-LSH with copper multi strand conductor ISI marked in concealed rigid P.V.C. conduit (HMS) ISI marked of suitable size and 1.5sq. mm. PVC insulated FRLSOH / FR-LSH copper earth continuity conductor of green colour inside conduit, screwless connector for joints etc. as required as per specification for :-		
(A)	Light point/fan points.		
(i)	Primary short point	21.00	NO
(ii)	Primary medium point	67.00	NO
(iii)	Primary long point	248.00	NO
(B)	(Light point/fan points) looping point		
(i)	Secondary short point	14.00	NO
(ii)	Secondary medium point	79.00	NO
(iii)	Secondary long point	11.00	NO
(C)	3 Pin 6 Amp socket outlet on separate board		
(i)	Short point	5.00	NO
(ii)	Medium point	32.00	NO
(iii)	Long point	78.00	NO
(D)	Call bell/buzzer points		
(i)	Long point	10.00	NO
(E)	Twin control light points		
(i)	Medium point	11.00	NO
(ii)	Long point	24.00	NO

2	Point wiring (excluding metallic switch box & sheet but including switches, sockets) for 3 pin 6 Amp. socket outlet point with 1.5sq. mm. PVC insulated cable FRLSOH / FR-LSH with copper multi strand conductor ISI marked in concealed rigid P.V.C. conduit (HMS) ISI marked of suitable size and 1.5sq. mm. PVC insulated copper earth continuity conductor of green colour inside conduit with required materials as per specification on same board.	450.00	NO
3	Wiring for circuit wiring with PVC insulated cable FRLSOH / FR-LSH with copper multi strand conductor ISI marked in concealed rigid P.V.C. conduit (HMS) of ISI marked suitable size etc. as required as per specification		
(A)	2x2.5 Sq.mm.	2100.00	MTR.
(B)	4x2.5 Sq.mm.	1650.00	MTR.
(C)	6x2.5 Sq.mm.	1320.00	MTR.
(D)	8x2.5 Sq.mm.	1000.00	MTR.
4	Point wiring (excluding metallic switch box & sheet) for 3 Pin 16 Amp. socket outlet point with 4sq. mm. PVC insulated cable FRLSOH / FR-LSH with copper multi strand conductor ISI marked in concealed rigid P.V.C. conduit (HMS) ISI marked of suitable size etc. with 20/16 Amp. F.T. switch & socket/S.S. combined 20/16/6 Amp. of ISI marked and 4sq. mm. PVC insulated FRLSOH / FR-LSH copper earth continuity conductor of green colour inside conduit, screwless connector for joints as per specification for :-		
(A)	On separate board		
(i)	Medium point	21.00	NO
(ii)	Long point	32.00	NO
(iii)	Extra long-I	45.00	NO
(iv)	Extra long-II	67.00	NO
(v)	Extra long-III	29.00	NO
(B)	Same board switch & socket 16 Amp./S.S. combined 20/16/6 Amp	30.00	NO
5	Supply and fixing PVC conduits required confirming to IS 9537 (Part-3), ISI marked along with the accessories in concealed system etc. as required.		
(i)	PVC. conduit 20 mm (HMS)	300.00	MTR.
(ii)	PVC. conduit 25 mm (HMS)	5300.00	MTR.
(iii)	PVC. conduit 32 mm (HMS)	1800.00	MTR.

6	Supplying and fixing of approved make modular type G.I. metal box 1.2mm minimum thick and depth 50mm for single row boxes and 60mm depth for two/three row boxes earth terminal stud with nut and washer with modular base and cover plate including fixing in concealed etc. as required for:-		
(A)	1Or 2 Module metal box	450.00	NO
(B)	3 Module metal box	234.00	NO
(C)	4 Module metal box	56.00	NO
(D)	6 Module metal box	560.00	NO
(E)	8/9 Module metal box	389.00	NO
(F)	12 Module metal box	21.00	NO
(G)	16 Module metal box	10.00	NO
(H)	18 Module metal box	10.00	NO
7	Supplying and drawing single core PVC insulated cable FRLSOH / FR-LSH with copper multi strand conductor ISI marked in existing rigid PVC casing and capping/conduit in surface or concealed as per specification.		
(A)	1.5 sq. mm. wire		
(i)	1 X 1.5 sq. mm.	560.00	MTR.
(ii)	3 X 1.5 sq. mm.	1800.00	MTR.
(B)	2.5 sq. mm. wire		
(i)	1 X 2.5 sq. mm.	6070.00	MTR.
(ii)	2 X 2.5 sq. mm.	18000.00	MTR.
(iii)	3 X 2.5 sq. mm.	2500.00	MTR.
(iv)	4 X 2.5 sq. mm.	1000.00	MTR.
(v)	5 X 2.5 sq. mm.	1200.00	MTR.
(C)	4.00 sq. mm. wire		
(i)	3 X 4.00 sq. mm.	1500.00	MTR.
(ii)	5 X 4.00 sq. mm.	1200.00	MTR.
(D)	6.00 sq. mm. wire		
(i)	3 X 6.00 sq. mm.	600.00	MTR.
(ii)	5 X 6.00 sq. mm.	1000.00	MTR.
8	Supplying & fixing of approved make Industrial type metal plug & socket DBs (without MCB) SPN sheet encloser (dust protected) inclusive of 2 pole and earth metal plug and socket and space to incorporate SP MCB complete as per specification as required.		
(A)	20 Amp	2.00	NO

9	Supplying & fixing of ISI marked Industrial type metal plug socket D.B.s (without MCBs) for TPN enclosure three pole and earth metal plug and socket including space to incorporate TP MCB complete as per specification as required.		
(A)	20 Amp	2.00	NO
10	Supply and fixing as per specification call bell/buzzer of approved make with necessary materials complete.		
(A)	Buzzer	10.00	NO
11	Supply and fixing as per specification Switch of approved make ISI marked with necessary material complete.		
(A)	6/10Amp SP 250 Volt modular switch	400.00	NO
(B)	16/20Amp SP 250 Volt modular switch	180.00	NO
(C)	Blank plate 1 module	370.00	NO
12	Supply and fixing as per specification socket outlet of approved make & ISI marked with necessary material complete		
(A)	10Amp 250 Volt 3 Pin modular type	400.00	NO
(B)	10/16/20Amp 250 Volt 3 Pin modular type	180.00	NO
13	Supply and fixing as per specification 6Amp 250Volt bell push switch of approved make ISI marked with necessary material complete.		
(A)	6/10Amp SP 250 Volt modular switch bell push	10.00	NO
14	Supply and fixing of approved make step type modular electronic fan regulator including connection etc. as required on existing board		
(A)	100 Watt (2 module)	10.00	NO
	PART-2 : CEILING FANS / EXHAUST FANS / LIGHTS		
15	Supplying, erection and testing of approved make electric Ceiling fan of double ball bearing complete with standard down rod, canopy, hanging shackle, Aluminium blades, without regulator, A.C. 230-250 volts including connections with all necessary material complete of approved as required confirming to IS :374/2019 with up to date amendments.		
(A)	Ceiling Fan Ornamental 1200 mm Sweep, with minimum air delivery 210 m ³ /min and service value \geq 4.00 as per BEE.	10.00	NO

16	Supplying, erection and testing of approved make wall mounting fan oscillating type with base, blades, guard, speed regulator etc. AC 230-250 volts with connections and including raw bolt/anchor hole fastener etc. complete finished and as required.		
(A)	400 mm sweep	2.00	NO
17	Supplying and fixing of deluxe fresh air fan with louvers (ventilating fan) with self-closing louvers of decorative PVC blades mounting square frame of approved make complete with all necessary material as required		
(A)	300mm RPM1300/1400	4.00	NO
18	Supplying, erecting and testing of approved make exhaust fan heavy duty with mounting frame, blades AC 230-250 complete connection and including, frame bolt/anchor hole fasteners etc. complete finished and as required.		
(A)	300mm sweep RPM 900 / 1400	2.00	NO
(B)	450mm sweep RPM 900 / 1400	24.00	NO
19	Supplying, installation/fixing, and testing of approved make exhaust/fresh Air inline fan Ac 220-240V, 50 Hz size 150mm (6 inches) 23-25 watts including frame bolt/ anchor hole fastners etc. having fully copper winding motor, silent operation and delightful aesthetics complete including connections.		
(A)	150mm (SS Finished)	10.00	NO
20	Supply and fixing Led tube rod comprising of LED tube with non-integral/integral driver, upto 6500K color temp having 40000 burning hrs life with minimum @ L 70, system lumen output should be minimum with system efficacy> 100 lm/Watt. LED driver PF> 0.95 & THD < 20%. The colour rendering index of LED light should be more than 70. Submission LM 79-08/IS16106 (2012), IEC60598, IEC61347i/c connection wire, testing etc. to complete the job.		
(A)	Tube light LED 1 X 20/22Watt, Integral i/c batten aluminium body, PC diffuser.	12.00	NO
	PART-3: DISTRIBUTION BOARD / PANELS AND SWITCHGEARS		
21	Supply, fixing, testing & commissioning of ISI Marked Automatic Transfer Switches (ATS) confirming to IEC : 60947-1 & IEC : 60947-6-1 with automatic inbuilt time delay 4 pole, 415 V with two earthing terminals if required.		
(A)	630 Amps. .(With enclosure)	1.00	NO
(B)	800 Amps. .(With enclosure)	1.00	NO

22	Supply, fixing, testing & commissioning of ISI marked and approved make of moulded case circuit breaker (MCCB) suitable for 3 phase, 3 pole, 50 Hz, 415 Volts, (Ics=100%Icu) AC supply with thermal - magnetic release having respective breaking capacity (KA) at 415 Volts cited against their range standard conforming to IS/IEC 60947-2		
(A)	MCCB 25kA current rating - 63 to 100Amp & adjustable overload setting 80% -100% of In, adjustable short circuit setting 6-10 In 3 Pole	24.00	NO
(B)	MCCB 25kA current rating - 125Amp & adjustable overload setting 80% -100% of In, adjustable short circuit setting 6-10 In 3 Pole	18.00	NO
(C)	MCCB 25kA current rating - 160Amp & adjustable overload setting 80% -100% of In, adjustable short circuit setting 6-10 In 3 Pole	4.00	NO
(D)	MCCB 25kA current rating - 200Amp & adjustable overload setting 80% -100% of In, adjustable short circuit setting 6-10 In 3 Pole	4.00	NO
(E)	MCCB 36kA current rating - 315Amp & adjustable overload setting 80% -100% of In, adjustable short circuit setting 6-10 In 3 Pole	2.00	NO
23	Supply, fixing, testing & commissioning of ISI marked and approved make of moulded case circuit breaker (MCCB) suitable for 3 phase & N, 4 pole , 50 Hz, 415 Volts, (Ics=100%Icu) AC supply with microprocessor release with inbuilt instantaneous protection & variable trip class 7.2 Ir & 6 Ir having respective breaking capacity (KA) at 415 Volts cited against their range standard conforming to IS/IEC 60947-2		
(A)	MCCB 50kA current rating - 800 Amps 4 Pole & Micro-Processor Release, over load 40% -100% x In. & short circuit 1.5 - 8 x Ir. Adjustable.	2.00	NO
24	Supply, fixing, testing & commissioning of ISI marked and approved make of air circuit breaker (ACB) with microprocessor release with overload, short circuit, neutral protection, instantaneous, ground fault protection (LSING) Ics=Icu=Icw for 1sec for total selectivity, ambient temperature 50deg.C, In with breaking capacity of 50 kA/60kA/75kA, 4 pole, 415 Volts conforming to IS/IEC : 60947-2		
(A)	800Amp, manual, drawout 50kA	2.00	NO
(B)	1250Amp, manual, drawout 50kA	2.00	NO
(C)	2500Amp, manual, drawout 60kA	4.00	NO

25	Supply, fixing, testing & commissioning of ISI marked and accepted standard of miniature circuit breaker (MCB) of ' C' series with short circuit indication, suitable for 240/415 Volts,50 Cycle, 10 kA/15 kA Value AC supply conforming to IS : 8828 : 1996, IEC : 60898 :2002 & 60947-2 but without enclosures :-		
(A)	Single pole		
(i)	MCB SP 0.5Amp to 5Amp 10kA rating	36.00	NO
(ii)	MCB SP 6Amp to 32Amp 10kA rating	920.00	NO
(B)	Double pole		
(i)	MCB DP 6Amp to 32Amp 10kA rating	34.00	NO
(ii)	MCB DP For 40Amp 10kA rating	18.00	NO
(iii)	MCB DP 50Amp to 63Amp 10kA rating	15.00	NO
(iv)	MCB DP 125Amp 15kA rating	14.00	NO
(C)	For Triple pole		
(i)	MCB TP 0.5Amp to 5Amp 10kA rating	6.00	NO
(ii)	MCB TP 6Amp to 32Amp 10kA rating	42.00	NO
(iii)	MCB TP For 40Amp 10kA rating	18.00	NO
(iv)	MCB TP 50Amp to 63Amp 10kA rating	21.00	NO
(v)	MCB TP 80Amp 15kA rating	4.00	NO
(D)	Four pole		
(i)	MCB FP 0.5Amp to 5Amp 10kA rating	6.00	NO
(ii)	MCB FP 6Amp to 32Amp 10kA rating	45.00	NO
(iii)	MCB FP 50Amp to 63 Amp 10kA rating	38.00	NO
26	Supply, fixing, testing & commissioning of approved make powder coated sheet steel encloser SPN MCB DB inclusive of busbar, neutral bar, earth bar, connection copper wire not less than 16 sq.mm & two earth terminals etc. complete as per IS:13032(exclusive of MCB & isolator)-		
(A)	12 Way double door IP 43 protection	24.00	NO
(B)	16 Way double door IP 43 protection	12.00	NO
27	Supply, fixing, testing & commissioning of approved make TPN MCB DB metal double door IP 43 protection with provision for FP MCB/ Isolator/ RCCB/ RCBO as incomer and SP MCBs as outgoing inclusive of busbar, neutral bar, earth bar, connection copper wire not less than 16 sq.mm & two earth terminals etc. complete as per IS:13032(exclusive of MCB & isolator):		
(A)	4 Way (8+12)	4.00	NO
(B)	6 Way (8+18)	12.00	NO
(C)	8 Way (8+24)	4.00	NO

28	Supply, fixing, testing & commissioning of approved make vertical TPN MCB DB metal double door IP 43 protection with provision for FP MCB/Isolator/RCCB/RCBO as incomer and SP/TP MCBs as outgoing inclusive of busbar, neutral bar, earth bar, & two earth terminals etc. complete as per IS:13032(exclusive of MCB & isolator)		
(A)	8 Way (8+24)	2.00	NO
29	Supply, fixing, testing & commissioning of approved make, powder coated metal double door vertical TPN MCB DB IP 43 protection with provision for MCCB upto160A TP/FP 36kA as incomer and space for SP/TP MCBs as outgoing (without MCCB/MCBs) inclusive of busbar & connections etc.		
(A)	4 Way without MCCB	8.00	NO
(B)	8 Way without MCCB	1.00	NO
30	Supplying and installing of RCBOs (Residual current circuit breaker with overload and short circuit protection) ISI marked complete as per I.S. standard conforming to IEC:61009-1 & IS:12640-2, 240/415V 50 Hz with 10 kA short circuit withstand capacity for earth leakage, overload & short circuit protection including connection in existing enclosure in approved manner as per specification.		
(A)	DP (4 module)		
(i)	2 pole 6Amp to 25Amp, 100mA sensitivity	24.00	NO
(ii)	2 pole 32Amp, 100mA sensitivity	10.00	NO
(iii)	2 pole 40Amp, 100mA sensitivity	4.00	NO
(iv)	2 pole 63Amp, 100mA sensitivity	6.00	NO
(B)	FP (8module)		
(i)	4 pole 25-32Amp, 100/300mA sensitivity	12.00	NO
(ii)	4 pole 40Amp, 100/300mA sensitivity	6.00	NO
(iii)	4 pole 63Amp, 100/300mA sensitivity	10.00	NO
31	Supplying and installing of SPDs (surge protection device) ISI marked complete as per I.S. standard conforming to IEC:61543 - 11 for direct & indirect lightning surges protection type 2 maximum discharge current (Imax) up to 70kA & type 1+2 (Imax) up to 100KA including connection in existing enclosure in approved manner as per specification.		
(A)	Type 2 : 40kA, 3P+N protection against indirect lightning & switching surges	2.00	NO
(B)	Type 1+2 : 50kA, 3P+N protection against direct & indirect lightning surges	2.00	NO

32	Fixing of MCB/MCCB/Isolator in sheet steel enclosure as required as per accepted practice, including mounting on busbar and cable connection etc. complete (labour only)		
(A)	MCB/Isolator SP/DP	1037.00	NO
(B)	MCB/MCCB Isolator TP/TPN/FP	180.00	NO
33	Labour charges for fixing sheet steel enclosures, MCB/MCCBDB flush mounting type , as per accepted practice, duly embedded and end plate completely flushed in wall, cable connection etc. complete :-		
	For item no :-		
(A)	27.11.1 to 27.11.7 ; 27.12.1 to 27.12.3 & 27.13.1	52.00	NO
(B)	27.12.4 & 27.12.5 ; 27.13.2 to 27.13.4 ; 27.14.1 to 27.14.4 & 27.15.1 to 27.15.4	15.00	NO
34	Supply and fixing of MPP - H heavy duty capacitor 415 Volt, 3 Ph., peak inrush current upto $250 \times I_n$, over current upto $1.8 \times I_n$ (normal current), operating losses total not more than 0.35 W/kVAR, switching 8000 operation/year, as per IS:13340-1993, IS:13341-1992 of approved make as required as per specification		
(A)	1 to 4 kVAR bank	20.00	Per kVAR
(B)	5 to 25 kVAR bank	500.00	Per kVAR
35	Supply, fixing, testing & commissioning wall/floor mounted LT panel primer coated with powder coated paint & provided with required gasket for dust/vermin proof with degree of protection IP42 suitable for 415Volt 3 phase, 50 Hz, 4 wire system fabricated out of CRCA sheet upto 2 mm thick (1.6 mm for doors) duly compartmentalized for incomer, bus section, outgoing, cable alleys & CT, PT Ampere Metre, Volt Metre, selector switches, frequency Metre, phase indicating lamp, Energy Metre complete including cost of busbar supports, detachable cable gland plates, 2 earthing terminals, internal wiring & fixing of separately supplied MCBs, MCCBs, ACB, panel mounted changeover switch/SFUs, etc. as required but excluding cost of busbar strips, Ampere Metre, Volt Metre, selector switch as per approved design & specification	1800.00	KG

(A)	Supply and fixing of LT panel accessories of approved make in existing LT panel including connections etc. as required as per specification.		
(i)	Digital Ampere Metre with CTs with selector switch	5.00	Set
(ii)	Digital Volt Metre with selector switch & HRC fuse	5.00	Set
(iii)	Multifunction Meter	5.00	NO
(iv)	Copper bus bar strips with PVC sleeves	100.00	KG
(v)	Aluminium bus bar strips with PVC sleeves	190.00	KG
(vi)	LED lamp indicator	60.00	NO
36	Supplying and fixing of capacitor duty contactor of approved make in existing power factor/LT panel including connections etc.as required as per specification.		
(i)	Upto 3 kVAR 440V,3Ph,50Hz, Aux contact-1NO	1.00	NO
(ii)	For 5 kVAR 440V,3Ph,50Hz, Aux contact-1NO	1.00	NO
(iii)	For 10 kVAR 440V,3Ph,50Hz, Aux contact-1NO	1.00	NO
(iv)	For 15 kVAR 440V,3Ph,50Hz, Aux contact-1NO	1.00	NO
(v)	For 20 kVAR 440V,3Ph,50Hz, Aux contact-1NO	1.00	NO
(vi)	For 25 KVAR 440V,3Ph,50Hz, Aux contact-1NO	1.00	NO
(vii)	For 30 kVAR 440V,3Ph,50Hz, Aux contact-1NO	10.00	NO
37	Supplying and fixing of APFC relay 1A/5 A site selectable, measurement of individual current and voltage harmonic (THD), capacitor failure indication, In-built temperature sensor of approved make in existing power factor Panel including connections etc. as required as per specification as mentioned below :		
(A)	Automatic power factor relay 16 Steps 230V 144 x 144mm	1.00	NO
38	Supplying and fixing of CT 1A/5A as per site selectable busbar dimension of approved make in existing main panel for power factor Panel including connections etc. as required as per specification.	3.00	NO
39	Supplying and fixing of analog time switch for automatic ON - OFF street light of approved make in existing LT panel including connections etc. as required as per specification	2.00	NO
40	Supplying and fixing of contractor 2 Pole rating 240/415V :for ON - OFF street light of approved make in existing LT panel including connections etc. as required as per specification		
(A)	25A	2.00	NO

41	Three phase voltage monitoring relay:- For protection of sensitive equipment against under/over voltages which are caused due to voltage fluctuations, neutral loss, phase reversals at the end of the utility transformers etc		
(A)	Supply, installation, testing and commissioning of electronic voltage monitoring relays for three phase applications shall be multifunctional type providing the flexibility of monitoring under voltage, over voltage, voltage fault memory, window mode, phase rotation and phase loss. The relay shall be based on positively safe logic. All the functions and values shall be adjusted by selector and trimmer on front side. With a supply voltage of 220 V AC-510 V AC and 6 Amp 1 CO cadmium free contact with a dielectric strength between supply and contacts of 2500 V AC and between open contacts 1000 V AC, it shall have colored LED's for visual indication and shall comply to EN standards EN 6100-4-2/3/4/5/6/11. The switch-off delay time shall be selectable in a range of 0.5 to 0 sec. The electrical life at rated load AC1 shall be 60×10^3 cycles and shall work at an ambient temperature of -20 to +60 deg C. The mounting shall be on 35 mm DIN rail (EN 60715) and shall have necessary approvals like CE and GOST.	4.00	NO
42	Lightning & surge protection for solar plants on the building roof for KW plants:- Type 1 + 2 SPD		
(A)	Supply, installation, testing and commissioning of surge arrester for protection of DC side(1,000V) of systems in photovoltaic applications against overvoltage caused by direct lightning strike - limp 12.5 KA 10/350 μ s and induced overvoltage's upto I _{max} 30 KA, 8/20 μ s and a protection level of 1.8 KV. Short circuit withstand current of 125 A. Has Visual indication of Healthy/Replace status onboard and remote, with Replaceable modules and Complies with prEN 50539-11:2010	2.00	NO
43	Panel thermostat		

(A)	Supply, installation, testing and commissioning of 250 V AC operated panel thermostat shall have 1 NO in heating control and 1 NC in ventilation control , 10A, AgNi contact material and shall have wide temperature setting range -20 to +40 & +0 to +60deg C in heating/ventilation control. It shall have very small and compact size 17.5 mm wide and thermostat have snap action thermostatic bimetal sensor .The electrical life at rated load AC1 shall be 1 lakh cycles and shall work at an ambient temperature of -45 to +80 deg C. The mounting shall be on 35 mm DIN rail (EN 60715) and shall have necessary approvals like CE and GOST and EAC.	4.00	NO
44	Supply and fixing as per specification caution/danger board of approved make with necessary material complete.		
(A)	Small size 200 X 150 mm for MV/LT	8.00	NO
	PART-4: EARTHING AND LIGHTNING ARRESTER		
45	Supply and laying 4.0mm (8 SWG) dia. G.I. wire including jointing etc. as required.	270.00	MTR.
46	Supply and laying 4mm dia. copper wire including soldering etc. as required.	210.00	MTR.
47	Supply and laying 25mm X 5mm G.I. strip at including jointing etc. as required.	340.00	MTR.
48	Providing and fixing 25mm X 5mm copper strip earth electrode as required	160.00	MTR.
49	Supply and laying 50mm X 6mm G.I. strip at 0.5 metre below ground level/surface as strip earth electrode including jointing etc. as required.	100.00	MTR.
50	Providing and fixing of lightning conductor finial made of 18mm dia 500mm long bright nickel plated copper tube tapered having single prong at top with bright nickel plated brass base M10 for connection and intersection of flat or round conductor including holes, clamp complete as required.	6.00	NO
51	Riveting/sweating and soldering of copper/G.I. Tape (with another copper/G.I. Tape, base of finial or any other metallic object) as required	300.00	NO

52	Providing and fixing copper tape 20mm X 3mm thick on parapet and surface of wall of lightning conductor as required (for horizontal runs)	710.00	MTR.
53	Providing and fixing copper tape 20mm X 3mm thick on parapet and surface of wall of lightning conductor as required (for vertical runs)	70.00	MTR.
54	Providing and fixing "Testing Joint" made by 20mm X 3mm thick copper strip 125mm long with 4 Nos of tinned Brass bolts, Nut, check nuts and spring washers etc. complete as required.	6.00	NO
55	Supply and erection of approved make safe earthing electrode consisting pipe-in-pipe technology as per IS 3043-1987 made of corrosion free copper bonded pipes with constant ohmic value surrounded by highly conductive compound with high charge dissipation suitable for effective and maintenance free earthing in earth pit of minimum bore dia. 200mm size, as mentioned below :		
(A)	With 3 metre pipe of 80mm outer dia., 40mm inner dia and 14mm terminal dia. In soft/hard rock/marshy soil with 50 kgs. (two bag) back filling bentonite compound UL listed and confirm to relevant International/Indian standards around electrode upto ground level.	40.00	NO
56	Providing back filling bentonite compound suitable for safe earthing device. The product should be UL listed and confirm to relevant International/Indian standards.	1000.00	KG
57	Supply and installation of polycarbonate heavy duty pit cover tested for 5000Kg SWL for earth electrode at ground level size 300x300x155 mm with lockable lid.	40.00	NO
PART-5: RACEWAYS AND CABLE TRAY			
58	Supply, installation, testing and commissioning of G.I. floor raceway of mention below sizes 1/3 compartments including all necessary civil works.		
(A)	75 x 38 x 1.2 mm	100.00	MTR.
(B)	100 x 38 x 1.2 mm	180.00	MTR.
(C)	150 x 38 x 1.2 mm	140.00	MTR.

59	Supply, installation, testing and commissioning of G.I. junction box for duct entry 1/3 compartments junction box (frame & trap) including all necessary civil works.		
(A)	150 x 150 x 65 - 90 mm	26.00	NO
(B)	225 x 225 x 65 - 90mm	29.00	NO
60	Supply, installation, testing and commissioning of G.I. cross over/junction box for duct entry 1/3 compartments junction box c/w fly overs (frame & trap) including all necessary civil works.		
(A)	225 x 225 x 65 - 90mm	16.00	NO
(B)	300 x 300 x 65 - 90mm	14.00	NO
61	Supply, installation, testing and commissioning of G.I. coupler for under floor M-Tracks 38mm duct size wherever required.	420.00	NO
62	Supply, installation, testing and commissioning of G.I. fixing bracket wherever required for under floor M-Tracks of duct size as mentioned below :-		
(A)	75 X 25 mm	60.00	NO
(B)	100 X 25 mm	100.00	NO
(C)	150 X 25 mm	80.00	NO
63	Supply and erection of hot dip G.I. cable tray perforation not more than 17.5% for specific dimensions along with tees, bends. The cable tray shall be hang from ceiling/ fixed to wall with necessary angle/flat iron/hanging rod, for ceiling suspensions, clamp, anchor fastener, nuts, bolts, washers, not more than 1.0 mtr. apart complete as per specification to complete the job. The tray shall be as follows :-		
(A)	100 x 50 x 1.6mm thick	400.00	MTR.
(B)	300 x 50 x 1.6mm thick	360.00	MTR.
(C)	450 x 50 x 2 mm thick	150.00	MTR.
(D)	600 x 50 x 2 mm thick	260.00	MTR.
PART-6: CABLES AND TERMINATION			
64	Supply and fixing of multi core round FRLSOH / FR-LSHH PVC insulated copper (flexible) conductor & PVC sheathed cables 1100Volts as per IS:694-1990 of approved make		
(A)	(50/0.25 mm) Three core 2.5 sq.mm.	1800.00	MTR.
(B)	(56/0.3 mm) Three core 4.0 sq.mm.	1200.00	MTR.
65	Supply of XLPE insulated FRLSOH / FR-LSH heavy duty power cable conforming IS-7098 (Part-1) 1988, 1100 Volt grade, 2/3/4/8/10/12 core ISI marked with copper stranded/solid conductor.		
(A)	Armoured 3 core		
(i)	2.5 sq. mm.	700.00	MTR.
(ii)	4 sq. mm.	370.00	MTR.
(B)	Armoured 4 core		

(i)	2.5 sq. mm.	450.00	MTR.
(ii)	4 sq. mm.	390.00	MTR.
(iii)	6 sq. mm.	450.00	MTR.
(iv)	10 sq. mm.	670.00	MTR.
(v)	16 sq. mm.	680.00	MTR.
(vi)	25 sq. mm.	320.00	MTR.
66	Supply of XLPE insulated power cable (conforming IS-7098 Part-I) 1100 Volt grade, 1 core/2 core/3½ core/4 core ISI marked with alu. stranded /solid conductor		
(A)	Unarmoured 1 core		
(i)	70 sq. mm.	180.00	MTR.
(ii)	150 sq. mm.	200.00	MTR.
(B)	Armoured 3 core		
(i)	6 sq. mm.	300.00	MTR.
(ii)	10 sq. mm.	500.00	MTR.
(C)	4 core armoured		
(i)	25 sq. mm	450.00	MTR.
(ii)	35 sq. mm	320.00	MTR.
(iii)	50 sq. mm	150.00	MTR.
(iv)	150 sq. mm.	100.00	MTR.
(v)	185 sq. mm.	60.00	MTR.
(vi)	300 sq. mm.	1400.00	MTR.
67	Supply of approved high-tension XLPE cable (conforming IS-7098/II/85) as per ISI standard 3 core XLPE cable 11 Kv grade armoured with alu. solid/stranded conductor ISI marked as required		
(A)	120 sq. mm.	100.00	MTR.
68	Brass compression gland (double compression)		

(A)	Supplying and fixing heavy duty double compression cable gland for P.V.C. insulated armoured cable with brass washer, rubber ring complete erected with cable and lead connection etc. as per specification complete.		
(i)	Gland size 22mm suitable for cable 2,3,3½ & 4 x up to 6 sq. mm	180.00	NO
(ii)	Gland size 22mm suitable for cable 2/3, 3½, 2/4 x 10 sq. mm or 2x 16 sq. mm	40.00	NO
(iii)	Gland size 28mm for 3/4 x 16 sq. mm	40.00	NO
(iv)	Gland size 32 mm for 2/3, 4 x 25 sq. mm OR 2/3, 4 x 35 sq. mm or 2/3/4 x 50 sq. mm.	20.00	NO
(v)	Gland size 50 mm ,4 x 150 sq. mm,4 x 185 sq. mm	8.00	NO
(vi)	Gland size 70 mm, 4 x 240 sq. mm,4 x 300 sq. mm	24.00	NO
69	Providing & Making cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for 11 KV 3 core XLPE alum. conductor cable as required as per specification and as per accepted standard including connection testing complete.		
(A)	3 x 70-120 sq. mm. Outdoor	12.00	NO
(B)	3 x 70-120 sq. mm. Indoor	8.00	NO
70	Supplying and fixing ferrules as per IS - specification suitable for following size of cable for circuit identification including connection as required complete		
(A)	For conductor size-		
(i)	2.5 to 6.00 sq. mm	720.00	NO
(ii)	10.00 sq. mm	80.00	NO
(iii)	16.00 sq. mm	80.00	NO
(iv)	25.00 sq. mm	40.00	NO
(v)	35.00 sq. mm	20.00	NO
(vi)	50.00 sq. mm	20.00	NO
(vii)	150.00 sq. mm	16.00	NO
(viii)	185.00 sq. mm	16.00	NO
(ix)	300.00 sq. mm	96.00	NO

71	Supplying and fixing crimping type alum. lugs as per I.S.S. specification suitable for following size of cable with alu./copper solid/stranded conductor evenly crimped with high/pressure tool and connected to switch gear/bus/M.C.C.B./M.C.B. etc. as required complete.		
(A)	6mm to 16 sq. mm	880.00	NO
(B)	25 sq. mm	40.00	NO
(C)	35 sq. mm	20.00	NO
(D)	50 sq. mm	20.00	NO
(E)	150 sq. mm.	16.00	NO
(F)	180 sq. mm	16.00	NO
(G)	300 sq. mm.	96.00	NO
72	Supplying & fixing pin terminal lugs as per ISS specification suitable for cable evenly cramped with high pressure tool & connection to switch gear terminal as required complete.		
(A)	Copper lugs pin type		
(i)	Upto 16 sq. mm conductor size	890.00	NO
73	Supplying and installing double wall corrugated pipes (DWC) of HDPE (IS 14930 Part II -marked) for cable laid underground with necessary material and at required depth upto 90cm. below road/ground surface, excluding excavation, back filling with excavated material, ramming and making the surface good.		
(A)	63.00mm outside dia.	250.00	MTR.
(B)	110.00mm outside dia.	300.00	MTR.
(C)	210.00mm outside dia.	180.00	MTR.
74	Laying of one number armoured / unarmoured power cable 1:1 KV grade of size not exceeding 25 sq. mm in the existing RCC hume/stone ware/G.I. pipe/ DWC Pipe/ surface in existing trench as required.	1870.00	MTR.
75	Laying of one number armoured / unarmoured power cable 1.1 KV grade of size exceeding 120 sq. mm but not exceeding 400 sq. mm. in the existing RCC Hume /Stone ware/G.I. Pipe/ DWC Pipe/ surface in existing trench as required.	1400.00	MTR.

76	Laying of one number armoured/unarmoured cable 1.1KV grade of size not exceeding 25 sq. mm on wall/truss with approved type of iron clamp etc. as required.	2570.00	MTR.
77	Laying of one number armoured/unarmoured cable 1.1KV grade of size exceeding 25 sq. mm but not exceeding 120 sq. mm on wall/truss with approved type of iron clamp etc. as required.	470.00	MTR.
78	Laying of one number armoured/unarmoured cable 1.1KV grade of size exceeding 120 sq. mm but not exceeding 400 sq. mm on wall/truss with approved type of iron clamp etc. as required.	160.00	MTR.
79	Laying of one number single core H.T armoured power cable of grade 11KV of size not exceeding 150 sq. mm direct in ground including excavation sand cushioning, excluding protective covering and refilling the trench etc. as required as per local electricity board norms and rules.	100.00	MTR.
PART-7: SUBSTATION AND DG SETS			
80	Supply of support for overhead line RS joist of I.S. standard including drilling of required hole etc. complete as required as per PGVCL norms and material should be approved from or from approved make list of PGVCL.		
(A)	H - Beam 152x152mm, Std weight 37.1 Kg/Mtr	208.00	MTR.
81	Supplying and drawing all aluminium alloy conductor (AAAC) of approved make conforming to IS 398-1979 Pt. IV, including binding at existing insulator, jointing, jumpering, tearing off, connecting etc. as required including clearing of obstacles (if any) as per PGVCL norms and material should be approved from or from approved make list of PGVCL.		
(A)	AAAC 0.075 sq inch (80 sq.mm Al. EQ.)- (Raccoon)	1.50	KM
82	Supplying and drawing guard wire/earth wire/bearer wire 18.62 sq mm (4.87mm. dia/6swg) G.I. including stringing, binding at existing insulators or brackets, jointing, jumpering, connecting & cradle etc. as required and clearing of obstacles (if any) as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	3.00	KM
83	Erection of RS Joist pole/'H' beam/steel tubular/steel rail pole of length exceeding 10 metres but not exceeding 15 metres in cement concrete M-10 (1 cement:3 core sand: 6 graded stone aggregate 40mm nominal size) base, foundation, muffing including excavation and back refilling etc. as required as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	16.00	NO

84	Supplying and erection of stay set complete (galvanized) 19mm. dia x 1.8 metre long stay rod anchor plate of size 300 mm x 300 mm x 7.5mm thimble stay clamp, turn buckle (19mm dia x 600mm), 7/4.00mm dia G.I. stay wire etc. in cement concrete M-10 (1 Cement: 3 Coarse sand: 6 graded stone aggregate 40mm nominal size) foundation including excavation and refilling etc. as required as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	2.00	NO
85	Supply, fabrication and erection of angle/channel/flat iron fitting for overhead line & sub-station etc such as 'D' bracket, cross arms, top clamp, 'V' cross arms, back/support clamp or other similar work etc. including nut bolts of required size, making holes, fabrication, welding, cutting, etc. and painting with one coat of red oxide paint & two coat of aluminium paint as required as per specification as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	1600.00	KG
86	Supplying and erection of 11KV ceramic pin insulator complete with long steel head G.I. pin, nut, washer etc. as required as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	36.00	NO
87	Supplying and erection of 11KV ceramic disc insulators for overhead lines with galvanized insulator fittings, ball and socket type, and complete with galvanized strain clamp, bolts, nuts, washers etc. as required as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	24.00	NO
88	Supplying and erection of single piece non-linear resistor type lightning arrester (set of 3 nos) for 3 wire, 11KV overhead lines/sub-station with rated voltage of 30KV (rms) with a nominal discharge current rating of 5 KA and complete with galvanized clamping arrangement, G.I. bolts, nuts, washer etc. as required as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	2.00	Set
89	Supplying installing, testing & commissioning of outdoor H.T., AB switch assembly set gang operated with brass contact parts, including required GI pipe operating rod, handle & locking arrangement on On-Off position conforming to IS complete with required material and installing on existing DP structure to complete the job as required as per specification.(Set of 3 nos.) as per PGVCL norms and material should be approved from or from approved make list of PGVCL.		
(A)	11KV, 600Amp	2.00	Set
90	Supplying installing, testing & commissioning D.O. fuse assembly with brass part contact for 11/0.4 KV DP Structure set of 3 Nos. with fuse barrel i/c required fuse element & other materials as per specification on existing D.P. structure as required as per PGVCL norms and material should be approved from or from approved make list of PGVCL.		
(A)	11KV	2.00	Set

91	Supply & fixing anti climbing device with 2 ply G.I. barbed wire 1 Kg. per pole complete as per MPMKVVCO. Specification as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	16.00	NO
92	Supply, laying and fixing of G.I. earth coil of 4mm dia G.I. wire having 120 turns of nearly 50mm dia. and 3 mt. long tail in existing pit duly earthed with pole etc complete as required as per specification as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	16.00	NO

93	Supplying and fixing 11/0.4 KV enamel coated danger board size 200x250mm with clamp on existing HT/LT structure/poles as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	16.00	NO
94	Supplying, installing, testing and commissioning of 11/0.4 KV 3 Phase 50 cycle oil immersed, naturally cooled, outdoor type transformer connected delta on H.T. side and star on L.T. side, hand operated off load Tap changer switch, rating and diagram plate, two earthing terminal, lifting lugs, oil level gauge, drain valve with plug, temperature not exceeding 50°C on load, temperature dial gauge, Bucholz relay, oil conservator with drain plug, oil filling hole with plug, dehydrating silica gel breather on eye level, four unidirectional roller, arcing horns, explosion vent, terminal arrangement bushing on H.V. side and cable box on LV side, first filling of oil upto desired level and transformer installing on existing structure with all required materials arrangement as required ISI marked & as per IS specification or as per PGVCL norms.		
(A)	Energy efficiency (New level -1) Copper wound - 1250 KVA	2.00	NO
95	Supplying and fixing limit switch with accessories & arrangement on existing HT/LT structure/poles AB switch handle for inter locking between distribution panel main incoming LT switch gear/ system as required to complete the job as per specification as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	2.00	NO

96	Supply & fixing fencing of chain link mesh 100 x 100 mm, 12 SWG GI wire for for D.P. structure electric sub-station switch yard including single post of angle iron size 50x50x5mm, 2.5 mt long should be provided upto 2.00 mt. apart or as required. The panel frame with required angle iron/ flat iron members/cross members including mesh welded in frame panel shall be erected between the posts. The angle iron post shall be erected in cement concrete M-15 (1:2:4) (20 mm graded metal) foundation, including excavation of pit and refilling the same. The fencing shall be provided with one entrance gate including locking arrangement as required as per specification. The height of fencing shall be 2 mt. above ground level. Fencing shall be painted with required shade as per specification as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	60.00	SQ. MT.
97	Supply of rubber mat 2 x 1.0Mtr, 1100V tested	4.00	NO
98	Supply of hand gloves 11KV tested	2.00	NO
99	Supply of fiber discharge rod I/C connection copper lead tested	2.00	NO
100	Supply of fiber D.O operating rod for 11KV tested	2.00	NO
101	Supply of first aid box complete with medicine & bandage as per specification.	2.00	Set
102	Supply of shock instruction chart duly framed with glass, as reqd.	1.00	NO
103	Designing and construction of pedestal (plinth) for transformer of desired size including excavation in hard rock/soft rock, base concrete M-7.5 (1:4:8), 20mm metal and pedestal of RCC M-15 (1:2:4) including required tar steel reinforcement for required height as per IE rules from base concrete including shuttering and finishing with 10mm thick plaster in cement mortar 1:3 curing & white washing etc. complete as per specifications as per specification as per PGVCL norms and material should be approved from or from approved make list of PGVCL.	16.00	CUM
104	Collection and spreading of metal dust, murum and 40mm graded hard metal in sub-station yard or as required as mentioned below -		
(A)	Metal 40 mm	4.00	CUM

105	Supplying, installation, testing and commissioning of triple pole outdoor type 11KV vacuum circuit breaker with outdoor control & relay panel with numerical static relay for feeder protection (1F). The installation of VCB shall be carried out in accordance with IS: 3072. The VCB shall be mounted on suitable size duly painted MS channel/angle iron structure with nut bolts and washer. The structure shall be fixed on existing cement concrete foundation. The complete work should be done as per IS specification.		
(A)	11 KV, 630A VCB	2.00	NO
106	Supplying, installation, testing and commissioning of single phase C.T./P.T. outdoor type 11KV with terminal box. The C.T./P.T. shall be mounted on existing structure fabricated with suitable size MS channel/angle iron structure with nut bolts and washer duly painted. The structure shall be fixed on existing cement concrete foundation as per IS specification as mentioned below.		
(A)	11 KV CT outdoor type 200-100/5 Amp	6.00	NO
107	Supplying, installation, testing and commissioning of single phase C.T./P.T. outdoor type 11KV with terminal box. The C.T./P.T. shall be mounted on existing structure fabricated with suitable size MS channel/angle iron structure with nut bolts and washer duly painted. The structure shall be fixed on existing cement concrete foundation as per IS specification as mentioned below.		
(A)	11 KV/110V single phase PTs oil immersed	2.00	NO
108	Supplying, installation, testing and commissioning of indoor control relay panel shall consisting of ammeter, voltmeter, selector switch, auxiliary relays for anti-pumping device, trip and alarm of buchholz relay, oil and winding temperature circuit, electronic hooter, 230 V AC to 110 V DC power pack with charging equipment for closing, tripping and indication, triple pole IDMTL two O/C and one E/F delay with current setting range 50-200% and 10-50%, push button high speed trip relay etc. complete as per IS specification.	2.00	NO
109	Supply, installation, testing & commissioning of HT trivector energy meter, DLMS compliant category-A (for substation/feeder metering energy audit), 3 phase 4 wire, 110 Volts, 5 Amp, accuracy class 0.5S with GSM (GPRS compatible) modem suitable for required C.T. including uPVC box/sheet metal box with TTB duly tested from PGVCL.	1.00	NO

110	Supply, installation, testing and commissioning of 'Silent Type' diesel generating set comprising with diesel engine water cooled, Synchronous alternator, (with AMF control panel), acoustic enclosure, battery with charger and related accessories including exhaust pipe 'B' class with insulation as per CPWD specification and CPCB - IV Norms.		
(A)	Supply, installation, testing and commissioning of diesel generating set three phase, water cooled with AMF control panel, 300/320 KVA, 415V . With electronic governor.	1.00	NO
111	AMF Panel specs are:- 500A thermal magnetic based with o/c,s/c release TP mccb with control mcbS, current transformer CL-1, 15VA, four pole contactor of 240V AC, 2NO+2NC, indicating lamps of RYB, bush button , digital MFM (KW/KWH/PF/A/V/F), DC Ameter , 4 Point amarl annunciator with inbuilt hooter, AMF conttoler with Aux. relay coil for 24V AC 4 C/O 14 pin etc as required for AMF opeation.		
(A)	Supply, installation, testing and commissioning of diesel generating set three phase, water cooled with AMF control panel, 750 KVA, 415V . With electronic governor. AMF Panel specs are:-1250A four pole EDO breaker, current transformer CL-1, 10VA, four pole contactor of 240V AC, 2NO+2NC, indicating lamps of RYB, bush button , digital ameter , volt meter, freq. meter, DC a meter , DC voltmeter , voltage monitoring relay, Aux. relay , Aux contactor, auto manual switch, on delay timer , 4 Point amarl annunciator with inbuilt hooter, AMF conttoler with Aux. relay coil for 24V AC 4 C/O 14 pin etc as required for AMF opeation.	1.00	NO
PART-8 : UNINTRRUPTIBLE POWER SUPPLY SYSTEM			

112	Supply, installation, testing and commissioning of UPS with isolation transformer & battery for backup, minimum load power factor 0.8, power factor 0.99, having OVCD (over voltage cut-off device), having CVCF (constant voltage constant frequency, bypass parameters configurable, 2 stage charging (constant current/float charge), having temperature compensated charger, Fan speed control, digital signal processor controller, total harmonic distortion (current)-THDi (<10% @ 50% R Load, Input 1 phase voltage 230v, voltage range 110-300v, Output voltage (220AC/230AC/240AC \pm 1%), surge protection minimum 5KV, Total harmonic distortion Voltage (THDv- <3% linear load, <5% nonlinear load, 90 % AC/AC efficiency, Over load capacity (105-110%: 3min, 111-130%: 30Sec), operating temperature with full load 0-40°C, communication features (RS232, USB com port, Intelligent slot (optional). UPS installation with all required material arrangements as required as per IS specification.		
(A)	5 KVA (1 phase input & 1 phase output)		
(i)	For 30 minute backup, min. 4000 VAH	2.00	NO
113	Supply, installation, testing and commissioning of UPS with isolation transformer & battery for backup, having three phase input with ground (R-Y-B-N-G), Voltage range 190v AC-478v AC (based on load %), line low transformer (0-50% : 190v/51-100% : 305v \pm 3% VAC), line low comeback +25 - 35 VAC (\pm 3%), line high transfer 478 VAC (\pm 3%), line high comeback 461 VAC (\pm 3%), frequency range 46 - 54 Hz, power factor 0.99, Total harmonic distortion (current)-THDi (<5% with full load, having output voltage 220 VAC/230 VAC/240 VAC, surge protection minimum 5KV, voltage regulation \pm 1%, frequency 50 Hz \pm 0.1 Hz, Synchronization range 46 -54 Hz, voltage distortion \leq 2 % (linear load) & \leq 5 % (nonlinear load), having pure sine wave output waveform, crest factor		

	<p>3 : 1, efficiency (AC -AC) 94%, power factor 0.9, having inbuilt isolation transformer, over load 101 - 109% : 5 Min, 110 - 129% : 1 Min, 130 - 150% : 10 sec, having SMF/VRLA battery type, transfer time line mode to battery mode 0 ms, inverter to bypass, ECO mode 0 ms, bypass to inverter 0 ms, ECO to inverter mode < 10 ms, when bypass voltage of frequency is out of range, having features Eco mode, Fan speed control, EPO function, frequency converter mode & parallel function up to 6 units. Operating temperature 0 - 45°C, noise level < 55 db @ 1 meter having display & indication features i.e. user friendly dot matrix LCD display, input : voltage & frequency, battery : voltage & level in %, internal DC bus voltage & frequency, current, power & load level in %), UPS status (operating mode/warning/fault/codes (fault & warnings), UPS settings (output voltage/ frequency/ bypass enable/disable/special function., UPS/CVCF/ECO.</p> <p>LED status (normal mode/load on battery/load on bypass/system fault), Audible alarm (main failure alarm, low battery alarm, UPS warning, overload, fault & bypass mode etc.), protections (advance electronic protection for device, safety backed with MCBs, fast acting fuses, high speed pulse blanking, electronic overvoltage/under voltage), connections (terminal block for input/bypass/battery & output), static bypass, communication interface RS 232/USB port for software interface, intelligent slot for SNMP (optional). UPS installation with all required material arrangements as required as per IS specification.</p>		
(A)	20 KVA with parallel redundancy protocol (3 phase input & 1 phase output)		
(i)	For 30 minute backup, min. 16000 VAH	5.00	NO
	PART-9: ON GRID SOLAR PHOTO VOLTAIC POWER PLANT		

114	<p>Supply, Installation, Testing and Commissioning of on grid Solar Photo voltaic Power Plant conforming to MNRE specifications as amended, consisting of Mono/Poly Crystalline silicon solar cells, net metering facility, necessary protections, earthing, mounted on Aluminium/GI structure of suitable strength with following components complete as required:- a) Solar Photo voltaic Module of capacity 330Wp or aove, manufactured in India, conforming to IS14286/IEC61215 ,IS/IEC61730-Part-1, IS/IEC61730-Part-2. Solar Photovoltaic Module conversion efficiency shall not be less than 16.5%. PV modules used in solar power plants/systems must be warranted for their out put peak watt capacity, which should not be less than 90%at the end of 10 years and 80%at the end of 25 years.</p> <p>b) Power Conditioning Unit (PCU)of 350-800V DC Input voltage range and 400 VAC, three phase, 4wire, 50Hz+/- 2.5Hz, output voltage suitable to generate AC Power with efficiency not less than 97%, total harmonic distortion less than 3% and suitable for ambient temperature from 0 to 50 degree C. The PCU shall adjust the voltage and frequency level to suit the Grid Voltage Frequency. c) Data Monitoring System complete with accessories. d)Fixing of Array junction box & Main junction box with IP65 protection and termination arrangement for incoming and outgoing cable along with glands, lugs and other accessories etc. as required. e) Lightning and surge voltage protection. f)Connections & Interconnections by supplying & fixing required size XLPE insulated copper conductor 1.1kV grade armoured power and control cables between solar modules, main power cable to grid supply PCU unit along with supplying & fixing of necessary channel/conduit lugs and other accessories etc</p>	500.00	KWp
	PART-10 : LIGHTING FIXTURE		

115	<p>Supply, Installation, Testing & Commissioning of Recessed mounted trim less downlight Wall washer shall have shall deliver a minimum system lumen output of 890-977lm or better, with a minimum system wattage of 12W and a minimum efficacy of 76-83lm/W or better, operating at a regulated DC current of no less than 400mA and achieving a minimum efficiency of >80% or better under standard conditions. The correlated color temperature (CCT) shall range from a minimum of 2700K to 5700K or better, with chromaticity maintained within a tolerance of no more than 3 SDCM (MacAdam) or better. The system's lifetime shall meet or exceed L80/B10 standards with a minimum operational expectancy of 50,000 hours at an ambient temperature of Ta-30°C or better, unified glare rating (UGR) of less than 10, and a color rendering index (CRI) exceeding 90 or better, driver shall support an input voltage of 220-240V~50/60Hz, with total harmonic distortion (THD) not exceeding 10% or better, and be compatible with On-Off, DALI 2.0, AD, TD, or BLE driver types, ensuring compliance with all specified operational parameters or better.</p>	56.00	NO
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116	<p>Supply, Installation, Testing & Commissioning of Recessed Wall washer shall deliver a minimum system lumen output of 942lm or better, with a minimum system wattage of 13W and an efficacy of not less than 74.24lm/W or better, operating at a minimum regulated DC current of 300mA or better while achieving an efficiency of no less than 83% or better under standard conditions. The correlated color temperature (CCT) shall range from a minimum of 2200K to 5700K or better, with chromaticity maintained within a tolerance of no more than 3 SDCM (MacAdam) or better. The system's lifetime shall meet or exceed the L80/B10 standard, guaranteeing a minimum operational expectancy of 50,000 hours at an ambient temperature of Ta-30°C or better. The unified glare rating (UGR) value shall be specified as not applicable, while the color rendering index (CRI) must exceed 90 or better to ensure superior color accuracy. The driver shall support an input voltage of 220-240V~50/60Hz, with total harmonic distortion (THD) not exceeding 10% or better, and be compatible with driver types including On-Off, DALI 2.0, AD, TD, or BLE.</p>	7.00	NO
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117	<p>Supply, Installation, Testing & Commissioning of a Recessed Fixed Downlight shall deliver a minimum system lumen output in the range of 1328 to 1461lm or better, with a minimum system wattage of 21W and an efficacy not less than 64 to 70lm/W or better, operating at a regulated DC current of no less than 500mA or better while maintaining an efficiency of >80% or better under standard conditions. The correlated color temperature (CCT) shall be between a minimum of 2200K and 5700K or better, with chromaticity maintained within a tolerance of no more than 3 SDCM (MacAdam) or better. The system's lifetime shall conform to L80/B10 standards, ensuring a minimum operational expectancy of 50,000 hours at an ambient temperature of Ta-30°C or better. Optical characteristics shall include a beam angle of 54° (medium) or better, a unified glare rating (UGR) of less than 15 or better, and a color rendering index (CRI) exceeding 90 or better to ensure optimal performance and color accuracy. The driver shall support an input voltage of 220-240V~50/60Hz, with total harmonic distortion (THD) not exceeding 10% or better, and be compatible with driver types including On-Off, DALI 2.0, AD, TD, or BLE.</p>	959.00	NO
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118	<p>Supply, Installation, Testing & Commissioning of a Recessed Fixed Downlight shall deliver a minimum system lumen output in the range of 1328 to 1461lm or better, with a minimum system wattage of 21W and an efficacy not less than 64 to 70lm/W or better, operating at a regulated DC current of no less than 500mA or better while maintaining an efficiency of >80% or better under standard conditions. The correlated color temperature (CCT) shall be between a minimum of 2200K and 5700K or better, with chromaticity maintained within a tolerance of no more than 3 SDCM (MacAdam) or better. The system's lifetime shall conform to L80/B10 standards, ensuring a minimum operational expectancy of 50,000 hours at an ambient temperature of Ta-30°C or better. Optical characteristics shall include a beam angle of 54° (medium) or better, a unified glare rating (UGR) of less than 15 or better, and a color rendering index (CRI) exceeding 90 or better to ensure optimal performance and color accuracy. The driver shall support an input voltage of 220-240V~50/60Hz, with total harmonic distortion (THD) not exceeding 10% or better, and be compatible with driver types including On-Off, DALI 2.0, AD, TD, or BLE.</p>	310.00	NO
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119	<p>Supply, Installation, Testing & Commissioning of a Recessed Fixed Downlight shall deliver a minimum system lumen output in the range of 1328 to 1461lm or better, with a minimum system wattage of 21W and an efficacy not less than 64 to 70lm/W or better, operating at a regulated DC current of no less than 500mA or better while maintaining an efficiency of >80% or better under standard conditions. The correlated color temperature (CCT) shall be between a minimum of 2200K and 5700K or better, with chromaticity maintained within a tolerance of no more than 3 SDCM (MacAdam) or better. The system's lifetime shall conform to L80/B10 standards, ensuring a minimum operational expectancy of 50,000 hours at an ambient temperature of Ta-30°C or better. Optical characteristics shall include a beam angle of 54° (medium) or better, a unified glare rating (UGR) of less than 15 or better, and a color rendering index (CRI) exceeding 90 or better to ensure optimal performance and color accuracy. The driver shall support an input voltage of 220-240V~50/60Hz, with total harmonic distortion (THD) not exceeding 10% or better, and be compatible with driver types including On-Off, DALI 2.0, AD, TD, or BLE.</p>	69.00	NO
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120	<p>Supply, Installation, Testing & Commissioning of Trimless Downlight shall deliver a minimum system lumen output in the range of 700 to 812lm or better, with a minimum system wattage of 14W and an efficacy not less than 50 to 58lm/W or better, operating at a regulated DC current of no less than 500mA or better while achieving an efficiency of >70% or better under standard conditions. The correlated color temperature (CCT) shall range from a minimum of 2700K to 5700K or better, with chromaticity maintained within a tolerance of no more than 3 SDCM (MacAdam) or better. The system's lifetime shall conform to L80/B10 standards, providing a minimum operational expectancy of 50,000 hours at an ambient temperature of Ta-30°C or better. Optical features shall include a beam angle of 35° (narrow) or 52° (wide) or better, a unified glare rating (UGR) of less than 10 or better, and a color rendering index (CRI) exceeding 90 or better to ensure superior lighting quality and color accuracy. The driver shall support an input voltage of 220-240V~50/60Hz, with total harmonic distortion (THD) not exceeding 10% or better, and be compatible with driver types including On-Off, DALI 2.0, AD, TD, or BLE.</p>	39.00	NO
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121	<p>Supply, Installation, Testing & Commisioning of Recessed Fixed Downlightshall deliver a minimum system lumen output in the range of 823 to 873lm or better, with a minimum system wattage of 13W and an efficacy not less than 64 to 70lm/W or better, operating at a regulated DC current of no less than 300mA or better while maintaining an efficiency of >83% or better under standard operating conditions. The correlated color temperature (CCT) shall range from a minimum of 2200K to 5700K or better, with chromaticity maintained within a tolerance of no more than 3 SDCM (MacAdam) or better. The system's lifetime shall comply with L80/B10 standards, ensuring a minimum operational expectancy of 50,000 hours at an ambient temperature of Ta-30°C or better. Optical characteristics shall include beam angles of 35° (narrow), 53° (medium), and 70° (wide) or better, with a unified glare rating (UGR) of less than 10 for narrow, less than 13 for medium, and less than 25 for wide configurations, or better, ensuring optimal light distribution and visual comfort. The color rendering index (CRI) shall exceed 90 or better for accurate and vibrant color representation. The driver shall support an input voltage of 220-240V~50/60Hz, with total harmonic distortion (THD) not exceeding 10% or better, and shall be non- while being compatible with driver types including On-Off, DALI 2.0, AD, TD, or BLE.</p>	12.00	NO
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122	<p>Supply, Installation, Testing & Commissioning of Recessed Downlight shall deliver a minimum system lumen output of 4218lm or better, with a minimum system wattage of 50W and an efficacy not less than 88.5lm/W or better, operating at a regulated DC current of no less than 1200mA or better, maintaining an efficiency of >80% or better under standard operating conditions. The correlated color temperature (CCT) shall range from a minimum of 2700K to 5700K or better, with chromaticity maintained within a tolerance of no more than 3 SDCM (MacAdam) or better. The system's lifetime shall meet or exceed L80/B10 standards, ensuring a minimum operational expectancy of 50,000 hours at an ambient temperature of Ta-30°C or better. The optical performance shall include a beam angle of 57° (medium) or better, with a unified glare rating (UGR) of less than 10 or better to ensure visual comfort. The color rendering index (CRI) shall exceed 90 or better for superior color accuracy. The driver shall support an input voltage of 220-240V~50/60Hz, with total harmonic distortion (THD) not exceeding 10% or better, and be compatible with driver types including On-Off, DALI 2.0, AD, TD, or BLE</p>	40.00	NO
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123	<p>Supply, Installation, Testing & Commisioning of 2x trimless Downlight shall provide a minimum system lumen output in the range of 460 to 703lm or better, with a minimum system wattage of 14W and an efficacy not less than 32 to 49lm/W or better, operating at a regulated DC current of no less than 500mA or better, ensuring an efficiency of >70% or better under standard operational conditions. The correlated color temperature (CCT) shall range from a minimum of 2700K to 5700K or better, with chromaticity maintained within a tolerance of no more than 3 SDCM (MacAdam) or better. The system's lifetime shall meet or exceed L80/B10 standards, ensuring a minimum operational expectancy of 50,000 hours at an ambient temperature of Ta-30°C or better. The optical performance shall include beam angles of 40° (narrow) and 54° (wide) or better, with unified glare rating (UGR) values of less than 11 for narrow and less than 25 for wide configurations or better, ensuring minimal visual discomfort. The color rendering index (CRI) shall exceed 90 or better to guarantee accurate color representation. The driver shall support an input voltage of 220-240V~50/60Hz, with total harmonic distortion (THD) not exceeding 10% or better, and be compatible with driver types including On-Off, DALI 2.0, AD, TD, or BLE.</p>	44.00	NO
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124	<p>Supply, Installation, Testing & Commissioning of Recessed Mounted Downlight shall operate with a minimum system wattage of 15W, delivering a minimum lumen output of 1650lm or better. The system's efficacy shall ensure optimal energy efficiency, providing consistent illumination with a beam angle categorized as diffused. The correlated color temperature (CCT) shall range from a minimum of 3000K to 6000K or better, offering versatile lighting solutions. The color rendering index (CRI) shall exceed 80 or better, ensuring accurate color representation. The driver shall operate at a regulated current of 350mA, with driver options including DALI and BLE, ensuring compatibility with various control and dimming systems. The system shall be designed for an ingress protection rating of IP20, suitable for indoor use where protection against solid objects larger than 12mm is required but with no protection against water. The driver shall support both On-Off, DALI 2.0, AD, TD, or BLE control systems, ensuring seamless integration into existing systems for easy operation and control.</p>	64.00	NO
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125	<p>Supply, Installation, Testing & Commisioning of Recessed Mounted Downlight shall operate with a minimum system wattage of 24W, delivering a minimum lumen output of 2208lm or better, with an efficacy of no less than 92lm/W or better. The correlated color temperature (CCT) shall range from a minimum of 3000K to 6000K or better, providing versatile lighting solutions. The system shall have a beam angle of 120° or better to ensure broad and uniform light distribution. The driver shall operate at 650mA and ensure a minimum LED lifetime of >50,000 hours at L70/B10 standards under normal operating conditions, with an operating temperature range of 0°C to 50°C. The luminaire shall be rated with an ingress protection of IP20, indicating protection against solid objects larger than 12mm but not protected against water. The input voltage shall be compatible with 220V-240V/50-60Hz, and the driver shall support various types including On-Off, DALI 2.0, AD, TD, or BLE, ensuring compatibility with different control and dimming systems.</p>	187.00	NO
126	<p>Supply, Installation, Testing & Commisioning of ceiling suspended pendant light shall operate with a minimum wattage of 25W, delivering a minimum lumen output of 3000lm or better to provide sufficient illumination for various applications. The color rendering index (CRI) shall exceed 90, ensuring excellent color accuracy and visual clarity. The correlated color temperature (CCT) shall range from a minimum of 2700K to 6000K or better, offering flexibility in creating different lighting atmospheres. The optical beam direction shall be fixed to ensure controlled and precise light distribution. The driver shall have an input voltage range of 220V-240V, making it compatible with standard electrical systems. The driver shall support multiple control systems, including On-Off, DALI 2.0, AD, TD, and BLE, to ensure compatibility with advanced lighting control protocols for seamless integration and optimal functionality.</p>	80.00	MTR.

127	<p>Supply, Installation, Testing & Commissioning of ceiling suspended pendant light shall operate with a minimum wattage of 38W, providing a lumen output of 3000lm or better for effective illumination. The color rendering index (CRI) shall exceed 90, ensuring high color accuracy and visual appeal. The correlated color temperature (CCT) shall range from 2700K to 6000K or better, The optical beam direction shall be fixed, ensuring controlled and precise light distribution. The light fixture shall have a total length of 1523mm, delivering a well-balanced and efficient light spread. The driver shall operate within an input voltage range of 220V-240V, ensuring compatibility with standard electrical systems. Additionally, the driver shall support various control systems, including On-Off, DALI 2.0, AD, TD, and BLE</p>	37.00	MTR.
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128	<p>Supply, Installation, Testing & Commissioning of Pendant Mounted Linear Downlight shall provide a minimum lumen output ranging from 2300lm to 2500lm, depending on the configuration. The system's wattage shall be 18W per meter for uplight and 36W per meter for downlight. The efficacy shall range from 85 to 95lm/W, ensuring optimal energy efficiency. The DC current shall be 500mA for uplight and 1000mA for downlight, designed to ensure reliable operation. The system efficiency shall be greater than 75% to 90%, providing consistent performance. The correlated color temperature (CCT) shall range from 3000K and 6500K or better, offering flexibility for different lighting environments. The Macadam shall be within 3SDCM for color consistency. The lifetime shall be L80/B10, ensuring over 50,000 hours of operation at a temperature of Ta-30°C. The downlight beam angle shall be 86° with an opal lens and 65° with a prismatic lens, while the uplight beam angle shall be 118° with a Batwin lens. The system shall have a UGR value of less than 19 for downlight, ensuring reduced glare. The light fixture shall have a total length of 2302mm, The CRI shall exceed 80 for uplight and exceed 90 for downlight, ensuring accurate color rendering. The driver shall support an input voltage of 220-240V~50/60Hz and must have a total harmonic distortion (THD) of less than 10%. Additionally, the driver shall be compatible with On-Off, DALI 2.0, AD, TD, or BLE</p>	2.00	NO
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129	<p>Supply, Installation, Testing & Commissioning of Pendant Mounted Linear Downlight shall provide a minimum lumen output ranging from 2300lm to 2500lm, depending on the configuration. The system's wattage shall be 18W per meter for uplight and 36W per meter for downlight. The efficacy shall range from 85 to 95lm/W, ensuring optimal energy efficiency. The DC current shall be 500mA for uplight and 1000mA for downlight, designed to ensure reliable operation. The system efficiency shall be greater than 75% to 90%, providing consistent performance. The correlated color temperature (CCT) shall be adjustable between 3000K and 6500K, offering flexibility for different lighting environments. The Macadam shall be within 3SDCM for color consistency. The lifetime shall be L80/B10, ensuring over 50,000 hours of operation at a temperature of Ta-30°C. The downlight beam angle shall be 86° with an opal lens and 65° with a prismatic lens, while the uplight beam angle shall be 118° with a Batwin lens. The system shall have a UGR value of less than 19 for downlight, ensuring reduced glare. The light fixture shall have a total length of 5102mm, The CRI shall exceed 80 for uplight and exceed 90 for downlight, ensuring accurate color rendering. The driver shall support an input voltage of 220-240V~50/60Hz and must have a total harmonic distortion (THD) of less than 10%. Additionally, the driver shall be compatible with On-Off, DALI 2.0, AD, TD, or BLE</p>	1.00	NO
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130	<p>Supply, Installation, Testing & Commissioning of ceiling suspended pendant light shall operate with a minimum wattage of 22W, providing a lumen output of 3000lm or better for effective illumination. The color rendering index (CRI) shall exceed 90, ensuring high color accuracy and visual appeal. The correlated color temperature (CCT) shall range from a minimum of 2700K to 6000K or better, The optical beam direction shall be fixed, ensuring controlled and precise light distribution. The light fixture shall have a total length of 921mm, delivering a well-balanced and efficient light spread. The driver shall operate within an input voltage range of 220V-240V, ensuring compatibility with standard electrical systems. Additionally, the driver shall support various control systems, including On-Off, DALI 2.0, AD, TD, and BLE</p>	1.00	NO
131	<p>Supply, Installation, Testing & Commissioning of Pendant Mount Downlight shall have a minimum wattage of 7W, delivering a lumen output of 630lm or better. The efficacy shall be at least 90lm/W, ensuring optimal energy performance. The system shall support adjustable CCT (Correlated Color Temperature) shall range from a minimum of 3000K to 6500K or better, providing flexibility for different lighting environments. The beam angle shall be selectable between 15°, 24°, and 36°, offering versatility in light distribution. The driver shall operate at a current of 150mA, ensuring proper operation and long-lasting performance. The LED lifetime shall be L70/B10, exceeding 50,000 hours, at an ambient temperature of 0°C to 50°C. The system shall have an ingress protection (IP) rating of IP20, suitable for dry indoor environments. The driver shall support On-Off, DALI 2.0, AD, TD, or BLE control systems for integration with advanced control protocols. The driver shall be compatible with an input voltage range of 220-240V~50/60Hz and shall maintain a total harmonic distortion (THD) of less than 10%, ensuring high power quality and minimal electrical interference.</p>	15.00	NO

132	<p>Supply, Installation, Testing & Commissioning of Pendent mounted downlight shall deliver a minimum of 635lm with a total wattage of 8W, ensuring efficient illumination with an efficacy of at least 79lm/W. The system shall operate with a DC current of 200mA, maintaining an efficiency greater than 90%. The CCT (Correlated Color Temperature) shall range from a minimum 3000K to 6500K or better, The system shall comply with a Macadam of 3SDCM, ensuring color consistency. The lifetime shall exceed 50,000 hours at an ambient temperature of Ta-30°C with L80/B10 performance. The beam angle shall be 45°, offering a balanced light distribution. The UGR value shall be less than 10, ensuring low glare for visual comfort. The CRI (Color Rendering Index) shall be greater than 90, guaranteeing high-quality color rendering. The driver shall be compatible with an input voltage of 220-240V~50/60Hz, and the integration shall be non-. The system shall have a total harmonic distortion (THD) of less than 10% to maintain high power quality. The driver shall support On-Off, DALI 2.0, AD, TD, or BLE control systems.</p>	15.00	MTR.
133	<p>Supply, Installation, Testing & Commissioning of Recessed Mounted Linear Downlight shall feature a minimum wattage of 30W with a maximum LED lamp lumen output of 3000lm, ensuring efficient and bright illumination. The CCT (Correlated Color Temperature) shall range from 3000K to 6000K or better, The light fixture shall have a total length of 2500mm The driver shall support advanced control systems, including On-Off, DALI 2.0, AD, TD, or BLE, enabling seamless integration with a wide range of control protocols. The driver shall be compatible with an input voltage range of 220-240V~50/60Hz and must maintain a total harmonic distortion (THD) of less than 10%, ensuring optimal power quality and minimizing electrical interference.</p>	20.00	MTR.

134	Supply, Installation, Testing & Commissioning of Surface Mounted Linear wall washer shall provide a lumen output ranging from a minimum of 1466lm to a maximum of 1664lm, with a system wattage of 20W, ensuring effective lighting performance. The efficacy shall range from 77lm/W to 86lm/W, with a DC current of 500mA, delivering energy- efficient performance. The system shall feature a CCT(K) adjustable between 2700K and 5700K, offering flexibility in lighting ambiance. The Macadam shall be 3SDCM, and the system shall have a lifetime of L80/B10 with a minimum of 50,000 hours at Ta-30°C. The UGR value shall be <19, providing uniform and glare-free illumination. The CRI shall be greater than 90, ensuring accurate color rendering. The driver shall support an input voltage of 220-240V~50/60Hz, with a THD of less than 10%. The driver type shall support On-Off, DALI 2.0, AD, TD, and BLE control protocols for advanced integration.	1.00	NO
PART-11: OUTDOOR LIGHTING FIXTURES AND POLES			
135	Supply and fixing integral post top lantern LED fitting comprises of copper dust finish cast aluminium spigot and spun aluminium canopy fixed with opal polycarbonate, pipe arrangement for vertical mounting, open construction driver and accessories are wired upto terminal block. LED of 1 to 3 Watt each assembled on single MCPCB, having color temp upto 6500K & having 50000 burning hrs. life with minimum @ L 70, system lumen output should be minimum with efficacy>100lm/Watt. LED driver PF > 0.95 & surge protection 10KV. The colour rendering index of LED light should be more than 70. Submission LM 79-08/IS16106 (2012), IEC60598, IEC61347i/c connection wire, testing etc. to complete the job.		
(A)	40 Watt LED, color temp 3000-6500k as required.	12.00	NO
(B)	25 Watt LED, color temp 3000-6500k as required.	22.00	NO

136	Supplying and fixing flood light with high power LED of 3 to 6 Watt each assembled on single MCPCB and additional unique peanut lens on each LED, system lumens output with efficacy>120 lm/Watt. luminaire having color temp upto 6500K & 50000 hrs. burning life with minimum @ L 70, The colour rendering index of LED light should be more than 70. Luminaire comprises of driver, PF > 0.95 & surge protection 10KV. Housing made of pressure die cast aluminium with heat resistant flat glass, IP65 protection. Submission LM 79-08/IS16106 (2012), IEC60598, IEC61347/c connection wire, testing etc. to complete the job.		
(A)	120Watt, color temp 3000-6500k as required.	20.00	NO
(B)	150Watt, color temp 3000-6500k as required.	8.00	NO
137	Supply, fixing & testing of approved make of LED integral type bollard cylindrical/square shape housing cast aluminium dome shape top cover fixed with cylindrical shape acrylic cover having base plate with holes for direct mounting complete with all accessories including preparation of foundation, fixing, connection etc. as required. LED of 1 to 3 Watt each assembled on single MCPCB, system lumens output with efficacy>90 lm/W. luminaire having color temp upto 6500K & 50000 burning hrs. life with minimum @ L 70, The colour rendering index of LED light should be more than 70. Luminaire, comprises of driver PF> 0.95 & surge protection 10KV. IP65 protection. Submission LM 79-08/IS16106 (2012), IEC60598, IEC61347/c connection wire, testing etc. to complete the job.		
(A)	Bollard LED 8-10 Watt cylindrical shape height > 700mm, color temp 3000-6000k	45.00	NO

138	Supply & Fixing of Decorative LED Street Light of 1 to 3 watt with each, system lumens output with Efficacy \geq 135lm/W(@6500k), It's body made of Die cast aluminium using pressure die-casting process. Hole for coupling on pipes \varnothing 60 mm, for lateral installation. Silicon gasket ensures the IP protection. IP Rating - IP66. Power LED Module with high efficacy LED's on single Printed Circuit Board with metal core plate. Colour Rendering Index: Ra > 70. Electronic Power Supply for LED Module, which offers Protection against Short Circuit, Over- Voltage & Over-Current, with in-built surge protection upto 4kv (an additional surge protection device of 10kV also provided in-built the fixture). PF >0.95 and THD<10%. Lens cover in PC (IK09). Estimated LED Lifetime is L70 @ 1,00,000 hours minimum. LM79-80 report from LED manufacturer should be submitted. Safety test report as per IEC 60598-2-3; IEC 60598-1 / IS 10322 IEC 61347 i/c connection wire , testing etc-Supporting Test Report from NABL approved lab, with 5 year on site warranty.		
(A)	40Watt, Color Temp 3000-6500k as required	25.00	NO
(B)	60Watt, Color Temp 3000-6500k as required	18.00	NO
(C)	80/90Watt, Color Temp 3000-6500k as required	10.00	NO
139	Providing and erection on existing foundation 12.5 meter high mast lighting system suitable to install 6 No. 2 x 400 w M.H/S.V/LED flood light fitting and control gear with integral Power tool, weight 340 kg. comprising of 2 section of hot dipped galvanized materials as per BSEN ISO 1461 thickness 3 mm, dia 100mm & 360mm for top and bottom respectively, stress fitting arrangement on site with 350mm overlap dynamic loading to withstand max wind pressure as per -IS 875 part III, parameters for structural & foundation design must be taken from wind tunnel test. Lightning protection of GI single spike 800mm at top and at base inside compartment with double internal lock with adequate size of MCB erected on PVC board complete with base plate of 25mm thick 520mm dia. and foundation bolts having 4 nos. bolts of 24mm dia, 750mm long (EN8 grade), Anchor plate 445 PCD, including accessories viz. (1) Lantern carriage of 50 NB ERW class-B, MS pipe covered with PVC sleeve suitable to carry 250kg. load and upto 6 fittings symmetrically.	2.00	NO

	<p>(2) Trailing copper cable 5x2.5 sq.mm, EPR insulated PCP sheathed.</p> <p>(3) Double drum/350kg winch having gear 53:1, oil bath (SAE90/140) arrangement.</p> <p>(4) 2 nos. stainless steel wire ropes 5mm dia (7/19) breaking load capacity 1450 kg.x 2.</p> <p>(5) Integral power tool 3-phase, 0.75 HP 2m/min single speed.</p> <p>(6) Feeder pillar fabricated out of 14 SWG CRCA sheet and comprise of incoming MCB 32 A TPN switch, HRC fuses, single dial timer, suitable size of contactors for lighting and power tool, 2 nos. outgoing, reversing switch for motor.</p> <p>(7) Foundation drawing, test certificate and guarantee certificate shall be provided by manufacturer. (without fixture and lamp)</p>		
140	Providing and erection of black painted galvanized decorative designer poles in different section, top 60mm dia., bottom 140mm dia. with gold colour painted ornamental cast aluminium ring having lockable weather proof flush door junction box in bottom section, base plate dia. 290mm having 4 holes of 22mm dia. complete erected in an approved manner on existing foundation. Suitable size & type of foundation bolts 4 nos. X 16mm X 450mm 'J' type (EN8 grade)		
(A)	4 meter Height	18.00	NO
(B)	5 meter height	10.00	NO
	PART-12: LIFT AND ACCESSORIES		

141 Supply, installation, testing, commissioning, and final testing of automatic lift complete in the shaft well and pit already constructed as per CPWD specification including automatic rescue device (ARD), All standard equipments, accessories and control equipments as per manufacturer's design and as per CPWD specification (Part III LIFTS) on turnkey basis, Conforming to NBC/statutory norms and fulfilling following requirements.

(i) **Type:** Passenger lift.

(ii) **Load:** As specified elsewhere from 4 passengers (272Kg) to 26 passengers (1768Kg) (for each person standard weight 68Kg.).

(iii) **Speed:** 1.00 metre/sec. or less as required.

(iv) **Control:** ACV3F, 32bit microprocessor integrated serial communication control system with RMS (remote monitoring system)/BMS (building monitoring system) supporting software.

(v) **Motor/machine:** Permanent magnetic synchronous gearless motor.

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| <p>(vi) Operation: Simplex collective selective with/without lift attendant.</p> <p>(vii) Total rise: About 3 mtrs. (approx) two stops only.</p> <p>(viii) Landings: All floors on same side.</p> <p>(ix) Floors served: G+1.</p> <p>(x) Signals: Digital car position indicator, car travel direction indicator inside car & at all landings, voice annunciator with suitable music shall be provided in the lift car.</p> <p>(xi) Shaft size: As per manufacturer's design and as per CPWD specification (Part III LIFTS), Shaft to be constructed separately.</p> <p>(xii) Guide rail: As per manufacturer's specification.</p> <p>(xiii) Lift & car size: As per manufacturer's design and as per CPWD specification (Part III LIFTS).</p> <p>(xiv) Car entrance: As per manufacturer's design and as per CPWD specification (Part III LIFTS).</p> <p>(xv) Landing entrance: As per manufacturer's design and as per CPWD specification (Part III LIFTS).</p> | |
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(xvi) Car door: S.S. (stainless steel) hairline finish centre/telescopic opening door with vision panel.
(xvii) Landing door: S.S. (stainless steel) hairline finish centre/telescopic opening door with vision panel.
(xviii) Door operation: Automatic electric power operated door, full height infrared curtain with multiple criss/cross light beams.
(xix) Car interior: S.S. (stainless steel) panel with hair line finish on all sides.
(xx) Car floor: Anti skid PVC flooring on heavy duty M S (mild steel) platform.
(xxi) Car ceiling & lighting: S. S. (stainless steel) finish with aesthetic appearance with LED ceiling lights
(xxii) Carventilation: Pressure fan/blower fan (car fan with automatic sleep timer shall be provided).
(xxiii) Emergency lighting in car: Battery operated emergency lighting in the lift car.
(xxiv) Intercom system: Battery operated intercom system in lift car, machine room and ground

floor/control room.(xxv) Emergencyalarm: Battery operated alarm bell system in lift car & control room / ground floor.
(xxvi) Position of machine room: Directly above the hoist-way.(xxvii) Electric power supply: AC 415 V, 3 phases 50 Hz & AC 230 V 1phase 50Hz terminated in machine room.(xxviii) Fire man switch : Fire man switch at machine room/terminal landing(xxix) All car panel buttons and all floor switches must be with Braille language as per lift act.(xxx) Audio visual indication in the lift car showing overloading shall be provided such that doors keep open till excess load is removed.(xxxi) Spring buffer/hydraulic buffer shall be provided(xxxi) Spring buffer/hydraulic buffer shall be provided(xxxii) Mechanical over speed governor, door key holes in the floor doors shall be provided.

	<p>(xxxiii) Lift machine hoisting arrangement in the lift machine room and monkey ladder for lift pit should be provided by the lift agency, along with the other steel structure works, foundations for the machines etc.</p> <p>(xxxiv) In the hoist way fascia plate shall be provided.</p> <p>(xxxv) Permanent wiring in lift machine room and lift well with proper no. of light points, with fixtures, exhaust fan, plug points and 3 phase 440V power supply shall be made in lift shaft by the department, machine room or at desired level.</p> <p>(xxxvi) Car top safety barricade shall be provided.</p> <p>(xxxvii) ARD (automatic rescue device): Solid state inbuilt automatic rescue device (ARD) automatically rescues passengers trapped in the lift car in between floors in the event of power failure. Automatic operation and immediate action in the event of mains failure, capable of moving the lift to the nearest landing, opens the automatic door of</p> <p>the lift car and floor. Sealed maintenance free battery backup with automatic charging unit and auto changeover device on mains failure.</p>		
(A)	10 Passenger (680Kg.)	4.00	NO
(B)	Add extra for hall lantern and arrival gong system.		
(i)	Extra cost for per floor per lift	8.00	NO
(ii)	Add extra to item no. 44.1 cost for moon rock finish S.S. (stainless steel) panel.	4.00	NO
	PART-13: VRF SYSTEM: SUB HEAD IX :-HVAC		

142	Supply Installation, Testing & Commissioning of modular type Variable Refrigerant Flow/Variable Refrigerant Volume air cooled Outdoor units suitable for cooling and heating, having all hermetically sealed inverter type Scroll Compressor(s), minimum two compressors for above 14 HP modules, microprocessor based Controller, top discharge type condensing unit(s), with R 410 A Refrigerant, vibration isolators, with suitable foundation etc. complete as required. The unit shall deliver the rated capacity at AHRI Conditions and work even at 50°C ambient temperature without tripping. The unit shall be suitable to work on 400V +/- 10%, 3 Phase, 50Hz AC power supply. The unit shall be filled with first charge of the refrigerant and ready for use as required. The COP at AHRI conditions shall not be less than 3.1 and IEER not less than 6.5.	724.00	Per HP
143	Supply, installation, testing and commissioning of following minimum capacity Round- way flow VRV/VRF Cassette Type Indoor ceiling mounted unit equipped with synthetic washable media pre-filter, fan section with low noise fan/dynamically balanced blower, multispeed motor, coil section with DX Copper coil, electronic expansion valve, outer cabinet, drain pump, grill, necessary supports, vibration isolation, cord less remote control etc., suitable for operation on single phase 230 V \pm 10%, 50Hz AC supply, complete, as required. The unit shall have automatic force shut down provision in case of fire on receiving signal from BMS System. The cooling capacity of indoor unit will be at air inlet conditions of 27 Degree C DB and 19 Degree C WB temperature		
(A)	2 TR	5.00	NO
(B)	3 TR	10.00	NO
(C)	4 TR	132.00	NO
(D)	TFA		
(i)	4TR	6.00	NO
(ii)	6TR	1.00	NO
(iii)	8TR	1.00	NO
	<u>PART-14: Central Controller for Indoor & Outdoor Units</u>		

144	<p>Supply, installation, testing & commissioning of Central Controller capable of controlling of all IDUs, ODUs complete with necessary hardware, accessories etc. to perform the following functions: (for IDU Qty upto 80 nos.)</p> <p>Control of IDUs, ODUs Units as above with monitoring of vital parameters such as temperature sensing & setting, ON/OFF, status etc.</p> <p>Permit / prohibit function of each remote controlled unit</p> <p>Operation of units in individually or in group</p> <p>Fault indication with Alarm</p>		
(A)	The central controller will be complete including all hardware & software (including wiring) suitable to perform above function.	2.00	NO
145	Supply, Installation, testing and commissioning including vaccumiazation and Nitrogen testing of following nominal sizes of soft/hard drawn copper refrigerant piping for VRV/VRF system, complete with fittings, with suitable adjustable ring type hanger supports, jointing/brazing including accessories, insulated with XPLE Class-O tubular insulation/with Class-O closed cell elastometric nitrile rubber tubular sleeves sections of specified thickness as given below for Suction and Liquid lines, all accessories as per specifications etc. as required :		
(A)	9.5 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	240.00	MTR.
(B)	12.7 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	400.00	MTR.
(C)	15.86 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	440.00	MTR.
(D)	19 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	500.00	MTR.
(E)	22.2 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	200.00	MTR.
(F)	25.4 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19mm thick insulation	140.00	MTR.
(G)	28.58 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	180.00	MTR.
(H)	31.8 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19 mm thick insulation	180.00	MTR.

(I)	34.9 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19 mm thick insulation	125.00	MTR.
(J)	38.1 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19 mm thick insulation	220.00	MTR.
(K)	41.27 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19 mm thick insulation	160.00	MTR.
146	Providing and fixing of CPVC, 6 Kg/ Cm ² drain water piping with fittings ,support and insulated with 6 mm thick closed cell elastomeric class O Nitrile Rubber insulation with tubular sleeves complete as per specification and direction of Engineer-in-charge.		
(A)	20 mm dia ID	270.00	MTR.
(B)	25 mm dia ID	360.00	MTR.
(C)	32 mm dia ID	175.00	MTR.
(D)	40 mm dia ID	135.00	MTR.
147	Supplying, Installation, testing and commissioning of Special Refrigerant Y joints for VRF System etc complete as required.	150.00	NO
148	Supplying, Installation, testing and commissioning of Additional Refrigerant charging R-410A etc complete as required.	450.00	KG
149	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.		
(A)	24 gauge (Thickness 0.63 mm)	260.00	SQ. MT.
(B)	22 gauge (Thickness 0.80 mm)	40.00	SQ. MT.

150	Supplying and fixing of following thickness duly laminated aluminum foil of mat finish closed cell Nitrile rubber (Class "O") insulation on existing duct after applying suitable adhesive for Nitrile rubber. The joints shall be sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete as per specifications and as required.		
(A)	19 MM	300.00	SQ. MT.
151	Supply and fixing of acoustic lining of supply air duct and plenum with 25 mm thick resin bonded glass wool having density of 32 kg/m ³ , with 25 mm X 25 mm GI section of 1.25 mm thick, at 600 mm centre to centre covered with Reinforced Plastic tissue paper and 0.5 mm thick perforated aluminum sheet fixed to inside surface of ducts with cadmium plated nuts, bolts, stick pins, CPRX compound etc. complete as required and as per specifications.	50.00	SQ. MT.
152	Supplying & fixing of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers as per specifications	8.00	SQ. MT.
153	Supplying & fixing of powder coated extruded aluminium Return Air Grills with louvers but without volume control dampers complete as required.	8.00	SQ. MT.
154	Supplying, laying, testing and commissioning of industrial braided copper conductor, PVC insulated, PVC sheathed, flexible control cable in medium class PVC conduit of suitable size between indoor and outdoor unit etc as required .	2900.00	MTR.
	PART-15: FAÇADE LIGHTNING		

155

Supply, Installation, Testing, and Commissioning (SITC) of LED light source for the fixtures to be supplied shall be designed to operate with a minimum lamp load of up to 24W or better, utilizing LED chips which shall be of Osram or better or CREE or better origin. The input voltage compatibility for the system must be AC220V or better for mono-color configurations and must be 24V or better or 48V or better for RGBW configurations. The beam angle options available for selection shall include but not be limited to 8° or better, 10° or better, 15° or better, 45° or better, 60° or better, 80° or better, as well as elliptical configurations of 1030° or better, 2045° or better, 1565° or better, and 1545° or better, all of which shall be subject to site-specific requirements and shall be selected accordingly. The color output of the LEDs shall be available in RGB, RGBW, or Mono Color, and the color rendering index (Ra) must be a minimum of >82 or better. The output luminous efficacy of the LED fixtures shall be no less than +85lm/W or better to ensure sufficient brightness and energy efficiency. Control systems integrated into the LED fixtures shall be compatible with DMX512 or better, Switch or better, and DALI or better control protocols to provide versatile operation as per the site-specific needs. The housing of the fixture must be made of aluminum or better and the covering material shall consist of tempered glass or better to ensure durability. The external finish shall be treated with anti-ultraviolet poly cool powder or better, meeting outdoor-grade spraying standards, and must include a conventional UV protection layer for a minimum of 10 years or better. The ingress protection (IP)

30.00

NO

	<p>rating of the fixtures shall be a minimum of IP66 or better to ensure suitability for outdoor applications. The physical dimensions of the LED The fixture shall be designed to operate effectively within an ambient temperature range of - 25°C or better to +60°C or better. The operational life of the LED fixtures shall be a minimum of 50,000 hours or better. The printed circuit board (PCB) utilized in the fixtures must be fabricated from high heat conductivity aluminum or better with a minimum heat conductivity coefficient of $\geq 2.0\text{W/mK}$ or better to ensure efficient thermal management. All parameters stated shall be considered minimum requirements or better, and the supplier must ensure compliance with all technical specifications outlined herein, without deviation, to meet the tender's exacting standards. Approved Make - Molar / Martin Lightings / Colour Kinatics/Philips/NERI</p>		
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156	<p>Supply, Installation, Testing, and Commissioning (SITC) of The RGBW DC24V flexible SPI addressable LED wall washer light shall operate with a Minimum working power of 24W/m or better and must utilize a Minimum voltage of DC24V or better. It shall be controlled by a Minimum SPI IC or better to ensure the display of RGB color chasing LED light effects, delivering enhanced versatility and dynamic illumination. The light must feature a Minimum density of 36 LEDs/m or better, providing a total of Minimum 180 pixels on a 5-meter flexible wall washer light or better, with each 6 LEDs addressable for independent color and brightness control. This 24V dream color SPI neon LED wall washer shall be engineered to experience Minimum voltage drop or better, making it superior to 12V addressable RGB or DC5V LED strip systems by allowing longer operational runs without compromise in performance. It must utilize Minimum RGB 3-in-1 3030 LEDs or better, offering expanded color options and combinations for versatile lighting designs. The system shall be compatible with a Minimum SPI controller or better, enabling it to display a variety of color chasing effects to enhance aesthetic appeal. The LED quantity per meter must be a Minimum of 36 LEDs/m or better, with dimensions measuring a Minimum of 2323mm or better. The light fixture shall meet a Minimum IP65 rating or better for protection against environmental elements, making it suitable for both indoor and outdoor use.</p> <p>The beam angle shall be configurable with options of Minimum 20°, 30°, 40°, or 1540° or better, ensuring adaptability for various applications. The materials must include Minimum silicone and aluminum or better, ensuring durability and longevity under operational conditions. The color temperature of the LED wall washer light shall be RGB, providing dynamic and vibrant lighting solutions. The control method must be Minimum SPI or better, ensuring precise operation and configuration of lighting effects. The light shall be designed for professional-grade installations requiring reliable, efficient, and flexible lighting solutions. Approved Make - Martin/ Molar/ Color Kinetics/Philips/NERI</p>	150.00	MTR.
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157

Supply, Installation, Testing, and Commissioning (SITC) of light source for the specified LED fixtures shall mandatorily be LED and utilize LED chips of Osram or better or Cree or better origin to ensure optimal performance and reliability. The wattage of the fixture shall consist of a configuration of 24*2W or better, delivering efficient illumination under all operating conditions. The input voltage for operation must accommodate both DC24V or better and AC220V or better, with the driver positioned on the back of the fixture. The available beam angles for the fixtures shall include but not be limited to 10° or better, 15° or better, 45° or better, 90° or better, 1030° or better, 2045° or better, 1565° or better, and 1545° or better, with the final selection being site-specific and as per the requirements at the location of deployment. The fixtures shall offer illumination in single color, with a mandatory color rendering index (Ra) of no less than >82 or better to ensure high-quality color reproduction. The delivered lumen output must be a minimum of +80lm/W or better to ensure adequate brightness and efficiency. The control type for the fixtures must be compatible with DMX512 or better, DALI or better, and On/Off switching systems to ensure flexibility and adaptability based on operational requirements. The housing of the LED fixtures shall be constructed from high corrosion resistance die-cast copper-free aluminum or better to withstand harsh environmental conditions. The cover material shall be glass or better, and the coating shall comprise polyester powder coating or better with a phosphocromating pre-finish or better to ensure long-term durability. All screws utilized must be stainless steel or better, and the gasket shall be made of silicone rubber or better to ensure an effective seal against external elements. The ingress protection (IP) rating of the fixture shall be a minimum of IP67 or better,

50.00

NO

<p>allowing for reliable performance in outdoor and adverse weather conditions. The fixture must operate effectively within an ambient temperature range of -25°C or better to +60°C or better. The operational life of the LED fixture shall be a minimum of 50,000 hours or better. The PCB used in the fixture must consist of excellent heat conductivity aluminum or better with a minimum coefficient of heat conductivity $\geq 2.0\text{W/mK}$ or better for superior thermal management. The fixture must include an adjustable bracket or better for installation flexibility. Additionally, the cable gland shall be a double nickel-plated brass cable gland of PG11 or better to ensure robust and secure wiring connections. All stated parameters shall be regarded as the minimum acceptable or better, and compliance with these technical specifications is mandatory to meet the stringent requirements of the tender. No deviation from these specifications shall be permitted. Approved Make - Martin/ Molar/ Color Kinetics/Philips/NERI</p>	
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158	<p>Supply, Installation, Testing, and Commissioning (SITC) of specified LED fixtures shall mandatorily utilize a source type of LED with a minimum lamp load of 300W or better. The LED chips used shall be of Osram or better or CREE or better origin, ensuring superior performance and reliability. The input voltage shall be compatible with AC220V or better, allowing seamless integration into electrical infrastructure. The beam angle options available for selection must include but not be limited to 8° or better, 10° or better, 15° or better, 45° or better, 60° or better, 80° or better, 1030° or better, 2045° or better, 1565° or better, and 1545° or better, all equipped with a flap cover or better for precision light control, as required on-site. The fixtures shall be capable of delivering RGB, RGBW, or Mono Color outputs with a color rendering index (Ra) of no less than >82 or better. The output luminous efficacy of the fixtures must achieve a minimum of +85lm/W or better, ensuring excellent brightness and energy efficiency. Control compatibility for the fixtures shall include DMX512 or better, Switch or better, and DALI or better, allowing for advanced and adaptable control mechanisms tailored to site-specific requirements. The housing of the fixtures shall be constructed from aluminum or better, with a tempered glass or better cover for enhanced durability and resistance. The exterior finish must feature an anti-ultraviolet poly cool powder coating or better, subjected to outdoor-grade spraying processes, and provide conventional UV protection for a minimum of 10 years or better. The ingress protection (IP) rating of the fixtures shall meet or exceed IP66 or better to ensure suitability for outdoor environments and resistance to dust and water ingress. The fixtures must perform reliably within an ambient temperature range of -25°C or better to +60°C or better. The operational life of the fixtures shall be no less than 50,000 hours or better. The PCB used in the LED fixtures shall consist of high heat conductivity aluminum or better with a minimum heat conductivity coefficient of $\geq 2.0 \text{ W/mK}$ or better, ensuring efficient thermal management and enhanced longevity. All parameters stated above represent the minimum requirements or better, and compliance with these specifications is mandatory to meet the tender's requirements. No deviations shall be permitted, ensuring the highest standards for the proposed LED fixtures..</p> <p>Approved Make - Martin/ Molar/ Color Kinetics/Philips/NERI</p>	4.00	NO
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159	<p>Supply, Installation, Testing, and Commissioning (SITC) of LED lighting fixtures shall be suitable for operation in dark environments with an effective range of 1-40 meters or better. The LED chip utilized must be of OSRAM or better brand, ensuring superior quality and reliability. The color temperature of the fixtures shall be fixed at 7500K or better, providing a cool white light output suitable for the intended application. The fixtures shall have a minimum color rendering index (Ra) of 80 or better to ensure accurate color representation. The lamp luminous efficiency shall achieve a minimum of 110 lm/W or better, delivering high brightness with optimal energy efficiency. The housing or shell material for the fixtures shall be constructed from aluminum or better for durability and effective heat dissipation. The lens shall be an ultra-clear full coating lens or better to ensure maximum light transmission and minimal distortion. The power supply must incorporate a MEANWELL driver or better, ensuring consistent and reliable performance under varying electrical conditions. The cooling system shall include aluminum cooling fins or better in combination with a CPU-grade waterproof cooling fan or better to maintain optimal operating temperatures and enhance the longevity of the fixture. The wattage of the fixtures shall be 200W or better, ensuring adequate light output for the specified range. The fixtures must comply with a minimum ingress protection (IP) rating of IP65 or better to guarantee resistance to water and dust, making them suitable for outdoor and harsh environmental conditions. The fixtures shall support dual operational modes: rotatable or better for flexible light direction and stationary or better for fixed light placement, providing versatility in application. All technical parameters outlined above shall be considered minimum requirements or better. The fixtures must adhere to these specifications without deviation to meet the rigorous standards of the tender.</p> <p>Approved Make - Martin/ Molar/ Color Kinetics/Philips/NERI</p>	2.00	NO
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160	<p>Supply, Installation, Testing, and Commissioning (SITC) of The power supply unit shall be a high-efficiency, single-output enclosed type, designed with a Minimum 30mm low-profile architecture or better, offering a Maximum power output of 350W or better. It must feature a selectable AC input range of Minimum 115VAC or 230VAC via switch or better and shall be capable of withstanding a Minimum 300VAC surge input for a duration of Minimum 5 seconds or better. The unit must deliver output voltage options of Minimum 3.3V, 4.2V, 5V, 12V, 15V, 24V, 36V, and 48V or better, ensuring compatibility with a broad range of applications. It must include comprehensive protection mechanisms such as Minimum short circuit, overload, overvoltage, and over temperature protections or better, ensuring safety and durability. Cooling shall be achieved through a built-in DC fan, with forced air cooling functionality and a Minimum built-in fan ON-OFF control system or better. The design must conform to a Minimum 1U low-profile standard or better, facilitating integration into space-constrained environments. The unit must be able to withstand a Minimum 5G vibration test or better and operate at an altitude of up to a Minimum of 5000 meters or better. It must include a Minimum LED indicator for power-on status or better and exhibit no-load power consumption of less than Maximum 0.75W, ensuring compliance with global energy efficiency standards. Operating temperatures must range from Minimum -25°C to Maximum +70°C or better, providing reliable performance under extreme environmental conditions. The power supply must undergo a Minimum 100% full-load burn-in test or better to ensure reliability. Efficiency levels shall reach a Minimum of 89% or better, supported by the inclusion of a long-life built-in cooling fan for extended operational longevity. Approved Make - Molar/Ltech/Menwell/Philips/NERI</p>	40.00	NO
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161	<p>Supply, Installation, Testing, and Commissioning (SITC) of The Ethernet Control System shall be designed to operate on the Artnet protocol and must be capable of converting Minimum Artnet network data packets into DMX512 data or better. It shall incorporate a Minimum power input range of 5-24V DC or better and must accommodate an input signal of Minimum Artnet or better, with an output signal of Minimum DMX512 or better, ensuring superior compatibility and efficiency in professional lighting control applications. The system must feature a Minimum DMX channel configuration of 8 universes or better, allowing for broad and scalable usage in stage and entertainment lighting scenarios. The chassis shall be of a Minimum standard 1U (19") architecture or better, facilitating convenient integration into standard cabinet systems. It must include an interface designed with a Minimum LCD display and Minimum 4 buttons or better, enabling intuitive operation and efficient configuration. The system must provide connectivity through a Minimum RJ45 Ethernet port and Minimum 3-pin XLR DMX512 output connectors or better, delivering seamless and stable performance across networks. The current input shall be a Minimum of 30mA@12V DC or better, while the DMX output configuration must provide a Minimum of 8 DMX512 data output ports or better, supporting the connection of a Minimum of 256 DMX universes to one network or better. Ethernet compatibility shall include a Minimum 10/100Mb port or better, with functionality enhanced through data activity indicators and configurable DMX output refresh rates. The system must allow for Artnet management on a Minimum broadcast mode or unicast mode or better, ensuring versatile adaptability. Furthermore, the system shall adopt a Minimum high-speed ARM processor or better, guaranteeing stability and reliability for demanding lighting applications. It must be fully compatible with lighting software based on the Minimum Artnet protocol or better, ensuring precise, professional-grade stage lighting control. Approved Make - Martin/ Molar/ Color Kinetics/Philips/NERI</p>	4.00	NO
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162

Supply, Installation, Testing and Commissioning (SITC) of The Ethernet Control System shall be designed and engineered to operate fundamentally on the Minimum Artnet protocol or better and must be equipped to seamlessly convert the Minimum Artnet network data packets into Minimum DMX512 data or better. The system should incorporate advanced functionality to ensure the segmentation of different network subsets, which shall be essential to preclude interference arising from multiple sets of Minimum Artnet data transmissions. The architecture must adopt a Minimum high-speed ARM processor or better, ensuring operational stability, reliability, and efficiency under demanding conditions. The connectivity infrastructure should be comprised of a Minimum RJ45 Ethernet network interface or better and a Minimum 3-pin XLR DMX512 output interface or better, providing robust and stable communication channels. The control interface must feature a Minimum LCD screen display or better complemented by a Minimum of 4 buttons or better, enabling convenient system operation and intuitive parameter configuration. The chassis shall be constructed in a Minimum 1U (19") standard architecture or better, ensuring compatibility with conventional cabinet installations while maintaining structural convenience. The system should furnish a Minimum of 8 standard DMX512 data output ports or better, facilitating comprehensive control across a variety of lighting equipment. The system must support compatibility with professional lighting software that is based on the Minimum Artnet protocol or better, enabling precise and dependable stage lighting control applications. Additionally, it must be capable of connecting a Minimum of 256 DMX universes to a single network or better, ensuring scalability for expansive lighting setups. Ethernet compatibility shall incorporate a Minimum 10/100Mb Ethernet port or better, and the system must provide features such as data activity indicators and configurable DMX output refresh rates to enhance its operational versatility.

1.00

NO

<p>The system must allow management of Minimum Artnet data in both broadcast mode and unicast mode or better, ensuring adaptable deployment across varied network environments. The system's power input shall be capable of accepting a Minimum range of 5-24V DC or better, while the current input must accommodate a Minimum of 30mA@12V DC or better. Input signals shall be aligned to the Minimum Artnet protocol or better, with output signals adhering to the Minimum DMX512 standard or better. The DMX channel configuration shall provide control over a Minimum of 8 universes or better. The DMX output connections should be established using Minimum 3-pin XLR connectors or better, while the network connections shall employ a Minimum RJ45 interface or better, guaranteeing high reliability and performance. This system shall embody state-of-the-art technology and robust construction, delivering a sophisticated solution for professional-grade lighting control systems while ensuring that all operational parameters meet or exceed the prescribed Minimum specifications or better. Approved Make - Martin/ Molar/ Color Kinetics/Philips</p>		
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163

Supply, Installation, Testing, and Commissioning (SITC) of Fasad Lighting Controlling Server with Lifetime lisanse The system shall demonstrate a Minimum exceptional and unparalleled versatility or better, permitting direct interoperability with a Minimum comprehensive range of LED configurations and technologies or better. It must maintain Minimum compatibility with both proprietary and third-party LED controllers or better to ensure uninterrupted functionality across interconnected systems. A Minimum DMX-based output or better is essential, encompassing but not confined to Minimum Art-Net (including all iterations: I, II, 3, 4) operable in both unicast and broadcast formats or better, DMX512, and Minimum Color Kinetics or better. It must further support Minimum KiNET protocols (Minimum V1, V2, V3 or better) and facilitate Minimum Philips Hue integration or better. SPI compatibility must be enabled via a Minimum Nebula or equivalent or better, ensuring support for Minimum Streaming ACN (sACN/E1.31) in unicast and multicast configurations or better. The system shall also feature Minimum DVI-based output compatibility or better, incorporating Minimum ColourSmart Link, Colorlight A8, Colorlight 5A, Colorlight T9, and DVI standards (including Minimum VGA, HDMI, and other advanced formats or better). It must integrate seamlessly with a Minimum range of lighting desks, consoles, and associated hardware/software or better. Minimum adherence to advanced industry protocols or better is non-negotiable, encompassing Minimum Art-Net (I, II, 3, 4), ASIO, Blackmagic Design compatibility he system shall incorporate a Minimum Intel Core i7-12700 processor or better, boasting a Minimum 12- core architecture with 8 performance cores (P-cores) and 4 efficiency cores (E-cores) or better, operating with a Minimum 20-thread capacity or better. Processor speeds shall achieve Minimum base clock rates of 2.1GHz for P-cores and 1.6GHz for E-cores or better, reaching a Maximum Turbo Boost of Minimum 4.9GHz overall or better, 4.8GHz for P-cores or better, and 3.6GHz for E-cores or better. Additionally, the system must possess a Minimum 16GB of UDIMM DDR5-4400 RAM or better with Non-ECC configuration or better, ensuring Minimum high-speed and stable operation for multitasking or better, enabling seamless performance across demanding computational applications. Minimum DeckLink, Intensity, and equivalent systems or Continue...

1.00

NO

	Further functionalities must include Minimum MIDI, NewTek NDI (send and receive capabilities) or better, HTTP-based remote control systems, Spout for data transfer (Minimum send and receive or better), and Minimum Streaming ACN (sACN/E1.31) or better. Time synchronization using Minimum Art-Net, MIDI, SMPTE, and system time or better is indispensable. The system's LED mapping functionality shall enable a Minimum infinite variety of creative possibilities or better. It must allow Minimum installations in any form or layout or better, delivering pixel-perfect accuracy at Minimum lower resolutions or better for crisp and sharp results. Advanced 3D LED matrix support with Minimum voxel mapping capabilities or better is a requirement, allowing installations that combine Minimum 2D elements with 3D constructs or better to deliver groundbreaking visual results. All workflow features must be Minimum user-friendly, intuitive, and creative or better, empowering users to execute projects with Minimum efficiency and ease or better. With a Minimum leading-edge feature set or better, the system must establish itself as a robust platform capable of achieving Minimum visual and technical excellence or better in LED displays. better), CAST Software BlackTrax via scripting or better, and other standards including Minimum CIP, DMX512, GamePort, MA-Net 1, and MA-Net 2 or better. Integration with Minimum MADRIX I/O and ORION systems or better, along with support for a Minimum comprehensive media range (e.g., logos, videos, live captures, etc.) or better, is required. End. Approved Make - Lighting OEM Specified		
164	Supply, Installation, Testing, and Commissioning (SITC) of DMX Cable 5 Core Shielded Armored For Outdoor application	1000.00	NO
165	Supply, Installation, Testing, and Commissioning (SITC) of IP65 Connectors , DMX , Plug Fitment hardware Inteconnetc and all required accessories as on Required on Site	1.00	NO
166	Facade Lighting Programming Charges	1.00	JOB
	PART-16: ELV SYSTEM (AUDIO VISUAL)		

167

Supply, Installation, Testing, and Commissioning (SITC) of Active LED with Controller (Size 16.8 ft x 9.5 ft) shall adhere to the following specifications and requirements to ensure optimal performance and compliance with international standards. The display technology should be Micro LED (Indoor) SMD or better, with modules having a dimension of not less than 320mm x 160mm x 15mm or better to facilitate modular design and scalable configurations. The overall video wall dimensions must achieve a minimum width and height through a combination of cabinets as specified, ensuring compatibility with the modular units detailed herein. The total resolution of the display must not be less than the stated minimum resolution in pixels, providing exceptional clarity and image fidelity. Each pixel pitch must be less than 2.5mm to guarantee high-definition output, with a pixel density no less than 160000 pixels per square meter or better. The processing capability shall be 13 Bit or higher to support sophisticated visual rendering. The individual pixel per tile should comprise a minimum configuration of 128x64 pixels (HxV). Horizontal and vertical viewing angles shall be no less than 150 degrees and 130 degrees, respectively, for wide viewing coverage. The refresh rate should be a minimum of 3840Hz or higher to ensure a flicker-free display experience, with an adjustable color temperature ranging between 3000 and 15000. The video frame rate must achieve a minimum of 30Hz or better to maintain smooth playback of dynamic content. Reliability metrics shall demonstrate an average time without failures of no less than 5000 hours, complemented by an LED lifetime of 30000 hours or better. The system must support HDR compatibility, including HDR10, HDR10+, and HDR10 Pro standards, and operate continuously 24x7x365. The operational temperature range must span from -20 to +40 degrees Celsius, with humidity tolerances between 10% and 60% RH. The on-screen brightness should be a minimum of 450 cd/m² or better to ensure visibility in various lighting conditions. The system's ingress protection shall be rated at a minimum of IP30 or better. Maintenance procedures should ensure ease of access and a damage-free process for handling tiles or LEDs. Continued.....

2.00

NO

<p>the video wall must possess and provide evidence of all necessary certifications, including but not limited to BIS, CE, FCC, and RoHS, to confirm compliance with safety and international standards. A provision of 10% spare LED modules, along with cards, should be supplied and stored on-site. Each cabinet, not less than 640x480mm in size or better, must support six modules and include all necessary components such as receiving cards and power supplies for each module. The system must offer pixel-level brightness and chroma calibration, with capabilities for quick adjustments of dark or bright lines Interfaces should include at least one SL-DVI connector, one HDMI 1.3 connector, one audio connector, four gigabit Ethernet outputs, one light sensor connector, and one type-B USB control port. Additionally, there must be two UART control ports, enabling device cascading with a capacity of up to 20 devices. The electrical input voltage must range from AC 100-240V~50/60Hz, with rated power consumption not exceeding 6.6W or better. The LED display controller shall support a minimum of one DVI input, one HDMI input, one audio input, and four Ethernet outputs, accommodating input resolutions up to 1920x1200@60Hz, individual gamma adjustments for RGB, image rotation in 90° increments, mapping functionality, and the ability to pre-store and set images in the receiving card. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End.....</p>		
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168	<p>Supply, Installation, Testing, and Commissioning (SITC) of display with a diagonal size of 110 inches or larger, featuring a resolution of 3840 x 2160 (4K or higher) and a color capability of 1.07 billion colors or greater. The display must achieve a minimum brightness of 350 cd/m², with a maximum brightness of 400 cd/m². It shall provide a viewing angle of ±178° or better. The contrast ratio must be at least 1200:1, with a dynamic contrast ratio of 30,000:1. The response time of the display shall not exceed 8 ms, and the display's operational lifetime shall be 50,000 hours or more. The audio system integrated into the touch interactive display should consist of speakers rated at 2 x 14 watts or higher, ensuring quality sound output. The touch technology deployed should utilize advanced infrared technology, complemented by 4mm toughened glass that boasts 9H toughness or better. The surface technology of the display must be anti-glare, with touch accuracy specified at 1 mm or better. Furthermore, the display should support a minimum of 20 touch points in the Windows operating system. The front interface must include two USB-A 2.0 ports and three USB-A 3.0 ports. Additionally, the interface should provide keys for power, homepage, screen down, record, touch lock, and settings. The rear interface must comprise two HDMI inputs, one HDMI output, one USB-B port, one VGA with audio input, one USB-A 2.0 port, one USB-A 3.0 port, one RJ45 input, one TF card slot, one RS232 port, one COAX port, and one line output. The smart system should be based on Android, featuring an 8-core A55 CPU and a quad-core Mali G52 GPU. It must run Android version 12.0 or higher, with access to the Play Store. Built-in software should include a file manager, screen mirroring capabilities, and various productivity applications, including text recognition and wireless content sharing. The whiteboard feature should come equipped with a new menu bar that includes options for storage, sharing, and various drawing functions. Additionally, the device must support dual Wi-Fi (5G & 2.4G) and Bluetooth 5.0 or better. The system should be equipped with at least 8 GB of RAM and 128 GB of ROM. The display must hold certifications from BIS (Indian), CE, FCC, and RoHS. Compliance with ISO standards 9001, 45001, 27001, and 14001 is mandatory. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation</p>	3.00	NO
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169

Supply, Installation, Testing, and Commissioning (SITC) of an interactive panel display, which must be an 86-inch model featuring a minimum visual ratio of 16:9 and a minimum visual area measuring 1209.6mm (H) × 680.4mm (V). The resolution shall be a minimum of 3840 pixels (H) × 2160 pixels (V), with a pixel pitch of 0.315mm × 0.315mm or better. The panel must be equipped with a frequency of not less than 60Hz, supporting a color depth of 1.07 billion (10-bit) and a color gamut of a minimum of 72% (Typ). The contrast ratio shall be a minimum of 1200:1 (Typ) and must include a dynamic contrast ratio of 30,000:1 or better. The display shall be capable of achieving a viewing angle of 178° both horizontally and vertically, with the backlight source being Direct LED (DLED) and a minimum brightness of 350 cd/m², while the maximum brightness shall be 500 cd/m² or better. The operational lifespan must not be less than 50,000 hours. The integrated speaker system shall have an output of 2 x 20W or better. Touch functionality must be based on infrared identification, supporting at least 20 touch points, with a minimum identifier of 2mm. Input for touch and writing shall support opaque objects such as fingers and pens. The response time must not exceed 5ms, and the touch accuracy shall be ±1mm or better, with a writing height of no more than 3mm. Output coordinates shall have a resolution of 32767 (W) × 32767 (D), with the screen surface achieving a minimum hardness of 9 Mohs. The system version shall be based on Android 12.0 with a minimum working frequency of 1.2GHz, driven by an 8-core A55 CPU and a quad-core Mali G52 GPU or better. Memory specifications must include a minimum of 4GB RAM and 32GB ROM, and Bluetooth version shall be at least 5.0. Wireless communication shall support both 2.4GHz and 5GHz operation frequencies with a minimum operation distance of 10m. Continued.....

12.00

NO

<p>Front interface must feature a minimum of two USB 3.0 ports. Physical buttons shall include power, homepage, screen down, record, touch lock, and settings. Onboard interface shall provide 1 x TF Card slot supporting 64GB, 128GB, 256GB, and up to 1TB, along with a minimum of 1 x USB 3.0, 1 x USB 2.0, 1 x TOUCH Out, 2 x HDMI In, 1 x VGA, 1 x AUDIO In, 1 x RS232, 1 x RJ45 In, and 1 x earphone jack. Optional interfaces shall include a minimum of 1 x HDMI Out, 1 x DP In, 1 x RJ45 Out, and 1 x Mic In. The device shall be certified with BIS (Indian), CE, FCC, and RoHS certifications and must meet OEM standards for ISO 9001, ISO 45001, ISO 27001, and ISO 14001. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation.</p> <p>.End.....</p>		
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170

Supply, Installation, Testing, and Commissioning (SITC) of display system should be designed with a size of 75 inches, adhering to a visual ratio of 16:9. The maximum visual area must be no less than 1651 (H) × 929 (V) mm, with a resolution that supports 3840 (H) × 2160 (V) pixels. The pixel pitch must be no greater than 0.42975 × 0.42975 mm. The frequency shall be 60Hz, ensuring that the display supports up to 1.07 billion colors (10-bit) with a minimum color gamut of 72%. The contrast ratio should be no less than 1200:1 (typical), with a dynamic contrast ratio of at least 30,000:1. The viewing angle must extend to at least 178° both horizontally and vertically. The backlight source should be DLED, providing a brightness up to a minimum of 450 nits. The life span of the display shall be no less than 50,000 hours. The speaker system must support a 2.0 soundtrack with power output of no less than 2 x 20W. The touch specifications should include infrared identification touch mode with a minimum of 20 touch points. The minimum identifier should be no less than 2mm, and the input mode should support opaque objects such as fingers and pens. The response time shall not exceed 5ms, with touch accuracy of ±1mm and a writing height of ≤3mm. The output coordinates shall be 32767 (W) × 32767 (D). The surface hardness must be at least 9 Mohs. This configuration must meet or exceed the minimum design requirements. Any deviations from these specifications, including use of substandard components or performance, will lead to disqualification without prior notice. All components and systems must conform to the specified standards, ensuring robust functionality and reliability in professional environments. The system should run on Android 12.0 with a minimum frequency of 1.2GHz and 1.5GHz. The CPU should be octa-core A55, paired with a quad-core MaliG52 GPU. The system must be configured with at least 4GB/8GB of RAM and 32GB/64GB of ROM. The OSD should support English and all major Indian languages. The Bluetooth version should be 5.2, with an operating frequency of 2.4GHz and an operating distance of 0-10m. The system should include built-in Bluetooth. Continued.....

4.00 NO

<p>Wi-Fi support should comply with IEEE 802.11 a/b/g/n/ac/ax, operating on 2.4GHz and 5GHz frequencies, with a range of 0-10m. Wi-Fi should be built-in, supporting the relevant mode. The power parameters should be as follows: the voltage range must support 100-240V~ 50/60Hz 4A. The maximum power consumption should be no greater than 290W, with standby power consumption of $\leq 0.5W$. Front interface connections should include at least two USB 3.0 ports, with keys for power, homepage, screen down, record, touch lock, and settings. The onboard interface should feature one TF card slot supporting up to 1TB, one USB 3.0 port, one USB 2.0 port, one touch out, two HDMI inputs, one VGA input, one audio input, one RS232, one RJ45 input, one earphone jack, and one coaxial input. Optional interfaces should include one HDMI output, one DP input, one RJ45 output, one mic input, and OPS compatibility. The OPS module should include a CPU compatible with Intel® Core i5/i7 (8th/10th/12th Gen, Octa-Core), with a minimum memory of 8GB/16GB DDR4 and storage options of 256GB SSD or 512GB SSD/HDD 1TB (optional). The module should provide at least 6 x USB3.0 Type-A ports, one USB Type-C port, one RJ45 10/100/1000M, one HDMI 1.4 output supporting a maximum of 4K/30Hz, one DP output, one 3.5mm line-out, one 3.5mm mic-in, two Wi-Fi antennas, and a power button. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End.....</p>		
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171

Supply, Installation, Testing, and Commissioning (SITC) of Retractable Screen For Chairman - The height-adjustable display shall feature a 15.6-inch IPS full-view screen with a 16:9 aspect ratio and a resolution of 1080p. It must be designed with a dustproof and fingerprint-proof 10-point capacitive touch screen, demonstrating a sensitivity of less than or equal to 2 ounces and a touch response time of three milliseconds or less. The display shall integrate the touchscreen and display screen, characterized by a curved edge design and an ultra-narrow black border of five millimetres or less, ensuring excellent color reproduction without issues of greying or detachment. The display screen shall be equipped with a lift mechanism, utilizing an ultra-narrow, ultra-thin, finely sandblasted anodized panel. The panel thickness shall be limited to three millimetres', with a width of just 70 millimetres', minimizing desktop space while maintaining aesthetic appeal. The device shall operate on a low-voltage 12VDC circuit, eliminating the need for internal 220VAC power and thereby reducing the risk of leakage, ensuring both safety and reliability. Control of five mechanical actions—raise, lower, stop, forward, and backward—shall be facilitated by panel buttons. Upon raising, the display shall automatically tilt upwards by 15 degrees. The intelligent lift mechanism must include an automatic power-on feature when raising, and an energy-saving auto power-off function when lowering, ensuring safety. The integrated panel shall contain a power switch and a retractable metal USB interface for secure connectivity, avoiding detachment of the dust cover. It must allow file reading from USB drives, local browsing, or server uploads. An anti-obstacle and anti-pinch function shall be implemented; if obstacles interfere with the device's operation, it must cease movement within a predefined time to prevent damage. The lift display shall support simultaneous HDMI and VGA signal inputs, with the ability to auto-recognize a single signal while allowing for manual switching between dual signals. It shall enter power-saving mode when no signal is detected. . Continued

6.00

NO

<p>The system shall feature a separate lift mechanism for the microphone, complete with independent buttons for raising and lowering. A built-in conference speaking unit shall be included, with a chairman unit that offers priority and speech buttons. Standard CAT5e cabling shall be used for connections, incorporating RJ45 connectors that support independent microphone sensitivity adjustments and an 8-stage equalizer (EQ). The display shall have two 3.5mm speaker output ports, one RJ11 voting function module expansion port, and two RJ45 cascade interfaces to facilitate expansion for embedded conference voting, interpretation, and speaker amplification modules. High-fidelity audio quality must be achieved through lossless audio transmission technology, with a sampling frequency of 48KHz and a response frequency range from 20Hz to 20KHz A built-in microphone unit shall provide hot-plug and auto-recovery functionality. The system must support a voice control mode that intelligently opens the microphone and sets a closing time, with adjustable voice sensitivity and a customizable automatic shutdown feature for inactive microphones, allowing a maximum of 140 seconds before shutdown. Configuration settings must be accessible via the conference host's front panel menu or PC software. The display's specifications shall include a resolution of 1920 × 1080P and a contrast ratio of 600:1, with a brightness of 300 CD/m². The backlight shall utilize anodized brushed craftsmanship. Panel functions shall include a USB interface, options for raising (screen tilted forward), stopping, lowering (screen restoring to vertical), signal switching, and powering the device on/off. Control of the lift shall be accomplished through RF remote control (effective within 30 meters), manual control, or RS232/485 protocols. The chassis must feature multiple interfaces, including two DC12V power input/output ports, one USB-B touch input, one USB-APC power switch, one HDMI input, one VGA input, and two RJ45 control interfaces supporting RS-485/RS232 protocols The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>		
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Supply, Installation, Testing, and Commissioning (SITC) of The device shall mandatorily integrate a minimum 1/2.8 Sony® CMOS Image Sensor or superior for facilitating precision image acquisition and should enable an optical zoom capacity no less than a minimum of 20x or better, with a focal length spanning from F=5.2 mm to 94 mm or better. The horizontal field of view should possess a minimum coverage of 56.45° or better, supported by a shutter speed adjustable within a minimum range of 1/50 sec to 1/10,000 sec or better. The iris mechanism shall operate within a range of F1.5 to F3.0 or better, and the minimum illumination sensitivity threshold should be established at 2 lux or better for optimized low-light operability. Pan and tilt functionalities shall be enabled, allowing a minimum pan range of -130° to 130° and a tilt range of -30° to 90°, with a minimum movement speed of 0.2° – 90°/s and 0.2° – 70°/s, respectively. A minimum provision of 256 configurable presets shall be incorporated, alongside white balance configurations encompassing Auto, Indoor, One Push, and Manual modes. Exposure control mechanisms shall incorporate Auto, Manual, Shutter Priority, Iris Priority, and Brightness Priority or superior options. Continued

8.00

NO

	<p>Video output capabilities must include, at a minimum, 3G-SDI, HDMI®, USB, NDI® HX, ONVIF, RTSP, and UVC outputs, with support for signal formats including SDI/HDMI at 1080p60/50, 720p60/50, and USB at 1080p30/25. Communication interfaces should be comprised of USB-B 3.0, RJ-45 Ethernet at 100 Mbps, and serial communication through RS-232 and RS-485. Control protocols shall mandatorily feature VISCA/TCP, VISCA/UDP, PELCO-D, PELCO-P, and ONVIF compatibility. Connectivity features shall incorporate minimum support for PoE via IEEE 802.3af Class 3, 3G-SDI OUT, HDMI OUT, USB-B 3.0, and a 12VDC power input. Status indicators shall include a multisegment tricolor LED, with live feed, firmware upgrades, and privacy modes distinctly represented. The device must conform to regulatory mandates including FCC Part 15 Class B, IC Class B, CE, and Intertek® certifications for US and Canada. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installtion . End.....</p>	
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173

Supply, Installation, Testing, and Commissioning (SITC) of Ceiling Microphone system shall be equipped with a minimum of 1 x 3-pin terminal (compatible with Phoenix Contact MCVW 1.5-3-ST-3.81) and 2 x Digital Dante Network Audio connectors, utilizing RJ-45 connectors for both primary and secondary connections. The Ethernet/control interface must include 1 x RJ-45 Ethernet port, which shall be responsible for PoE power supply and data/control communication. The required supply voltage should be 44 – 57 V DC minimum, and the device must be capable of supporting PoE IEEE 802.3af Class 3 or better. The maximum power consumption of the system shall not exceed 8.8 W, with the safety certification being UL 62368, inclusive of UL 2043 testing and compliance. The ambient operating temperature range should be from 0°C to 40°C (32°F to 104°F), with the storage temperature capable of withstanding from -10°C to 60°C (14°F to 140°F) minimum. Relative air humidity must be maintained between 20% to 95%, non-condensing. The acoustic properties shall include a pre-polarized condenser microphone transducer principle, with a minimum AF frequency response from 160 Hz to 18,000 Hz. The system must exhibit a sensitivity of 0 dBV/Pa (988 mV/Pa) and achieve a minimum signal-to-noise ratio of 83 dB (A), with latency not exceeding 4 ms and equivalent noise level not exceeding 11 dB (A) minimum. The system must be equipped with 28 KE 10-237 microphone capsules, each providing a beam pattern with a maximum sound pressure level of 104 dB SPL and a dynamic range of at least 93 dB (A), with automatic dynamic beamforming technology. Continued

2.00

NO

<p>Additional features shall include Tru Voicelift, a priority zone, and the ability to manage exclusion zones. The system must support camera control via talker position data, with IEEE 802.1x compliance and coverage capable of extending up to a minimum of 80 m². Furthermore, the system shall be certified for use with leading platforms such as Microsoft Teams, Zoom, DingTalk, and Tencent, ensuring full interoperability and optimized performance. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation . End.....</p>		
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Supply, Installation, Testing, and Commissioning (SITC) of Integrated audio solution shall be designed to ensure an extremely high level of performance with a range of technical specifications that meet or exceed industry standards for professional audio applications. The system shall maintain a minimum Total Harmonic Distortion plus Noise (THD+N) of 0.002% (measured at 1kHz @ +4dBu, 22Hz to 22kHz frequency range), ensuring that the audio output maintains the highest fidelity with minimal distortion. The Equivalent Input Noise (EIN) of the system must be no greater than <125dBu, unweighted, across the full frequency spectrum from 20Hz to 20kHz. This ensures a quiet signal path with minimal interference or noise, critical for high-quality audio reproduction in sensitive environments. The system's Dynamic Range shall be no less than 110dB, unweighted, ensuring that the system can accommodate both very low-level signals and transient peaks without distortion, delivering exceptional clarity and detail across all audio sources. The Propagation Delay shall be maintained at a maximum of 4ms, guaranteeing that the audio signal is processed and transmitted with minimal latency, which is crucial for real-time communication and seamless audio performance. Crosstalk, which refers to unwanted signal interference between inputs, shall be no higher than <110dB at 1kHz, ensuring that each channel remains independent and free from cross-channel contamination, delivering a clean and precise audio output. The system shall operate at a minimum Sampling Rate of 48kHz, providing high-quality digital audio conversion, ensuring the preservation of audio detail and accuracy, making it suitable for professional environments. A/D-D/A Converters shall be no less than 32-bit, ensuring the conversion between analog and digital signals is performed with the highest possible bit-depth, contributing to the overall quality and precision of the system's audio performance. Acoustic Echo Cancellation shall require the HearClear™ license, which must be included in the system, to ensure effective echo management. The system must exhibit a maximum latency of 250ms when be reduced to no more than 100ms when operating at 16 channels, ensuring minimal disruption to real-time audio processing. Continued

1.00

NO

The power requirements for the system must be compatible with the BTU/Heat Load of a minimum of 44 BTU/hr, ensuring that the system operates efficiently without excessive heat generation, and that it is safe for use in a variety of environments. The system shall be powered by a 40-bit floating point processor, which shall be capable of handling complex audio processing tasks with high efficiency and accuracy, ensuring optimal performance under demanding conditions. Phantom Power must be provided at +48VDC and shall be capable of delivering up to 75mA maximum, ensuring the power needs of condenser microphones and other sensitive audio equipment are met. The power supply must adhere to IEEE 802.3af, Class 0 Power-over-Ethernet (PoE) standards, ensuring that the system is compatible with PoE infrastructure and minimizing the need for separate power adapters. Power consumption shall be no more than 13W under maximum load, ensuring that the system is energy-efficient and can operate in a wide variety of settings without putting undue strain on electrical systems. The system must be able to function in ambient operating temperatures ranging from a minimum of 32°F (0°C) to a maximum of 104°F (40°C), ensuring reliable operation in a broad range of environmental conditions. The system shall be capable of operating in humidity conditions ranging from a minimum of 0% to a maximum of 98%, non-condensing, ensuring robust operation in challenging environments, such as those with high levels of moisture or temperature fluctuation. Altitude operation must be supported from sea level up to a minimum of 6,600 feet (2,000 meters) above mean sea level, ensuring the system operates reliably in high-altitude locations with reduced atmospheric pressure. Continued

<p>The network connection options shall include at least two RJ45 connectors, which must be compatible with a minimum of Cat 5e cables, providing one dedicated 1000Mbps Dante™ connection and a separate Ethernet port for control and Power-over-Ethernet functionality. This ensures flexibility and high-performance networking in a variety of installation scenarios. The USB connection, when using the XC-SUB, must feature a 16-bit bit depth and support a minimum of 2x2 channels for both sending and receiving, ensuring high-quality data transfer for connected devices. The driver sample rate shall be a minimum of 48kHz, and the card sample rate must follow the DSP settings for accurate synchronization with the overall system. Dante™ compatibility shall support a minimum of 4x4 bi-directional channels, with AES67 Card Slots for up to eight (8) user-configurable options, ensuring scalability and flexibility for large installations requiring complex audio routing and distribution. The system shall feature indicators for audio in, audio out, network connectivity, and operational status, allowing for quick visual assessment of system performance. A recessed IP reset button shall be included for emergency recovery, alongside a factory service micro-USB port for technical maintenance and upgrades. Additionally, the system shall include Mix and Match functionality, ensuring that users can configure and operate the system in diverse and flexible configurations, depending on the specific requirements of the application. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>		
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Supply, Installation, Testing, and Commissioning (SITC) of codec system to be provided shall include video features that ensure minimum native 16:9 widescreen support and advanced screen layouts or better. It shall support video resolutions of minimum 4K at 30fps, 1080p at 60fps or 30fps, 720p at 60fps or 30fps, and 4CIF at 30fps, as well as CIF and QCIF or better. The system must be fully compatible with H.323, SIP, and WebRTC protocols for unified communication platforms. Bandwidth capabilities shall range from minimum 64kbps to 8Mbps or better, with video standards and protocols supported including minimum H.263, H.263+, H.263++, H.264, H.264 SVC, H.264 High Profile, VP8, VP9, and H.265 or better. The audio standards and protocols supported by the system shall include minimum G.711, G.722, G.722.1C*, AAC-LD, G.726, and SILK or better. The codec must have minimum 2 HDMI inputs supporting 4K at 30fps and minimum 1 USB 3.0 video input or better. For video output, the system shall include minimum 1 HDMI output supporting HDMI 2.1 with a maximum resolution of 4K at 60Hz and minimum 1 HDMI output supporting HDMI 1.4 with a maximum resolution of 1080p at 60Hz or better. Audio input configurations shall include minimum 1 x 3.5mm input, 1 x RCA input, 1 x USB 2.0, 1 x HDMI embedded audio input, and 1 x DMIC or better. Audio output shall consist of minimum 1 x 3.5mm output, 1 x RCA output, 1 x USB 2.0, and 1 x HDMI embedded audio output or better. Additional interfaces must include minimum 1 Ethernet port (RJ-45) 10/100/1000 for internet connectivity and minimum 1 RS232 port or better. Wireless connectivity shall be supported with minimum 1 x WiFi (802.11a/b/g/n/ac) or better, and content sharing shall be enabled via minimum 1 HDMI for wired content sharing and through wireless dongle compatibility. The system's IP network features must include minimum support for TCP/IP, DHCP, SSH, HTTP, HTTPS with SSL/TLS, RTP, RTCP, RFC3261, RFC3264, RFC2190, RFC3407, RFC2833, RFC4585 (RTP/AVPF), SNTP, and ARP or better configurable encryption on/off functionality, and automatic key generation and exchange or better Continued

2.00

NO

<p>. Video encoding and decoding shall support minimum a video stream of 4K at 30fps, a content stream of 4K at 30fps, and 1080p at 30fps or better. Security features must include minimum AES-128/256 encryption for signalling and media streams, TLS & SRTP, an administrator password, SSH/HTTPS, The codec system shall comply with minimum ITU-T H.239, BFCP standards and support both IPv4 and IPv6 protocols. It must include auto/manual gatekeeper discovery, IP precedence, H.323-based packet loss recovery, and URL dialling capabilities as a minimum standard. Protocol support must include minimum H.460, ICE, H.221, H.224, H.225, H.235, H.241, H.245, H.281, H.350, H.460, T.140, DTMF, and LDAP or better. The system shall provide provisions for software-based VC apps and support professional applications such as Cisco Webex, Zoom, Google Meet, and Microsoft Teams. Power supply requirements shall range from AC 100V ~ 240V, with a maximum power consumption of 50 Watts. The system must operate effectively within a working temperature range of minimum -10°C to 40°C or better and a storage temperature range of minimum -40°C to 70°C or better. Certification must include minimum BIS (Indian)*, CE, FCC, and RoHS or better, and the OEM must possess certifications for ISO 9001, 45001, 50001, 27001, and 14001 or better. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation . End.....</p>		
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Supply, Installation, Testing, and Commissioning (SITC) of The conference controller shall mandatorily include at the Minimum, or better, a front-panel interface equipped with a USB recording facility for seamless audio capture and a 3.5mm headphone jack that shall be utilized for precise audio monitoring. The device must incorporate, at the Minimum, one RCA audio input and one XLR audio input for superior audio source compatibility, as well as one RCA audio output and one XLR audio output to ensure robust and reliable audio dissemination. Furthermore, the controller shall include a Minimum of six Phoenix audio output connectors, alongside two RJ45 connectors dedicated to digital audio connectivity, ensuring seamless and failproof integration with auxiliary systems. Additionally, there shall be, at the Minimum, or better, two RJ45 interfaces specifically purposed for connection with the chairman unit, delegate unit, unit translators, and associated peripherals. The system must also provide a Minimum of one RJ45 connector for interfacing with a wireless access point or router, and a DP9 male interface explicitly for external control functionalities. Moreover, a DP9 female interface shall be provisioned to establish connections with camera systems, alongside a three-pin Phoenix interface, which must be present for the operation of the camera control keyboard. There shall also be a Minimum of one RJ45 interface enabling connection to a computer system or network switcher, in addition to an obligatory grounding screw for safety compliance and operational stability. The power supply must be capable of operating within the Minimum range of 100 to 240V AC, ensuring adaptability across varied environments, with a static power consumption rate not exceeding 12W and a Maximum operational power consumption capped at 150W or better. The controller must feature a frequency response range spanning a Minimum of 20Hz to 20kHz, a signal-to-noise ratio exceeding a Minimum of 96dBA, and a total harmonic distortion that must not exceed 0.05% at any instance. Channel crosstalk should be a Minimum of 85dB, while the dynamic range shall be greater than 94dB or better. Continued

2.00

NO

<p>Ethernet control shall mandatorily be facilitated through a Minimum of one RJ45 connection to a PC, and the unit must be designed to fit within a standard 19" rack for streamlined installation. The conference controller should offer adaptive support for diverse spatial configurations, including circular, square, rectangular, and semicircular setups suitable for classroom and other professional environments. The system shall conform to all necessary and applicable certifications, including, but not limited to, BIS (Indian), CE, FCC, and RoHS, with additional ISO certifications from the OEM, such as ISO 9001, 45001, 50001, 27001, and 14001. An OEM-certified copy of all requisite certifications, The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation . End</p>		
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Supply, Installation, Testing, and Commissioning (SITC) of chairman wired tabletop microphone shall, at a Minimum, feature a pluggable gooseneck microphone base, ensuring flexibility in microphone positioning. The microphone must include, at a Minimum, two 3.5mm stereo headphone jacks and two RJ45 connectors, allowing for versatile connectivity and facilitating ease of integration within the system. The user interface shall be designed with a touch-sensitive button interface, providing seamless interaction and control. The microphone shall employ a heart-type capacitance sound pickup pattern, optimizing clarity and accuracy. Equipped with an OLED display measuring 128mm × 32mm, the microphone must, at a Minimum, display essential information, including the microphone's operational status, volume bar, and time span of microphone activation. The microphone's sensitivity shall be rated at a Minimum of -46 dBV / Pa, with a maximum power consumption that must not exceed 2.0W, ensuring energy efficiency. The directivity shall be 0° / 180°, with a rating greater than 20 dB at 1 kHz to ensure excellent sound directionality. The headphone load shall be 16Ω, with a headphone volume output of 10mW via the 3.5mm stereo headphone jack, providing adequate audio clarity and output. The microphone input impedance shall be 2kΩ, with a signal-to-noise ratio (SNR) of at least 70dB to ensure superior audio performance and noise suppression. The frequency response range must span from a Minimum of 20 Hz to 20,000 Hz, ensuring comprehensive sound capture across a broad spectrum of frequencies. Connection to the microphone shall be facilitated via CAT5 or CAT6 cable, utilizing a snap connection to ensure secure and stable signal transmission. The equivalent noise level must be at 20 dBA (SPL), guaranteeing minimal background noise interference. The primary construction material of the microphone shall be ABS, ensuring durability and resilience. The maximum sound pressure level (SPL) shall be 125dB, with total harmonic distortion (THD) below 3%, ensuring the microphone can handle high volumes without distortion. The overall dimensions of the microphone, excluding the gooseneck, shall be 195L × 120W × 60H mm, ensuring a compact and functional design. Continued

8.00

NO

<p>The operating temperature range must span from 0°C to +55°C, ensuring reliable performance across diverse environments. The microphone's directivity shall be cardioid, optimized for capturing sound from the intended direction. The sensitivity shall be rated at -46 dBV/Pa, and the frequency response range shall span from a Minimum of 30Hz to 20kHz, with an equivalent noise level of 20 dBA (SPL), ensuring clear and accurate sound capture. The signal-to-noise ratio shall be a Minimum of ≥96dB, ensuring optimal clarity and noise rejection. The microphone shall be of condenser type, with a Maximum SPL of 125dB at 1 kHz with 1% THD under a 1 kΩ load, ensuring high-quality audio even in challenging acoustic environments. The conference unit connection shall be achieved via a mini 6-pin connector, ensuring secure and efficient data transfer. The input impedance shall be 2kΩ, maintaining consistency and performance across different setups. The working temperature range must be between 0°C and 45°C, with a storage temperature between -20°C and 50°C, ensuring durability and consistent performance in varying conditions. The OLED display shall feature indicators for volume adjustment, MIC ON/OFF status, priority button, and a consent button for delegate management, providing intuitive control and feedback during use. The microphone must be certified to meet the necessary standards, including BIS (Indian), CE, FCC, and RoHS certifications, ensuring compliance with global regulatory requirements. Additionally, the microphone must carry OEM ISO certifications, including ISO 9001, 45001, 50001, 27001, and 14001, affirming the manufacturer's commitment to quality, safety, and environmental management. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p> <p>.....</p>		
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Supply, Installation, Testing, and Commissioning (SITC) of delegate wired tabletop microphone shall, at a Minimum, feature a pluggable gooseneck microphone base, allowing for flexible microphone positioning to accommodate various speaker preferences. The microphone must include, at a Minimum, two 3.5mm stereo headphone jacks and two RJ45 connectors, facilitating versatile connectivity options and ease of integration into the system. The user interface shall feature a touch-sensitive button interface, ensuring a seamless and intuitive user experience. The microphone shall utilize a heart-type capacitance sound pickup pattern, optimizing sound clarity and precision. Equipped with an OLED display measuring 128mm × 32mm, the microphone must, at a Minimum, display essential information such as volume bar, microphone activation time, MIC ON/OFF status, and other relevant operational details. The microphone's sensitivity shall be rated at a Minimum of -46 dBV / Pa, ensuring accurate sound capture across various volumes. The maximum power consumption shall not exceed 2.0W, promoting energy efficiency. The microphone shall have a directivity of 0° / 180°, with a rating greater than 20 dB at 1 kHz, ensuring clear sound directionality. The headphone load shall be 16Ω, with a headphone volume output of 10mW via the 3.5mm stereo headphone jack, providing adequate sound clarity. The input impedance of the microphone shall be 2kΩ, ensuring consistent signal reception, and the signal-to-noise ratio (SNR) must be at least 70dB, ensuring high-quality sound reproduction with minimal noise interference. The microphone's frequency response range must span from 20 Hz to 20,000 Hz, ensuring full-range sound capture. Connection to the microphone shall be facilitated via CAT5 or CAT6 cable, utilizing a snap connection for secure and reliable signal transmission. The equivalent noise level must be at 20 dBA (SPL), ensuring minimal background noise. The main material used in the construction of the microphone shall be ABS, providing durability and resilience in professional environments. The microphone shall have a maximum sound pressure level (SPL) of 125dB with total harmonic distortion (THD) <3%, ensuring clear audio even at high volumes. Continued

44.00

NO

<p>The overall dimensions of the microphone, excluding the gooseneck, shall be 195L × 120W × 60H mm, ensuring a compact design suitable for desktop use. The microphone's operating temperature range shall be from 0°C to +55°C, ensuring reliable performance in a variety of environments. The microphone's directivity shall be cardioid, focusing sound capture on the speaker while rejecting background noise. The microphone's sensitivity shall be rated at -46 dBV/Pa, and its frequency response shall cover a range of 30Hz to 20kHz, providing clear and accurate sound reproduction. The equivalent noise level shall be at 20 dBA (SPL), ensuring minimal interference from background sounds. The signal-to-noise ratio must be a Minimum of ≥96dB, ensuring optimal audio quality. The microphone must be of condenser type, with a maximum SPL of 125dB at 1 kHz with 1% THD under a 1 kΩ load, capable of handling high sound pressure levels without distortion. The conference unit connection shall be via a mini 6-pin connector, ensuring reliable connectivity. The input impedance shall be 2kΩ, maintaining consistent performance across different setups. The working temperature range shall be from 0°C to 45°C, with a storage temperature between 20°C and 50°C, ensuring the microphone remains functional under various conditions. The OLED display shall feature indicators for volume adjustment, MIC ON/OFF status, and other operational information, providing users with easy-to-read feedback during use. The microphone must be certified with BIS (Indian), CE, FCC, and RoHS certifications, ensuring compliance with international standards. Additionally, the microphone must carry OEM ISO certifications, including ISO 9001, 45001, 50001, 27001, and 14001, confirming the manufacturer's commitment to quality, safety, and environmental management. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation . End</p>		
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Supply, Installation, Testing, and Commissioning (SITC) of DSP unit must be equipped with a minimum of 8 balanced microphone inputs, with the capability to support a minimum of 48V phantom power supply, facilitated by Phoenix connectors. Additionally, the system shall have a minimum of 4 balanced line inputs, also interfaced via Phoenix connectors. For outputs, the system should include at least 6 balanced outputs, connected through Phoenix connectors, ensuring robust and reliable audio signal distribution. A wireless microphone interface, with a minimum of a 3.5mm connector, shall be incorporated to facilitate wireless audio input. Moreover, a monitor headphone interface with a 3.5mm connector must be provided for real-time monitoring of the audio signals. The system shall also include a minimum of 1 USB 2.0 Type A interface, capable of supporting bidirectional audio data transmission. A serial RS-232 port must be available for external connection to a control terminal, ensuring integration with other control systems. The unit shall be equipped with a RESET key, which will serve to restore factory settings, providing an easy method for system recovery. Furthermore, the system should include a minimum of 1 RJ45 interface for external configuration via a computer, facilitating user-friendly setup and configuration processes. The DSP unit shall feature full-band adaptive echo cancellation technology to effectively manage acoustic feedback and reverberation. Automatic reverberation suppression must also be implemented to ensure clean and intelligible audio outputs under various acoustic conditions. The system shall incorporate smart sound mixing and microphone selection technology, ensuring optimal performance in dynamic audio environments. Additionally, dynamic adaptive noise reduction, capable of achieving a minimum reduction of 18dB, shall be included to improve audio clarity by suppressing unwanted background noise. Sampling frequency shall be a minimum of 32kHz, and the system must utilize 24-bit A/D and D/A conversion, guaranteeing high-resolution audio processing. The DSP shall include visual control software designed to simplify panel operations, ensuring that no complex software configuration is necessary and that the system is ready to use immediately after installation. Furthermore, the system shall include RMS and peak value voltage meters, enabling real-time monitoring of signal magnitude, ensuring accurate feedback for optimal performance. Continued

14.00

NO

The signal processing modules within the DSP unit must be abundant, including high pass and low pass filtering capabilities, as well as a 7-band parametric equalization feature. The system must offer comprehensive audio processing functions such as a limiter, compressor, noise threshold, gain control, and feedback suppression, allowing for full customization and fine-tuning of audio output. The mixing capabilities shall include smart mixing and matrix mixing functionalities, providing flexibility in signal routing. A dedicated meter module should be included to monitor signal levels continuously, ensuring that levels remain within desired parameters. In terms of control, the DSP system must allow for volume balance and volume control adjustments, offering comprehensive user control over audio outputs. Frequency response shall range from a minimum of 20Hz to 20kHz at +4dBu, ensuring that the system is capable of reproducing the full spectrum of audio frequencies accurately. Microphone input response shall maintain a tolerance of +0/-2dB, while line inputs shall operate within +0/-0.5dB tolerance. The total harmonic distortion (THD +N) at 1kHz with +4dBu input level shall not exceed 0.009% for microphone inputs and 0.007% for line inputs, ensuring extremely low distortion and high-quality sound reproduction. The equivalent noise level of the system shall be at a minimum of -84dBu (20Hz-16kHz at 22dB), ensuring minimal background noise and maintaining audio integrity. The system's dynamic range shall exceed 105dB within the 20Hz to 16kHz range at 0dB, providing a wide range of audio signals without distortion or loss of detail. The maximum input for balanced microphones shall be at least -2dBu, and for line inputs, the system shall handle up to 20dBu, ensuring flexibility in signal handling. The DSP system must be able to provide a maximum output voltage (balanced) of at least 20dBu and a maximum microphone gain of 50dB, with line inputs offering a 0dB gain. The microphone input impedance shall be a minimum of 2.2k Ω , with line input impedance at a minimum of 20k Ω , ensuring compatibility with various audio equipment. Output impedance shall be at a minimum of 400 Ω , allowing for flexible integration into existing systems. The microphone shall be of the condenser type, designed for use with 48V phantom power. It shall feature a providing accurate sound pickup at varying sound levels. Continued

<p>Φ24 back electret condenser transducer and employ JFET impedance transformation with electronic balancing, ensuring precise and reliable signal capture. The microphone shall have an omnidirectional pickup pattern, with a frequency response spanning from 50Hz to 20kHz, ensuring it captures a wide range of frequencies. The microphone's sensitivity shall be a minimum of $-44 \pm 3\text{dB}$ ($0\text{dB}=1\text{V/Pa}$ @ 1kHz), DSP Should Include Minimum 4 Number of Ceiling Microphone The rated output impedance of the microphone shall be $2.2\text{k}\Omega$, with a minimum load impedance of $1\text{k}\Omega$, ensuring high performance across various setups. The signal-to-noise ratio (SNR) of the microphone shall be at least 75dB, with a maximum sound pressure level (SPL) of 115dB at 1kHz, THD<1%, providing clear and distortion-free audio even at high volumes. The dynamic range of the microphone shall be at least 104dB within the 20Hz-20kHz range at $2.5\text{k}\Omega$, ensuring excellent audio clarity. The microphone must feature a maximum electrical output level of at least 1.6dBV (20Hz-20kHz, THD<1% at $2.5\text{k}\Omega$) and shall be connected using a mini XLR-3 male connector with twisted shielded mic cable, ensuring a stable and secure connection. The system shall be designed for reliable operation within a working temperature range of 0°C to 45°C and a storage temperature range of -20°C to 70°C ($32-113^{\circ}\text{F}$ to -4 to 158°F). Humidity tolerance shall be from 10% to 90% (non-condensing), ensuring performance in various environmental conditions. The color of the system shall be matte black, ensuring a professional and unobtrusive appearance. This equipment shall meet the highest standards of audio performance, reliability, and flexibility, providing a robust and professional solution suitable for demanding environments. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p>		
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180

Supply, Installation, Testing and commissioning (SITC) of 8 x 4" Line-Array Speaker System with LMT shall be designed to meet high-performance audio standards, ensuring optimal sound coverage and clarity in demanding environments. The speaker system shall be rated for a continuous power output of 240W, guaranteeing sustained performance for extended periods. The frequency response of the system shall span from a minimum of 96Hz to a maximum of 16kHz, delivering clear and accurate sound reproduction across a wide frequency range. The system shall feature 8 x 4" long-excursion full-range cone drivers, each designed for maximum efficiency and low distortion. The sensitivity of the system shall be 95dB SPL (1W/1M), providing sufficient sound pressure at a reasonable input power, making it suitable for both small and medium-sized venues. The maximum sound pressure level (SPL) shall reach 110dB continuous and 116dB peak, ensuring that the system can deliver high-output sound without compromising clarity or performance. The transducer sections shall include 8 x 4" (102mm) diameter each capable of handling continuous power ratings of 30W, with program power handling of 60W, and peak power handling of 120W. The voice coils of the transducers shall have a diameter of 25mm (1"), offering improved thermal dissipation and reduced distortion. The magnet material used in the transducers shall be Ferrite, ensuring both cost-effectiveness and durability. The impedance of the system shall be configurable as either series & parallel at 8Ω or discrete at 16Ω x 8, providing flexibility in system configuration and integration into various sound setups. The crossover frequency for the system shall be set at a suggested low-pass filter of 120Hz, using a 24dB/octave slope to ensure smooth transition between frequency ranges and prevent distortion. This will allow for optimal performance in a variety of acoustical environments. The enclosure of the speaker system shall be constructed from 12mm, 7-ply birch-faced plywood, providing a sturdy and acoustically favorable trapezoidal design that enhances sound projection. Continued

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40.00

NO

<p>The grille shall be made from 16-gauge perforated steel, powder-coated in black, and backed by charcoal foam to protect the internal components while ensuring maximum acoustic transparency. The surface finish shall be SoundFlex® environment-friendly coating, providing an aesthetic, durable, and environmentally responsible finish. For mounting, the system shall include 4 x M6 mounting points and a wall bracket for versatile and secure installation, ensuring that the speaker can be positioned optimally for sound coverage in various room configurations. The speaker shall offer a coverage pattern of 100° horizontal by 100° vertical, ensuring consistent and wide sound dispersion across the listening area. The input connectors shall be configured for 100 Volt operation, utilizing SL4MP connectors (x2) with an additional parallel connection option for easy daisy-chaining or connecting to other systems. This ensures secure and efficient audio signal transmission across multiple speakers in a setup. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p> <p>.....</p>	
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181	<p>Supply, Installation, Testing and commissioning (SITC) of in Ceiling Speaker shall have The passive ceiling speaker with a minimum cutout size of Ø210mm (Ø8.3") or better and a mounting depth of at least 87mm (3.4") excluding drywall. It shall feature a woven glass fiber cone woofer of no less than 6.5 inches in size and a single unit or better, combined with dual titanium dome tweeters of 0.75 inches each or better, ensuring accurate high-frequency reproduction. The frequency response shall cover a minimum range of 55Hz to 20kHz or better, with a sensitivity of at least 90dB (1M/1W) and a nominal impedance of 8Ω+8Ω or better. RMS power handling must not be less than 60W or better, with binding post input connectivity. The frameless grill design shall support both round and square options, ensuring a clean, built-in appearance. The woofer surround shall use butyl rubber for durability and superior bass performance. Installation must utilize a dog-leg mounting system for ease of setup. The speaker shall include an environment equalizer with a minimum range of ±3dB or better, ensuring sound can be tailored to room acoustics. An advanced crossover design shall deliver an open, balanced, and dynamic sound signature. The titanium dome tweeters and woven glass fiber woofer shall ensure extended bass output, minimal distortion, and precise sound reproduction. The dual-tweeter setup must provide wider dispersion and better sound coverage for small spaces, resulting in optimal audio performance. he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation</p>	56.00	NO
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182

Supply, Installation, Testing and commissioning (SITC) of 4 channel amplifier system shall be designed with a minimum power output capability of 1000W per channel at 4Ω and shall support 8Ω configurations with the same output rating of 1000W per channel, while also being compatible with 70/100V line applications at a minimum of 4x1000W or better. The amplifier shall ensure a THD+N value of less than 0.05% under typical conditions, measured across a frequency range of 20 Hz to 20 kHz with an 8Ω load and 3 dB below the rated power. The signal-to-noise ratio shall be no less than 120 dB (A-weighted), maintaining clarity and precision across the entire frequency spectrum. The frequency response shall span from 20 Hz to 20 kHz with an accuracy of ±0.25 dB or better at rated power and ±0.15 dB at 1 dB below the rated power, with an 8Ω load, ensuring high fidelity. The amplifier shall utilize a Class D output circuitry, incorporating a full-bandwidth PWM modulator for ultra-low distortion. The input impedance shall not be less than 15 kΩ balanced, with a damping factor exceeding 2000 at 8Ω load, 1 kHz, and below, guaranteeing superior control of the connected transducers. The gain and level adjustments shall be configurable, with amplifier gain selectable at minimum sensitivity levels of 0.7V, 1.0V, and 1.44V, and level adjustment for each channel available via front-panel potentiometers. A front-panel power switch shall be provided for operational control. Cooling shall be achieved through fan-based front-to-rear airflow mechanisms, maintaining optimal thermal conditions. The system shall include comprehensive protection circuits such as input limiters, short circuit protection, DC output protection, under/overvoltage protection, SOA (Safe Operating Area) protection, intelligent mains fuse protection, power stage overload protection, and temperature protection for transformers. The power supply system shall be of a universal and regulated switch-mode type, with integrated Power Factor Correction (PFC) and operational voltage compatibility ranging from 90V to 270V AC. The protection systems shall include clip limiting, SOA protection, DC protection, overcurrent detection, thermal safeguards, mains overvoltage detection, and fuse protection mechanisms. Front-panel indicators for each channel shall include 0dB, Signal, Continued

17.00

NO

<p>Limit, and Protect status LEDs, with parallel configuration available for Channels 1 & 2 and 3 & 4. Input connectors shall comprise electronically balanced 3-pin XLRs for each channel, and output connectors shall include 4-pin Speakon connectors configured as +1/-1 for CH-1, +2/-2 for CH-2 on one Speakon and +1/-1 for CH-3, +2/-2 for CH-4 on the other. The Digital Signal Processor (DSP) shall operate at a minimum resolution of 32-bit / 96kHz, providing 4 input and 4 output channels with control available via USB. A minimum of 20 presets shall be supported, with each input featuring a 10-band equalizer (PEQ / LS6 / LS12 / HS6 / HS12 / APF), volume adjustment from -60dB to +5dB, and delay capabilities up to 4.99ms. Each output shall also feature a 10-band equalizer (PEQ / LS6 / LS12 / HS6 / HS12 / APF / APF-1), delay adjustment up to 9.99ms, limiting from -19dB to 0dB, and crossover options for HPF and LPF. Input and output linking shall be provided, with inputs linkable as A, B, C, and D and outputs linkable across channels 1 through 4. he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation</p> <p>End</p>		
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183

Supply, Installation, Testing and commissioning (SITC) of Motorized Podium shall be a minimum of 27" with a resolution of 3840x2160 (pixels) utilizing a backlight type that shall ensure an enhanced visual experience. The brightness should be no less than 400 cd/m² or better to ensure sufficient luminance under various lighting conditions. The contrast ratio shall be at a minimum of 1000:1 or better, ensuring vivid and deep color contrasts. The response time should be no greater than 14ms or better, allowing for smooth transitions and minimal blurring during high-motion content. The pixel pitch shall be no less than 0.1554mm (H) × 0.1554mm (V) to ensure fine detail resolution. The viewing angle should be at a minimum of 178° (H) and 178° (V) or better, ensuring uniform visibility across the screen from various angles. The lifespan of the display shall be a minimum of 30,000 hours or better, guaranteeing prolonged performance. The color gamut should cover a minimum of 72% (typical) of NTSC or better for true-to-life color reproduction. The viewable area should be no less than 596.736mm × 335.664mm or better, providing ample space for clear visuals. The display shall support a color depth of no less than 1.07 billion colors, ensuring rich and accurate color reproduction. The system shall be based on Android 12 OS or better, with an internal cache capacity of no less than 8GB DDR4 RAM or better, and a minimum internal storage of 64GB (ROM) or better for responsive performance and ample storage. The voltage requirements should be DC 20V/5A, with a maximum power consumption of no greater than 100W, and a standby power consumption should be no greater than 0.5W to ensure energy efficiency. The Wi-Fi standard must comply with IEEE 802.11a/b/g/n/ac with an operating frequency of no less than 2.4GHz/5GHz or better. Bluetooth connectivity should support versions 2.1+EDR, 4.2, and 5.2 for a wide range of device compatibility.

2.00

NO

The system should feature one HDMI input, supporting HDMI2.1 with a maximum resolution of no less than 3840x2160@60Hz or better, and one Type-C output that shall support a maximum resolution of 3840x2160@60Hz or better, with a DP1.2 version. Additionally, there should be two USB-A ports supporting images, music, and video file playback, though upgrade capabilities are not supported. The interface should include one HDMI output capable of looping out all signals, supporting a maximum resolution of 3840x2160@60Hz or better, with a version of HDMI2.1 (TMDS), and one RJ45 Ethernet interface supporting 10M/100M/1000M Base-T self-adaptive for reliable network connectivity. The system should feature a Type-C input (power interface) for charging, and the power supply (adapter) shall provide DC 20V/5A to ensure stable operation. The bare machine dimensions shall not be less than 775.6mm * 526mm

* 1118mm or better, with support for base elevation and rotation adjustments, ensuring ergonomic flexibility. The following accessories should be included as part of the package: one stylus, one adapter, two gooseneck microphones, one 5-meter HDMI cable, one 1.8-meter Type-C cable, and one optional screen sharing dongle. Furthermore, the system shall include a qualified certificate label, instruction manual, and warranty card for user guidance and after-sales support. The environmental storage humidity shall be no less than 10% and no greater than 90% non-condensing, while the working humidity should be between 20% and 85% non-condensing. The system should be capable of operating in temperatures between 0°C and 40°C, with a storage temperature range from -10°C to +60°C or better, ensuring resilience in diverse conditions. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation

184

Supply, Installation, Testing and commissioning (SITC) of speakerphone shall incorporate both USB and Bluetooth connectivity, facilitating seamless integration with various devices and networks. It shall be equipped with a built-in microphone array consisting of no less than 12 microphones, enabling optimal voice capture within a radius of no less than 6 meters. The speaker shall deliver a volume output no less than 95dB, ensuring clear and audible sound in all conditions. The sampling rate of the system shall be no less than 48KHz to ensure high-fidelity audio performance. The voice pickup pattern shall encompass a full 360° to capture audio from all directions. The interfaces of the speakerphone should include, at a minimum, Type-B, RJ9, line in/out, and DIN6 connectors, ensuring versatility in connectivity options. The frequency response of the microphones shall span from no less than 100Hz to no greater than 22KHz, ensuring broad and accurate capture of voice frequencies. Similarly, the speaker frequency response shall extend from no less than 100Hz to no greater than 22KHz, ensuring rich and clear sound reproduction. The voice pickup range shall be capable of reaching no less than 3 meters, ensuring effective audio capture in medium-sized meeting rooms. The system shall support echo length cancellation of no less than 500ms and deep echo cancellation of no less than 65dB, ensuring clarity in voice communication even in environments with significant reverberation. Two-way noise compression shall meet or exceed $\geq 18\text{dB}$, minimizing ambient noise and enhancing voice clarity. The built-in 3A algorithm shall be incorporated, providing AEC (Acoustic Echo Cancellation), ANS (Automatic Noise Suppression), and AGC (Automatic Gain Control) functionalities to optimize audio performance in real-time.

4.00

NO

<p>The speakerphone shall include a built-in rechargeable battery with a minimum capacity of 3.7V and 5200mAh, ensuring extended operation without the need for frequent recharging. Additionally, the system shall come with a cable of no less than 3.5 meters in length to facilitate flexible placement, along with two external expansion microphones connected via RJ9 cables. Each external microphone shall support a pickup range of no less than 2 meters, ensuring comprehensive coverage of larger meeting areas. The supplier shall ensure that the product complies with all relevant certifications, including but not limited to BIS (Indian), CE, FCC, and RoHS, guaranteeing adherence to international standards. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation</p>		
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185	<p>Supply, Installation, Testing and commissioning (SITC) of touch screen panel shall have a 7-inch capacitive touch screen with a resolution of 800 x 480, providing a responsive and user-friendly interface. The firmware should be upgradable via USB 2.0, ensuring ease of updates and maintenance. Control should be facilitated through RS-232 (RJ-45), allowing for reliable and versatile connectivity. The panel shall be powered by DC 12V and should support Power over Ethernet (PoE) in compliance with the 802.3af standard, enabling both data and power transmission over a single cable. The power consumption would be a maximum of 10W, ensuring energy efficiency touch panel would serve as an optimal assistant for virtual studio systems, equipped with pre-installed presets for common operations. It shall provide an intuitive interface that can be managed with simple finger taps, allowing users to switch between multi-camera virtual studio modes, control downstream key functions, and recall various virtual studio presets with ease. It must support live streaming and recording, enabling users to conduct virtual productions seamlessly e touch panel shall allow the installation of up to 4 virtual studios in its application. Users can select their desired virtual scene mode directly, providing swift recall of the corresponding virtual scene. It must be compatible with 4K chroma keyers, supporting features such as Lumakey, background blur, and auxiliary layer swap functions. Customization of each button shall be possible, allowing users to tailor the interface to their needs. The panel's PoE functionality should ensure that both data and power can be provided through a single cable, simplifying setup and reducing cable clutter. Ohe specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation</p> <p style="text-align: right;">End</p> <p>.....</p>	1.00	NO
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186	<p>Supply, Installation, Testing and commissioning (SITC) of USB Switch meeting or exceeding the following minimum technical requirements: The system shall have minimum computer connections including 4 x USB Type B Female (Blue) and 4 x USB Type A Female (Blue), 1 x 5-pin Terminal Plug (Green) for serial connection, and 1 x 2-pin 9-24V Terminal Plug (Green) and 1 x 12V DC Jack Female (Black) for power connection. The system shall meet minimum power consumption requirements of DC12V: 0.376W: 117BTU/h and DC24V: 0.48W: 117BTU/h, with power mode selection via terminal block or DC jack, and optional power adapter (Part No.: 0AD8-8012-33MG).The system shall have minimum port selection capabilities via remote port selector or serial command, with LED indicators for selected port (Green), serial RS422 (Orange), and RS485 (Green). The system shall meet minimum cable length requirements including 2x USB 3.2 Gen 1 Type-B to Type-A Cables (1.2M and 1.8M) and remote port selector (1.8M). Compliance on OEM Letterhead he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End.....</p>	16.00	NO
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187	<p>Supply, Installation, Testing and commissioning (SITC) of 1:4 HDMI distribution amplifier that shall have one HDMI video input with a connector of Type-A female HDMI. The amplifier shall support HDMI input resolution of up to 4K@60Hz 4:4:4 8bit, conforming to HDMI Standard 2.0 and HDCP Version 2.3, and shall be CEC supported. The video output shall include four HDMI outputs, each with a Type-A female HDMI connector, capable of supporting HDMI output resolution of up to 4K@60Hz 4:4:4 8bit. The HDMI output shall support up to 5V 200mA power for AOC cable and shall comply with HDMI Standard 2.0, HDCP Version 2.3, and 1.4 compliant CEC support control, the device shall include one EDID 4-pin DIP switch and one Micro-USB port. The general bandwidth shall be 18Gbps, and the HDMI V2.0 cable length specifications shall include a maximum of 5m for 4K@60Hz 4:4:4, up to 15m for 4K@60Hz 4:2:0, and up to 20m for 1080p. The operation temperature shall range from -5 to +55°C (+23° to +131°F), while the storage temperature shall range from -25 to +70°C (-13° to +158°F). The relative humidity shall be between 10% to 90%, non-condensing power supply shall accept an input of 100V~240V AC, with an output of 5V DC 1A. The power consumption shall not exceed 2.5W (Max). The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	16.00	NO
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188	<p>Supply, Installation, Testing and commissioning (SITC) of The 4K HDMI audio embedder/de-embedder shall feature a single HDMI input connector, designed as a 19-pin Type-A female HDMI 2.0, with support for HDCP 2.2. The output interface shall include one HDMI output connector, also a 19-pin Type-A female HDMI 2.0, compatible with HDCP 1.4, ensuring seamless video pass-through. For audio output, the device shall provide comprehensive options, including one stereo balanced audio L/R output, one analog audio L+R output, and one coax digital output. These outputs shall feature connectors such as a 5-pin Phoenix connector, an RCA jack, and a coaxial connector, catering to a range of audio systems. The stereo analog audio format shall support PCM, while the coaxial digital audio format shall accommodate LPCM 2CH, Dolby Digital 2/5.1CH, and DTS 2/5.1CH. The device shall support a maximum data rate of 18 Gbit/s and handle resolutions up to 4Kx2K at 60Hz with a 4:4:4 color format, ensuring optimal video and audio quality. Operational reliability shall be maintained within a temperature range of -10°C to 55°C and a humidity range of 10% to 90%. The device shall consume a maximum of 3W of power and require a power supply input of 100-240VAC at 50/60Hz, with an output specification of 12VDC 1Ahe specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p> <p>.....</p>	16.00	NO
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189	<p>Supply, Installation, Testing and commissioning (SITC) of Wireless Lapel Microphone System with Built-in Automatic Frequency Selection (AFS) technology, operating in UHF mode, with a minimum frequency range of 522-930 MHz and a minimum operating bandwidth of 134 MHz. The system shall incorporate Anti-Interference technology with Noise Lock Squelch, effectively blocking stray RF interference. The microphone shall have a minimum frequency response of 45 Hz to 18 kHz. The Signal-to-Noise Ratio (SNR) shall be a minimum of 104 dB or better. The RF output power shall be a minimum of 10/40 mW. The system shall allow for a minimum of 24 sets to be used simultaneously using multiple frequency bands in one venue. The microphone element shall be removable and of Dynamic/Condenser type. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End.....</p>	28.00	NO
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190	<p>Supply, Installation, Testing and commissioning (SITC) of Wireless Handheld Microphone System with built-in Automatic Frequency Selection (AFS) technology, operating in UHF mode, with a minimum frequency range of 522-930 MHz and a minimum operating bandwidth of 134 MHz or better. The system shall incorporate anti interference technology with Noise Lock Squelch, effectively blocking stray RF interference or better. The microphone shall have a minimum frequency response of 45 Hz to 18 kHz or better. The Signal-to-Noise Ratio (SNR) shall be a minimum of 104 dB or better. The RF output power shall be a minimum of 10/40 mW or better. The system shall allow for a minimum of 24 sets to be used simultaneously using multiple frequency bands in one venue or better. The microphone shall have a die-cast metal body and a microphone element of Dynamic or better quality, complete with all necessary accessories. he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	28.00	NO
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191

Supply, Installation, Testing and commissioning (SITC) of Matrix Switcher shall be designed to offer a minimum of four HDMI video input connectors, each being 4 x Type-A female HDMI video inputs. The video resolution capability shall support up to 4K@60Hz 4:4:4, ensuring high-quality video output across all connected sources. The video output shall consist of four HDMI video output connectors, specifically 4 x Type-A female HDMI video outputs, which shall maintain the same video resolution of up to 4K@60Hz 4:4:4 for consistent and high-performance video transmission. The HDMI output shall support active optical cable (AoC) connections with up to 5V500mA to ensure robust signal transmission over longer distances. The HDMI version supported shall be up to 2.0, and the HDCP version shall be up to 2.3, ensuring compatibility with the latest digital content protection standards. The audio signal transmitted via HDMI shall support LPCM 7.1 audio, Dolby Atmos®, Dolby® TrueHD, Dolby Digital® Plus, DTS™, and DTS-HD® Master Audio™ pass-through capabilities, delivering immersive audio quality in multi-channel setups. For digital audio signal output, the switcher shall feature four digital SPDIF audio output connectors, specifically 4 x Toslink connectors. The digital SPDIF audio format shall support PCM, Dolby Digital, DTS, and DTS-HD. The frequency response for digital SPDIF audio shall span from 20 Hz to 20 kHz, with a tolerance of ± 1 dB, ensuring accurate audio reproduction. The maximum output level for the digital SPDIF audio shall be ± 0.05 dBFS, and the total harmonic distortion plus noise (THD+N) shall be no greater than $< 0.05\%$ within the 20 Hz – 20 kHz bandwidth, measured using a 1 kHz sine wave at 0dBFS level (or maximum level). The signal-to-noise ratio (SNR) shall be no less than 90dB, ensuring clear and high-quality audio output, while the crosstalk isolation shall be no greater than < -70 dB, measured using a 10 kHz sine wave at 0dBFS level. Continued

14.00

NO

<p>For analog audio output, the matrix switcher shall feature four analog L/R audio output connectors, specifically 4 x L&R (RCA). The digital SPDIF audio format for analog output shall support PCM 2CH, with a frequency response from 20 Hz to 20 kHz, $\pm 1\text{dB}$, and a maximum output level of $2.0\text{V}_{\text{rms}} \pm 0.5\text{dB}$. The THD+N for analog audio output shall be no greater than $< 0.05\%$ over the 20 Hz – 20 kHz bandwidth, with measurements made under the same sine wave conditions. The signal-to-noise ratio for analog output shall be no less than 80dB, and the crosstalk isolation shall be no greater than $< -80\text{ dB}$, ensuring high fidelity audio. The left-right level deviation shall be no greater than $< 0.05\text{ dB}$, with the frequency response deviation maintained within $\pm 0.5\text{dB}$ across the 20Hz - 20KHz range. The output load capability shall support 1k ohm and higher, accommodating up to ten paralleled 10k ohm loads, while maintaining noise specifications at -80dB. Control ports shall include 1 x IR EYE, 1 x RS232, 1 x FIRMWARE, and 1 x TCP/IP to ensure versatile control options for integration into various systems. The control connectors shall feature 1 x 3.5mm jack, 1 x 3-pin terminal block, 1 x USB-A, and 1 x RJ45, facilitating flexible communication with external devices. The general transmission distances shall be defined as follows: 4K/60Hz/444 at 5m, 4K/60Hz/420 at 10m, and 1080P at 15m, ensuring reliable signal integrity across varying distances. he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>		
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192	<p>Supply, Installation, Testing and commissioning (SITC) of 8x8 Matrix Switcher shall be equipped with a minimum of eight HDMI video input connectors, each being 8 x Type-A female HDMI video inputs. The device shall support video resolution up to 4K@60Hz 4:4:4, ensuring high-definition video quality for both input and output signals. The video output shall consist of eight HDMI video output connectors, also 8 x Type- A female HDMI video outputs, maintaining the same video resolution of up to 4K@60Hz 4:4:4 to preserve the integrity of the video signal across multiple displays. The HDMI output shall support up to 5V500mA for active optical cable (AoC) connections, facilitating long-distance transmission with minimal signal loss. The HDMI version shall be compliant with up to version 2.0, and the HDCP version shall be compliant with up to version 2.3, ensuring compatibility with the latest video and content protection standards. The HDMI audio signal shall support LPCM 7.1 audio, Dolby Atmos®, Dolby® TrueHD, Dolby Digital® Plus, DTS™, and DTS-HD® Master Audio™ pass-through capabilities, offering an immersive and high-quality audio experience through all connected devices. For digital audio signal output, the switcher shall include eight digital SPDIF audio output connectors, specifically 8 x Toslink connectors. The digital SPDIF audio format shall support PCM, Dolby Digital, DTS, and DTS-HD. The frequency response for audio output shall range from 20 Hz to 20 kHz, with a tolerance of ± 1dB, ensuring accurate and high-fidelity sound reproduction. The maximum output level shall be ± 0.05dBFS, and total harmonic distortion plus noise (THD+N) shall be $< 0.05\%$ within the 20 Hz – 20 kHz bandwidth, measured with a 1 kHz sine wave at 0dBFS level (or maximum level). The signal-to-noise ratio (SNR) shall be greater than 90dB within the same bandwidth, providing clear audio output, while crosstalk isolation shall be < -70 dB, using a 10 kHz sine wave at 0dBFS level. Continued</p>	2.00	NO
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<p>For analog audio output, the matrix switcher shall feature eight analog L/R audio output connectors, specifically 8 x L&R (RCA). The digital SPDIF audio format for analog output shall support PCM 2CH, with a frequency response from 20 Hz to 20 kHz, $\pm 1\text{dB}$, and a maximum output level of $2.0\text{V}_{\text{rms}} \pm 0.5\text{dB}$. The THD+N for analog audio output shall be $< 0.05\%$ over the 20 Hz – 20 kHz bandwidth, maintaining the same sine wave measurement conditions as specified above. The signal-to-noise ratio for analog audio output shall be $> 80\text{dB}$, and the crosstalk isolation shall be $< -80\text{ dB}$, ensuring minimal interference between channels. The left-right level deviation shall be $< 0.05\text{ dB}$, with frequency response deviation within $\pm 0.5\text{dB}$ across 20Hz - 20KHz. The output load capability shall support 1k ohm and higher, accommodating up to ten paralleled 10k ohm loads, with noise specifications at -80dB to maintain high-quality audio. Control ports shall include 1 x IR EYE, 1 x RS232, 1 x FIRMWARE, and 1 x TCP/IP for flexibility in system control and integration with external devices. The control connectors shall feature 1 x 3.5mm jack, 1 x 3-pin terminal block, 1 x USB-A, and 1 x RJ45, allowing for seamless communication with other devices and networks. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation .End</p>		
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193

Supply, Installation, Testing and commissioning (SITC) of display shall possess a 55-inch size, utilizing a Slim DLED backlight type, ensuring enhanced brightness of 500 cd/m² for clear and vibrant visuals. It shall feature a native resolution of 3840 x 2160 (16:9) UHD, offering sharp, high-definition clarity for professional use. The contrast ratio shall be a minimum of 1200:1 (typical), with a dynamic contrast ratio of 50000:1, providing superior depth of blacks and rich, vivid colors. The panel lifetime shall meet or exceed 50,000 hours, ensuring longevity and reliability, and the response time shall be 8ms, facilitating smooth and fluid on-screen performance. The active display area dimensions shall be 1209.6 mm (H) × 680.4 mm (V), ensuring large and immersive viewing. The viewing angle shall be 178° both vertically and horizontally, maintaining consistent image clarity and color accuracy from wide viewing positions. The screen shall support 1.07 billion colors (8-bit + FRC), providing a rich and lifelike color spectrum. A 3H screen treatment shall be applied for durability, and the haze level shall be kept at 1%, enhancing the clarity of the display. The refresh rate shall be 60Hz, ensuring smooth visuals during extended usage. The display shall be designed specifically for landscape orientation and intended for indoor use, operating reliably up to 16 hours per day, 7 days a week. The built-in system shall include a mainboard model 17MB135VS, providing reliable performance for long operational hours. Connectivity options shall include VGA (DE-15F) input, 2x HDMI 2.0, 2x USB 2.0, and an internal USB 2.0 for video input. Audio output shall be provided through a headphone jack and Optic SPDIF connector. For external control, the display shall support RS232 (DE-9F), Ethernet (RJ45), and Service (RJ12) interfaces, with an external sensor connected via RJ12 for additional control flexibility. Continued

10.00

NO

<p>The display shall operate effectively within an environmental temperature range of 0-40°C and a humidity range of 10-90%, ensuring consistent performance in varying environmental conditions. The required power supply shall be 110 VAC - 240 VAC - 50/60 Hz, with typical power consumption of 138 W, a maximum power consumption of 180 W, and a deep standby power consumption ≤ 0.5 W, ensuring energy efficiency when not in active use. Key features shall include support for open content management, a scheduler, USB-Autoplay, Auto Launch, HDMI-CEC, HDMI-Wakeup, Auto-switch on failover, panel lock, OSD rotation, No Signal Power Off, screen saver, pixel shift, and videowall support. The display shall support remote control via LAN and feature a real-time clock for time-sensitive applications. Mechanical features shall include a joystick, rocker switch, detachable power cable, detachable logo, internal USB cover, compatibility with a 30-degree tilting installation, and overlay touch kit compatibility, providing flexibility in installation and interaction. Optional features for enhanced functionality may include SDM or OPS compatibility, embedded IR, and an IR extender option. Audio output shall be facilitated by 2x10 W built-in speakers, ensuring adequate sound for general use, making the display a well-rounded solution for various professional environments. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p> <p>.....</p>		
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194	<p>Supply, Installation, Testing and commissioning (SITC) of kiosks shall have LED monitor with a screen size ranging from 46 inches to 55 inches, constructed from durable mild steel to ensure longevity and robustness. The operating voltage will be 230V AC, and each unit will come with a one-year warranty, providing assurance of quality and reliability. kiosks will have an aspect ratio of 16:9, equipped with a minimum of 4GB RAM and powered by an Intel Dual Core, i3, i5, or ARM Cortex processor to handle various applications efficiently. The brightness of the screens will exceed 300 nits, ensuring visibility in various lighting conditions, and each unit will offer a minimum of 1TB of HDD storage for ample data management Connectivity options will include WiFi, LAN, Bluetooth, USB 2.0, and USB 3.0, enabling seamless integration with other devices and networks. The kiosks will operate effectively in an environment with temperatures ranging from 0 to 45 degrees Celsius and humidity levels up to 85% Designed for standalone floor mounting, these kiosks will support multi-touch functionality, allowing multiple users to interact with the system simultaneously. The touch accuracy will be maintained at 99%, and feature a capacitive touch screen for a responsive user experience. The operating system will support both Windows 10 and Android, providing flexibility in software deployment The screen resolution will be 1920x1080, ensuring high-quality visuals. Additional features will include a printing facility and vandal-resistant glass to protect the display. Branding options will be available through vinyl, laser-cut logos, or backlighting, and the kiosks will accommodate peripherals as required will utilize customized software to enhance user experience and functionality. The enclosure will feature powder coating and should be available in any color to match the aesthetic requirements of the installation environment. The kiosks will be capable of handling various functions such as payment processing, service applications, information checks, document printing, and check-ins, thereby providing users with self service capabilities at any time. End</p>	2.00	NO
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195

Supply, Installation, Testing and commissioning (SITC) of integrated, all-in-one display system shall be provided with a diagonal screen size of no less than 130 inches, utilizing a 1212 LED type screen. The display shall exhibit a screen size of a minimum of 2885mm in width, 1659mm in height, and 50mm in depth. The physical display area shall feature a display size with a minimum width of 2880mm and height of 1620mm, ensuring an optimized screen-to-frame ratio for various applications. The pixel configuration shall be no less than 1872 pixels in width and 1053 pixels in height, inclusive of the frame and rim, ensuring fine image detail for high-resolution output. The display shall exhibit a standard brightness of no less than 500 nits, ensuring adequate luminosity for visibility in diverse ambient lighting conditions. The refresh rate of the display shall be a minimum of 3840Hz or better, delivering high clarity and smooth transitions for moving visuals. The contrast ratio shall be at least 4000:1, ensuring clear differentiation between light and dark areas, thus providing an immersive viewing experience. The color temperature must be adjustable within a range from a minimum of 2500K to 9500K, ensuring the ability to optimize visual output according to environmental and user preferences. The system's viewing angle, both horizontal and vertical, shall be no less than 160° and 140° respectively, ensuring wide-angle visibility without significant degradation in color or clarity, even at extreme viewing positions. The AC operating voltage of the system shall range between a minimum of 100V to a maximum of 240V, ensuring compatibility with global electrical standards and flexibility for various installations. Continued

1.00

NO

The maximum power consumption of the display shall not exceed 1783W, with an average power consumption of no more than 595W, ensuring efficient energy use while maintaining high performance. The integrated display shall operate on the Android 8.0 system, which shall be configured with a minimum of 4GB DDR4 system memory, ensuring smooth multi-tasking and processing capability. The storage capacity of the display shall be no less than 16GB eMMC 5.1, allowing for ample space to store system files, applications, and data necessary for the display's operation. The control interface shall feature at least one MiniUSB port and one RJ45 port, ensuring convenient connection for both local control and network management. Input/output interfaces shall include no less than three HDMI 2.0 inputs, ensuring compatibility with a variety of external video sources, and at least one USB 2.0 and three USB 3.0 ports, allowing for versatile device connectivity. Audio output shall be supported through at least one Audio OUT port, and the system must also feature an SPDIF OUT port for digital audio output, alongside an additional RJ45 port for further networking options. The display shall be suitable for operation in environments with a minimum storage temperature ranging from -40°C to +60°C, ensuring reliable performance even in extreme climatic conditions. The operating temperature range shall be no less than -10°C to +40°C, providing flexibility in both indoor and outdoor settings. In addition, the storage humidity range shall be no less than 10% to 85% relative humidity, with the operating humidity range not exceeding 10% to 80% relative humidity, guaranteeing stable operation in diverse environments. The system shall be rated with a minimum IP40 front rating and an IP21 rear rating, ensuring adequate protection against ingress of solid objects and moisture, suitable for both indoor and outdoor installations. The system shall be supplied with all necessary hardware, including controllers and any additional components as required for on-site installation, ensuring that the complete system is ready for integration into the intended environment. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization along with the technical bid, accompanied by a compliance statement on the OEM's official letterhead and take Item and Design approval from Consultant End

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196	<p>Supply, Installation, Testing and commissioning (SITC) of signal cable shall feature a high-quality PVC jacket with an outer diameter of ø 8.80 mm, presented in marine blue for clear identification and durability. The cable's shielding shall be composed of two layers: Shield No. 1 and Shield No. 2, each constructed with bare copper wires (0.10 mm), providing 100% coverage for optimal signal integrity and protection against electromagnetic interference. The internal structure shall include a polyester nonwoven layer, thermally bonded and coated on both sides with aluminum for enhanced separation and shielding capabilities. A viscose filler material shall provide structural integrity and separation within the cable, ensuring robustness in installation and use. The conductor shield layer shall similarly consist of a polyester nonwoven material, thermally bonded and coated on both sides with aluminum, further bolstering the cable's electromagnetic shielding. The conductive copper shield shall also employ bare copper wires (0.10 mm) with 100% coverage, maintaining the cable's high performance and reliability. The insulation of the cable shall be cellular polyethylene (PE), with an outer diameter of ø 2.00 mm, ensuring excellent dielectric properties and durability. Four distinct colors shall be used for easy conductor identification, facilitating accurate and efficient installation. The conductor material shall consist of stranded bare low-capacitance oxygen-free copper (LCOF) wires, with a configuration of 64 x 0.10 mm strands, yielding a cross-sectional area of 0.50 mm² per conductor. This construction ensures high conductivity and low signal attenuation, suitable for demanding professional applications. The OEM shall provide written authorization, submitted alongside the technical bid, certifying that the equipment meets all specified standards and specifications. This documentation shall guarantee that only high-quality, reliable components are used. Compliance with these standards ensures that the cable operates at peak efficiency and reliability, meeting the rigorous requirements of professional environments. End</p>	1000.00	MTR.
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197	<p>Supply, Installation, Testing and commissioning (SITC) of speaker cable shall possess a jacket of flame-retardant PVC, with a diameter of Ø 9.4 mm and a chromatic hue of black, thereby ensuring a robust and fire-resistant exterior. The insulation shall comprise PVC, with a diameter of Ø 3.9 mm and a dichromatic color scheme of black and red, thereby facilitating a precise and nuanced signal transmission. The conductor shall consist of (OFC) stranded bare copper wires, with a quantification of 224 x 0.15 mm, thereby yielding a cross-sectional area of 3.96 mm², and a gauge of 224 x 34 AWG, equivalent to 11 AWG, thereby ensuring a high degree of conductivity and flexibility. The jacket shall be rated as flame retardant PVC, in accordance with the IEC 60332-3 standard, thereby guaranteeing a high level of fire resistance. The electrical properties shall include a conductor resistance of less than 4.65 ohm/km, and a test voltage of 2000 Veff, thereby ensuring a precise and reliable signal transmission. The temperature range shall be dichotomized, with a flexible installation range of -5° to +50° C, and a fixed installation range of -30° to +70° C, thereby accommodating diverse environmental conditions. The maximum load shall be quantified as 24.0 Ampere/Line, with a rotational flexibility of 360°, and a pitch per meter of 7.14, equivalent to 140mm, thereby ensuring a high degree of flexibility and versatility he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	2500.00	MTR.
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198	<p>Supply, Installation, Testing and commissioning (SITC) of Fiber optic HDMI cable, boasting a length of 20 meters and equipped with connectors, shall be capable of maintaining a 90-degree cable angle, thereby ensuring a precise and nuanced signal transmission. This high-speed HDMI to HDMI cable, with a bandwidth of 18Gbps, shall support subsampling rates of 4:4:4/4:2:2/4:2:0, thereby facilitating the transmission of high-definition video signals, including HDTV, 3D, and 2160p/1080p resolutions. Furthermore, this cable shall be compatible with HDCP2.2, Ethernet, ARC, HDR, Ultra HD, and UHD 4K, thereby ensuring a high degree of versatility and compatibility. The cable shall support high-speed data transfer rates of 18Gbps, with capabilities for HDR, CEC, EDID, and HDCP2.2, thereby guaranteeing a precise and reliable signal transmission. Additionally, the cable shall support uncompressed audio and video sync, with a maximum resolution of 4K@60Hz, and a maximum audio sampling rate of 1536KHz. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	36.00	NO
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199	<p>Supply, Installation, Testing and commissioning (SITC) of The USB Cable as on required on Size shall feature connectors of Type A Male to Type A Female and shall support all USB 3.0 devices, explicitly not compatible with USB 2.0/1.1 standards. The device shall enable data rates of up to 5Gbps, ensuring high-speed data transfer for supported devices. It shall be universally compatible with major operating systems, including Windows, Mac OS, and Linux, ensuring seamless integration across diverse platforms. The device shall not require any external power supply and shall be intended exclusively for use with self-powered peripherals. Installation shall be straightforward with a Plug and Play design, eliminating the need for additional drivers or software configuration. The extender shall support a maximum distance of up to 100 meters (328 feet) over an active optical link, making it suitable for extended range applications. The material construction shall incorporate fiber-optic technology to ensure noise-immune data transfer at speeds up to 5Gbps across extended distances. The device shall feature high-quality USB-molded connectors for enhanced durability and reliability. The maximum supported length of the extension shall be 100 meters, maintaining performance integrity throughout the length. This adherence to specified standards and features ensures that the system is optimized for high-performance, long-distance data transfer requirements, meeting the rigorous demands of professional and industrial environments he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p> <p>.....</p>	50.00	NO
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200

Supply, Installation, Testing and commissioning (SITC) of Meeting Participant Solution Including 22 No of Meeting Name Plate Device should be based on Dot matrix e-paper Based Technology Meeting Name Plate Device should have battery backup of should not less the 8 years for 4 changes per day and it should have Button Battery Meeting Name Plate Device display size should be Minimum 10.2" diagonally or more Meeting Name Plate Device Display color should be available in : B/W、 B/W/R Operating temperature : 0~40°C Resolution(pixel) : 800x528 Product size mm) : 181.2*124.1 along with 1 no of Core Distribution device Shall have Minimum 2.4GHz private protocol Network Interface - RJ 45 Network Protocol - TCP/IP, HTTP, DHCP PoE Power Supply Transmitting Power - 0dBm~23dB automatically Antenna-antenna Two ports omnidirectional antenna Coverage Radius - Not Less then 15 Mtr System Should Work on network via web interface without installing any software from any remote or central location. Can access it using mobile or a tablet also Divide screen the way to as many regions as required & populate images, Name and designation of the meeting participant Image Formats: jpg, bmp Static Text Can be shown on the Meeting Participant Device and it can be use a welcome message Can show the Meeting Participant Name on each device and there should be provision to bind the Participant Name with the Device from anywhere from the network Search for all valid/invalid Name information, Add, delete, modify valid store information, restore invalid Name, and conduct fuzzy query for name and according to Search and view all user information within the authority, add and delete user information (users cannot delete themselves), modify user information, and reset user password Search and view all Meeting Participant information, add, delete and modify Meeting Participant information. Import or update the Meeting Participant information in batches through Excel and export the product information (Excel) Continued

1.00

NO

	<p>Binding the template of the item in batches according to the condition. Search and view all Meeting Participant Plate information, delete and modify the information; Replace base station information of the Device View all base station information, import, delete, and modify Base station information. View unassigned Base station information and build time. View Base Station MAC address update and build time. The administrator can see the general task information of the current store and its sub-stores. Search and view all template information of non-breaking screen, upload, delete, modify template information. Search for all tag types information. Search and view all database configuration information, add database configuration information. Template Manager to Make the new Template, Add/delete/modify the template designer to add the color theme, layout design for the templates Tag Management to add/ delete/ modify the tags Updation of the device information from the Web application & View the History of Tag Update System Should be Supplied with Required CMS Software with 15 Year License. he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p> <p>.....</p>	
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201	<p>Supply, Installation, Testing and commissioning (SITC) of 21.5" Smart Frame shall have minimum A133 Quad-Core ARM Cortex-A53 processor, operating at a minimum clock speed of 1.7 GHz, or better, ensuring robust performance. The integrated memory shall be a minimum of 1GB, or higher, for efficient multitasking. The system storage capacity must be a minimum of 32GB, or greater, to accommodate essential applications and data. The display unit shall feature a minimum LCD size of 21.5 inches, or larger, with a resolution that must meet a minimum of 1920 x 1080 pixels IPS panel technology, or superior, to provide exceptional visual clarity and wide viewing angles. The aspect ratio of the display shall be maintained at a minimum of 16:9, or better, ensuring optimal compatibility with multimedia applications. The panel technology must be a minimum IPS LCD type, or better, guaranteeing superior color reproduction and consistent brightness. The system shall operate on Android 7.1 as the minimum operating system, ensuring compatibility with modern software applications. USB connectivity must include a minimum of USB 2.0 and Micro USB ports, providing versatile connection options for external devices. Additionally, the system must support a minimum of TF memory cards with a capacity of up to 64GB, ensuring expandable storage options. For network connectivity, the device shall feature a minimum of dual-band WiFi supporting 2.4GHz and 5GHz frequencies, or superior, ensuring high-speed internet access. Integrated speakers must deliver a minimum of 2X2W output with an impedance of 8Ω, or better, to provide clear audio playback. Furthermore, Bluetooth functionality shall be a mandatory minimum feature, enabling wireless device connectivity. The system shall support a minimum language selection of English and multiple other languages, ensuring user adaptability and inclusiveness. All parameters listed above represent the baseline requirements for the tender, and products meeting or exceeding these specifications shall be given preference. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	35.00	NO
	PART-17: IPPBX		

202

Supply, Installation, Testing, and Commissioning (SITC) of IP-PBX system must be supplied by an Original Equipment Manufacturer (OEM) certified with ISO 9001:2015 and ISO/IEC 27001:2013. The system will include Gateways, Digital Phones, IP Phones, Meeting Manager/Collaboration Bridge, Softphone, and UC Client, all sourced from the same OEM. A valid service and spare support availability of a minimum of five years is required IP-PBX will have a minimum capacity of 100 IP, Analog, or Digital Telephone lines and be expandable to accommodate up to 10,000 telephone lines. It will be installed in the Server Room of the COE Building, with the PRI lines firebox terminated in a separate rack located within the server room. This rack will be connected to the IP-PBX system proposed system must support automatic route selection (ARS) and least cost routing (LCR) features, enabling call routing based on user profile priorities, tariff considerations, and network availability, ensuring the most cost-effective path for all calls. This service will be transparent for users and independent of the physical location of the users The telephony system is to be designed with IP as the core of the communications system, allowing for fully distributed IP solutions across data networks. It should be call server-based and capable of supporting traditional TDM, mixed IP-TDM, or a fully 100% IP configuration. All telephony applications, gateways, endpoints, and telephony systems must originate from the same OEM Node matrix as per project needs. The Engineering, Procurement, and Construction Contractor will prepare and submit this design for approval before any purchases are made Following is the Minimum technical Specifications

Auto Redial

Callers who get a busy signal will be alerted if the line they are calling becomes available during a specified period of time. You only need to pick up the phone to be connected to the number you were trying to reach.

Call Paging

Call paging allows you to dial into the overhead or external speakers of telephones in order to make voice announcements. We can do multicast paging groups and store and forward paging.

Park and Page

Park and Page to automatically receive a call, park it on a free group park extension and page a paging group. Ideal for retail stores.

1.00 NO

Parent/Child Extension configuration

Parent/Child Extension configuration allows the creation of child extensions tied to a parent. Regarding the inbound/outbound calls the groups of parent/child extensions work as one extension on multiple devices. Child extensions do not use an IP line on the PBX. Ideal to use with eQall softphone.

Phone Book

Phone Book provides users with the ability to scroll through a company's Global Contact Directory on the phone and dial the desired extension easily.

Intercom

Intercom allows for room-to-room communication via telephone sets with auto-answer on the called telephone.

Speed Dial

Speed Dial gives you the ability to "save" frequently called numbers so that they can be easily dialed on your extension with an assigned shortcut of digits.

Global Speed Dial Directory

Global Speed Dial Directory in addition to personal speed dialing codes for individual extensions, supports speed dialing codes shared between all extensions on the PBX.

Alarm

This feature allows setting an alarm call one time only or repeatedly for the desired days in a week. The alarm call will be activated automatically by the pre-configured date/time with a precision of up to seconds. You can use your own alarm message, by uploading it as a file or record it from the phone.

Dial & Announce

Dial & Announce supports calls simultaneously to the predefined list of destinations. When answering the call, the uploaded as a file or recorded from the phone audio message will be played to the receiver. The Dial & Announce calls can be activated automatically by schedule or triggered by a call to the extension which is configured with Dial & Announce service.

Emergency Interrupt

Emergency Interrupt is used to interrupt the active calls and connect directly to called party in case of an emergency.

Authorized Phones

The Authorized Phones service is used to define the list of trusted external users, allows accessing the auto-attendant Call Relay menu automatically by recognizing the originators' Caller ID. When adding an authorized phone number to the list, select a Server extension for login. Calling the auto attendant, the trusted users' Caller ID will be recognized and the caller will automatically be logged in to the Call Relay menu. The Caller ID will be associated with the extension in the Login Extension field and as such the caller will bypass the usual prompt to enter the extension and extension password.

Callback on Auto Attendant

Authorized callers can initiate Callback by dialing the Auto Attendant and hanging up the call during the specified time out, without waiting for the Auto Attendant prompt. Server will call back to the authorized phone number and play the Auto Attendant prompts when answered. At this point, all Auto Attendant services, like connection menu, Remote Access Menu, Call Relay Menu are available to the authorized caller. This allows authorized callers to save calling charges when using the Call Relay or other Auto Attendant services on the Server.

Click To Call Chrome extension

Click To Call Chrome extension is used for making one-click calls via Server to phone numbers shown on the web pages. The Chrome extension detects the phone numbers on the web page and as soon as the user hovers over one of them, a callout pops up with the detected phone number and the “Call” icon.

WebRTC Click2Call

WebRTC Click2Call feature is available on the Server3000, Server5000 and eServer. Is used to make WebRTC calls from a web browser having WebRTC support to Server extensions or to destinations, which are external to Server.

Customizing the System Voice Messages

The system voice messages can be customized either for the selected extensions (user and auto-attendant extensions) or for all user extensions on Server at once. The following methods are available for customizing the system voice messages on Server: upload an earlier recorded file in the appropriate WEB configuration page, record a new voice message on the phone by using the appropriate option in the Voice Mail Service (VMS), or record a new voice message on the IP phone by using the Record from Extension service available for extensions.

Receptionist Phone Configuration Wizard

The Receptionist Phone Configuration Wizard allows configuring a new receptionist. Applicable to most of the Epygi supported IP phones.

Scheduling

Scheduling feature allows controlling the call routing rules and auto attendant scenarios automatically based on the preconfigured weekly schedules of working/non-working hours.

Hot Desking

Hot Desking is ideal for an office with multiple workers using a single physical phone at different time frames to log in to the handset and use it as their own extension.

Hold Music

Hold Music (".WAV" and ".MP3" Files Upload) allows callers to hear music or a recorded message while on hold or waiting for other participants to arrive on a conference call.

IP Phones Logo

IP Phones Logo is used to upload a custom logo for the IP phones. The uploaded custom logo will be visible on the display of the IP phone.

Call Blocking

This prevents calls from specific numbers from getting through, enabling you to avoid unwanted callers.

Direct Transfer to a Voice Mailbox

This enables callers to be directly transferred to another extension's voicemail.

Distinctive Ringing

This lets you customize ring tones for identified callers and categorize calls to specific lines (service, sales, or billing).

Do Not Disturb

Redirects all incoming calls to your voicemail through the PBX, ensuring your phone won't ring during the specified timeout.

Hiding Caller ID

Blocks your phone number from being identified by the call's recipient.

Auto Attendant with Standard and Customizable Scenarios

This Interactive Voice Response (IVR) system replaces a human operator and directs calls to the appropriate extensions or voice mailboxes. It engages callers through pre-recorded or synthesized audio prompts.

Call History for the Auto Attendant Custom Scenario

Input choices configured within auto attendant custom scenarios, selected by external callers as they navigate these scenarios, are recorded and stored as historical data. This information can be retrieved, processed, exported as XML files, and analyzed. This analysis helps evaluate the effectiveness of the pre-configured custom scenarios, allowing for informed decisions and improvements if needed.

Call Hunting

This ensures that incoming calls are directed to multiple extensions in sequence, enabling the call to be answered promptly by the first available person.

Simultaneous Ring

This feature allows incoming calls to ring simultaneously with several extensions so that the first available person can answer the call.

Call Pickup

This allows you to define pickup groups by grouping extensions. Any phone in the building can answer a call ringing on another extension within the designated pickup group.

Call Queue

This feature enables incoming callers to be placed in a queue where they can listen to a personalized recorded message. If unanswered within the specified timeframe, the caller can be directed to voicemail or redirected to another extension, ensuring efficient call management.

Extension Status

This allows a receptionist's phone to monitor multiple managers' phones and provide information on the extension's status - off-hook, on-hook, or ringing.

Hot Desking

Hot Desking is perfect for offices with multiple employees who use a shared physical phone at different times. It allows them to log in to the handset and use it as their personalized extension, enhancing flexibility and workspace efficiency.

Multi-Company Receptionist

Enables one receptionist to handle calls from designated numbers, each associated with a specific company. This efficient setup not only saves time but also optimizes your budget effectively.

Emergency Interrupt

Emergency Interrupt enables the immediate interruption of active calls, establishing a direct connection to the called extension in emergency situations.

Call Alert

Call Alert is used to notify the designated personnel about the emergency calls, as well as calls through certain call routing rules. The following information will be included in the notification: the routing pattern, the extension who placed the call, the dialed number and the call Date/Time. The notifications can be generated and displayed in the System Events, sent via E-mail, via SMS, or left as voice mail on the defined extension(s) with a voice message.

Call History

Call History gives you the ability to track and report call details (caller, call recipient, length of call, call cost, call quality etc.) on incoming and outgoing calls per extension.

Dial Plans

Dial Plans (Call Routing) allows calls to travel through a network along a pre-determined path to the end-user. This feature helps determine the least expensive way and/or least congested path to route a call. Incoming calls can also be grouped according to area code and routed to specific customer service reps who manage different geographic regions.

Class of Service

Class of Service can be used to define the permissions that PBX extensions will have when using certain call routing rules to make calls. An extension will only be allowed to use the call routing rules that have a matching Class of Service designation.

Date/Time Settings

Date/Time Settings in the call routing table allowing to secure Call Routing rules by limiting their availability for a certain time frame. When the caller attempts to use the specific Call Routing rule outside of the configured time frame, he/she will be denied access.

Time of Day Dialling

Time of Day Dialling makes it possible for calls to be routed according to the time of day. This enables you to pre-select where a call will be directed in regard to time.

PIN Barring

PIN Barring feature allows to assign and manage credits on the PIN codes configured in the Server Local AAA table. The assigned credits will be spent if the authentication by PIN option is used when making calls through call routing rules with Call Rate Settings enabled. PIN codes, which have no credits assigned cannot use the routing rules with Call Rate Settings enabled. Similar to the case where the calling credits are assigned to the Server extensions, the PIN barring feature calculates the call cost per minute and per second. Once the available credits assigned to the PIN are completely spent, placing new calls through the toll routing rules will not be possible until the available credit balance is updated, either manually or automatically. For user convenience the automatic credit balance update for PIN codes can be scheduled daily, weekly or monthly.

Overall Call Duration Limit

You may also secure Call Routing rules by putting a limit on the overall call duration for selected Call Routing rules. The duration limit can be set to limit the total duration for all calls for a specified time, such as daily.

Hot Desking

Allows an office with multiple workers using a single physical phone at different time frames to log in to the handset and use it as their own extension.

RTP Streaming Channel

This feature allows on-hold party to listen to music streamed by the Epygi Media Streamer, which has the ability to play MP3 files instead of the pre-recorded voice stored on your Server. This feature Should have ability to play different streams for each extension, to play very long audio files and allows the playlist selection to be easily changed.

Hold Music (".WAV" and ".MP3" Files Upload)

The Hold Music feature allows callers to hear music or a recorded message while on hold or waiting for other participants to arrive on a conference call.

T.38 Fax, Fax Relay and Clear Channel Fax

The T.38 fax relay standard permits faxes to be transported across IP networks between existing fax terminals. A clear channel gives full use of the bandwidth for this purpose.

The Hot Call Add-In application works with Microsoft Outlook allowing incoming and outgoing calls to be made within the native Outlook interface.

Hotkey Call is a Microsoft Windows software application, which allows PC users to dial telephone numbers directly from their desktop on any application window (e.g. web-browsers, e-mail client, text documents, etc.). This can be done by simply highlighting the number you wish to dial and pressing a predefined hotkey sequence (e.g. Ctrl-Y).

System Security Software

The System Security Software feature protects your IP PBX against external hackers, who could have the ability to reconfigure your system through eavesdropping, Denial of Service (DoS) or Theft of Service (ToS). Not only does the software prevent the above through internal protections, but each line also has the ability to be password protected through the security system.

Firewall

Firewall is a security service configurable through various criteria. It has three levels of security policies: low, medium and high. The Firewall allows or blocks traffic based on the policies, services and/or IP addresses. Filtering rules will take effect only if the Firewall has been enabled and are independent of the selected firewall security level. Additional service-based rules can be added.

System Security Diagnostics

System Security Diagnostics allows running the security audit and getting the security reports. The Security Audit generates warnings regarding the system's weaknesses. The warnings may vary depending on the selected global Security Level. The Security Audit will detect security-related configuration issues in the Firewall, IDS, IP Line passwords, Call Routing and extension settings.

SIP IDS

SIP IDS allowing to prevent the SIP attacks.

Securing Calls on Auto Attendant

The auto-attendant has a digit-parsing feature that can be enabled/disabled. This option can provide a lot of flexibility and dialing options for customers but it should be used with care. When the digit-parsing feature is enabled, all digits dialed by the caller while listening to the auto-attendant prompt will be sent directly to the Call Routing table to resolve the intended destination. With this option enabled the entries in the Call Routing table need to be properly secured.

User Rights Management

User rights management is useful to the Server administrator in order to set the restrictions for certain PBX users to manage the Server configuration. It allows to set restrictions on the GUI access for various PBX users, permits or denies access to certain Web GUI configuration pages.

Class of Service

Class of Service can be used to define the permissions that PBX extensions will have when using certain call routing rules to make calls. An extension will only be allowed to use the call routing rules that have a matching Class of Service designation.

Date/Time Settings

Date/Time Settings in the call routing table allowing to secure Call Routing rules by limiting their availability for a certain time frame. When the caller attempts to use the specific Call Routing rule outside of the configured time frame, he/she will be denied access.

Call Alert

The Call Alert feature is designed to inform specific personnel about emergency calls and calls routed through specific call routing rules. The notification includes essential details such as the routing pattern, the calling extension, the dialed number, and the call date/time. These notifications can be generated and viewed in the System Events, sent via email or SMS, or left as a voice message on predefined extension(s) along with a recorded message.

Securing Call Routing

The Local AAA Table serves as the hub for configuring and managing the local authentication database. When the Local Authentication option is enabled on the routing pattern, the caller needs to pass authorization. This can occur automatically through trusted caller ID detection, manually by entering specific login details (username and password), or by using a handset PIN code. Additionally, you have the flexibility to set an expiration period for the authentication process. Once successfully authenticated, the caller gains access to utilize the designated call routing rule.

PIN Barring

The PIN barring feature enables the assignment and management of credits for PIN codes, which are used when the authentication by PIN option is used for calls made through call routing rules with enabled Call Rate Settings. PIN codes without assigned credits cannot use routing rules with Call Rate Settings enabled.

Similar to the method used for Server extensions, the PIN barring feature calculates call costs per minute and second. Once the assigned credits are exhausted, new calls through toll routing rules become impossible until the credit balance is updated manually or automatically. Users can opt for convenient automatic credit balance updates daily, weekly, or monthly.

Overall Call Duration Limit

The Overall Call Duration Limit may secure the Call Routing rules by putting a limit on the overall call duration for selected Call Routing rules. The duration limit can be set to limit the total duration for all calls for a specified time, such as daily.

Call Relay

Call Relay allows an external call to be relayed through your IP PBX box to an external line or vice versa.

Call Forwarding

This allows you to program your PBX extension to redirect incoming calls to another number automatically.

Find Me Follow Me

This feature permits employees to have calls track them down wherever they are.

SMS

This allows you to receive notice of “events” (calls, voice mails, etc.) from the PBX to your mobile phone as a text message.

Voicemail service

The Voice Mailbox and Voice Mail Settings are readily available to all user extensions on the IP PBX by default. This Voicemail service enables the reception and storage of voice messages directly in the extension's mailbox. It includes features like new voicemail indications, notifications, and redirection options. Additionally, users can enable or disable the Voicemail service through their extension's admin settings.

Surveillance

IP PBX seamlessly integrates with your voice, video, and surveillance products, offering a unified solution for your business needs. With this surveillance feature, you receive real-time security updates 24/7 via email, cell phones, and more, ensuring a safe environment for your employees and business visitors.

Unified Messaging

Unified Messaging integrates different message types – voicemail, email, text messaging, fax – into a single mailbox that is accessible from a variety of devices, including your office phone, PC, and cell phone.

Call Answering Automatic or manual call answering options.

Call Management Features like call forwarding, call transfer, call hold, and call waiting.

Call Screening Ability to identify and manage incoming calls based on caller ID or other criteria.

Group Convenience Features for managing calls within a group, such as group call forwarding and group hold.

Cost & Bandwidth Saving Optimization features to reduce call costs and bandwidth usage.

RTP Streaming Channels Support for real-time transport protocol (RTP) streaming for audio and video calls.

Utility Additional tools and features to enhance the user experience, such as call recording, call history, and voicemail.

Hot Call Add-In for Microsoft Outlook Integration with Microsoft Outlook for seamless call management and communication.

Hotkey Call Ability to initiate calls using keyboard shortcuts.

Tools for Securing your Device Security features to protect the device and user data, such as password protection, encryption, and malware protection.

Unified Communications Integration of various communication channels, such as voice, video, messaging, and collaboration tools, into a single platform. 1

Auto Attendant Standard, customizable scenarios, call history

Call Management Blocking, forwarding, hold, transfer, relay, waiting

Voicemail System, SMS/email notification, caller ID-based profile

Call Park/Pickup Call park, pickup, multicast paging, intercom

Speed Dial Distinctive ringing, speed dial, many extension ringing

Call Hunting Call hunting, receptionist, call park with paging

Emergency Emergency call alert, hold music, call history archiving

Unified Messaging Voicemail transcription, CRM integration

Conferencing

Fax Support G3 fax support, T.38 and clear channel fax

Security Local authentication, PIN code barring, call encryption
Productivity Call queue, hot desking, parent-child extension config.

Advanced Features Automatic call distribution, call recording, barge-in

Voice Coding G.711, G.726 (16, 24, 32, 40 Kbps), G.729A, iLBC (13,33 kbit/s, 15,2 kbit/s), VAD, CNG, G.722, G.722.1, OPUS

Video Coding H.263, H.263+, H.264

VoIP Encryption SRTP

VoIP Signaling SIP v2, SIP/TLS

DTMF In-band and out-of-band signaling support

<p>VoIP Data and Signaling Protocols ITU-T G.711, G.726, G.729 Annex A, IETF RFC 3951- iLBC, SIP, SIP/TLS(RFCs: 2246, 3261, 3263, 3265, 3311, 3323, 3428, 3515, 3578, 3581, 3842, 3856, 3863, 3891, 3892, 4028, 4235)</p> <p>SDP RFC: 2327, 4568</p> <p>RTP/SRTP RFCs: 1889, 1890, 3389, 3550, 3551, 3555, 3711, 4733, 3952</p> <p>Fax over IP ITU-T T4, T30, T38, V17, V21, V27 ter, V29</p> <p>Physical Interfaces 2 Ethernet 10/100/1000 BASE T (RJ45)</p> <p>IP Phones 500 IP phones by default, up to 4,500 additional IP phones with feature keys</p> <p>IP Phone Connectivity LAN side or remote extensions, auto provisioning, PnP configuration, OpenVPN auto configuration</p> <p>Auto Attendants Up to 5,000 Auto Attendants can be added</p> <p>Virtual Extensions Up to 5,000 virtual extensions can be added</p> <p>System Capacity Up to 700 simultaneous VoIP calls with external parties, unlimited station-to-station calling for IP phones</p> <p>Emergency Repair Boot-up Device: DVD-ROM</p> <p>NAT Traversal STUN/NAT traversal (RFC 3489)</p> <p>Firewall Security Policy and service-based filtering, stateful inspection firewall, IDS/IPS</p> <p>LAN Services DHCP server, DNS server with forwarding functionality</p> <p>Time Synchronization Simple Network Time Protocol (SNTP) server/client</p> <p>QoS IP DIFFSERV</p> <p>SIP Tunnelling Supported</p> <p>Virtual LAN VLAN/IEEE 802.1Q</p> <p>Mail Client Send voice and fax messages as email attachments (.wav and .tif/.pdf) and system notifications</p> <p>DNS Support DYNDNS support with third party</p>		
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203

Supply, Installation, Testing, and Commissioning (SITC) of system shall be equipped with a minimum of 720p@30 FPS HD video calling capability or better, utilizing a minimum of H.264 High Profile, H.264, and VP8 codecs or better, and shall incorporate a minimum 2-megapixel, plug-and-play camera that shall be adjustable and include a privacy shutter and LED indicator or better. The camera's field of view shall be a minimum of 70.2° or better, and it must support self-view functionality. Audio performance must include a minimum of high-definition voice quality or better, with an HD handset and HD speaker, along with a Hearing Aid Compatible (HAC) handset. The speakerphone shall be a full-duplex, hands-free design with minimum AEC functionality or better. The system shall accommodate a minimum of 16 VoIP accounts or better and shall support advanced telephony features including, but not limited to, call hold, call forward, call waiting, call transfer, one-touch speed dial, hotline capabilities, group listening, emergency calling, redial, call return, and auto-answer. It must enable direct IP calls without SIP proxy and provide support for ringtone selection, import, and deletion. Advanced conferencing functionalities shall include a minimum of three-party video and five-party mixed audio/video conferencing or better. The device must support the import and export of data via Bluetooth and email for seamless integration or better. IP-PBX functionalities must include a minimum of Busy Lamp Field (BLF), Bridged Line Appearance (BLA), remote office functionality, hot desking, intercom, paging, message waiting indicators, voicemail, call park, call pickup, and music on hold or better. It shall provide a minimum of advanced call recording capabilities, call completion features, and robust anonymous call rejection functionalities or better. The directory shall be capable of storing a minimum of 1,000 local entries and 5,000 server entries or better, offering blacklist capabilities, XML/LDAP remote directory access, and smart dialing features. It shall include phonebook search, import/export, and comprehensive call history logs covering dialed, received, missed, and forwarded calls or better. Continued

1.00

NO

<p>The system's interface shall include a minimum of dual-port Gigabit Ethernet, built-in Wi-Fi operating at a minimum of 2.4GHz with 802.11b/g/n standards or better, and Bluetooth 4.0+ EDR for headset pairing and mobile device connectivity or better. It shall include a minimum of two USB 2.0 ports for connecting peripherals such as a 2 MP camera and USB flash drives or better, a minimum of one security lock port or better, and a minimum of one RJ9 (4P4C) handset port or better. Management features must include a minimum of browser, phone, or auto-provisioning configuration capabilities or better. Auto-provisioning shall be supported via FTP, TFTP, HTTP, and HTTPS for mass deployment, with minimum PnP, zero-sp-touch, and TR-069 functionality or better. The system must include minimum phone lock capabilities for privacy protection, factory reset, and reboot functionality, as well as system logs and package tracing export. Administrative access must restrict app installation or uninstallation through auto-provisioning, and the device shall incorporate a setup assistant wizard to simplify configuration. The device must include a minimum of 27 one-touch DSS keys and eight feature keys for critical functionalities such as hold, transfer, messaging, headset, mute, redial, speakerphone, and volume control or better. All feature keys must be equipped with illuminated indicators. Furthermore, the system shall integrate with Android-based applications, supporting a minimum of file management, email, calendar, camera, gallery, recorder, calculator, browser, and messaging functionalities, as well as third-party application compatibility or better. End</p>		
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204	<p>Supply, Installation, Testing, and Commissioning (SITC) of</p> <p>The audio capabilities of the device shall include a minimum support for the codecs G.722, G.711 (A/μ), G.729, and G.723 or better, alongside DTMF signaling via both in-band and out-of-band (RFC 2833) protocols, as well as SIP INFO or better. The audio subsystem shall incorporate a full-duplex hands-free speakerphone with a minimum of advanced features including AEC (Acoustic Echo Cancellation), VAD (Voice Activity Detection), CNG (Comfort Noise Generation), AJB (Adaptive Jitter Buffer), and AGC (Automatic Gain Control) or better to ensure superior audio performance. The phone functionalities shall include a minimum of abbreviated dialing, call pick-up, internal call restrictions, call hold, mute, and Do Not Disturb (DND) or better. It shall support one-touch transfer, hotline capabilities, redial, Auto Call Back (ACB), auto-answer, call forward, call waiting, and call transfer. Additionally, the device must include a minimum of 3-way conferencing and multi-party conferencing, emergency call capabilities, and advanced conferencing options or better. The display shall feature a minimum resolution of 128 x 64 graphical LCD or better, with LED indicators for calls and message waiting notifications. The interface shall be intuitive and include icon-based navigation to enhance user experience or better. Networking and security capabilities shall utilize an extended (proprietary) SIP protocol or better, with IP assignment supported via static configuration and DHCP. Security measures must include SRTP and TLS for secure communications, and QoS shall be supported with a minimum of 802.1p/Q tagging (VLAN) or better to ensure optimal performance in network environments. Installation options must include a desk mount configuration, with environmental performance parameters accommodating a minimum operating temperature range of 0°C to 45°C or better and a humidity tolerance of 10-95% (non-condensing) or better. The device shall comply with certifications such as CE, FCC-15 (Class B), and RoHS to ensure adherence to international standards or better. End</p>	30.00	NO
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205	Supply, Installation, Testing, and Commissioning (SITC) of desk phone shall provide a comprehensive suite of features, including but not limited to minimum capabilities for call hold, mute, Do Not Disturb (DND), speed dial, hotline functionality, redial, call back, auto-answer, call forward, call waiting, and call transfer or better. It shall support room monitoring, conferencing, directory access, call logs, paging, and dial-by-name functionality, ensuring versatile communication management or better. Call management features shall include a minimum of message wait lamp, ringer lamp, and voicemail notification capabilities or better. The phone must allow for group and selective call pickup, as well as advanced paging functionalities to facilitate effective communication in diverse environments or better. The display shall feature a minimum resolution of 240 x 64 pixels graphical LCD with backlit functionality or better, providing indicators for incoming and ongoing calls, mute, and hold statuses. The interface shall be intuitive, icon-based, and support multiple languages for enhanced usability. Caller ID must display a minimum of the name and number or better to support identification. Physical features shall include a minimum of 49 keys, comprising at least four context-sensitive keys, one RJ9 handset port, and one RJ9 headset port or better. Mechanically, the phone shall have a minimum weight of 0.805 kg or better, and installation options shall include both wall-mount and tabletop configurations. The device shall feature a black color finish, ensuring suitability for professional environments or better. Environmental specifications shall include an operating temperature range of a minimum of 0°C to 45°C or better, and storage temperature ranging from 0°C to 55°C or better. It must support operating and storage humidity levels from a minimum of 5% to 95% RH, non-condensing or better. The device shall support SNMP versions v1 and v2g for advanced network management capabilities or better. The device shall meet or exceed international certifications, including but not limited to CE, FCC-15, and RoHS, ensuring compliance with safety, environmental, and operational standards or better. End	1.00	NO
206	Supply, Installation, Testing, and Commissioning (SITC) of Analogue Phone	10.00	NO
	PART-18: IBMS		

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supply installation testing and commissioning of the following window based graphical software for IBMS system with 2 Nos Client for Operator workstation. 15000 hard/soft I/Os to be considered and shall have provision of future expansion. The following software packages shall have below minimum features and compliances.

a) 3D & HD vector dynamic graphics with Autocad import of plan with Zoom In & Zoom Out facility

b) Native 64 Bit System , BTL,UL,EN Certified System, BACnet Profile B-AWS (Advanced workstation) as per the BTL Listing

c) Multi-Monitor Support-(Min 4 Nos), Multi-language support, Object tracking on multiple cameras

d) Certified OPC DA Server by OPC Foundation

e) HTML5 based Web-Server software shall permit use of Standard Web-Browsers such as Microsoft Edge, Google Chrome, Mozilla Firefox, etc.

f) The Software shall comply to international standards and strive to deliver products that meet security standards such as ISA/IEC 62443, UL2900, ISO/IEC 27001, ISO/IEC62443 and OWASP

g) Cybersecurity SL2, Seamless integration of Security certificates within customer IT infrastructure, Microsoft's active directory-based authentication, LDAP integration, Use of network infrastructure that supports physical network or VLAN segmentation, End-to-end encryption from client to server, End-to- end encryption between servers, Certificate-based data exchange, Encrypted backups

h) Audit Trail , 4-Eye Principle, Data Point Validation, Verified tempering evidence for report transmission

i) The software shall integrate with BIM data seamlessly

j) Ability to provide data to other systems thru OPC DA Server and / Or Rest web services interface

1.00

NO

	<p>k) Reports - Customized reports for Trends and alarm with Graphic screen shots.</p> <p>l) Seamless integration of Fire alarm system should be there.</p> <p>m) Alarm Escalation: Assisted treatment of alarms which helps in Predefined & fast intervention steps for faster response</p> <p>n) Energy dashboards having cockpit view of total energy utilized. Energy and Power reports.</p>		
208	<p>The contractor is required to provide and operate an Automated 360° Photo Documentation System throughout the construction phase for a minimum duration of 24 months from the date of deployment. This system is essential for ensuring comprehensive and detailed documentation of the site activities, enabling transparent communication and efficient monitoring of construction progress. Designed to operate as an advanced digital solution, the system will ensure remote accessibility for all authorized users, allowing them to review site images and related data conveniently. The Automated 360° Photo Documentation System is tasked with capturing high-resolution 360° imagery of the construction site, providing a holistic view of the site's ongoing activities. This feature is instrumental in enhancing accountability and tracking the project's progress with precision. The captured images must facilitate the attachment of notes, allowing stakeholders to annotate directly on the visual records for the identification and resolution of issues. This functionality ensures that critical observations are documented systematically and are easily accessible for review by all relevant parties. Additionally, the system must generate detailed and comprehensive PDF reports that consolidate all observations, making it easier to communicate findings and updates in an organized manner. These reports will serve as vital references for stakeholders and project managers, providing a clear snapshot of site conditions at any given time. The Automated 360° Photo Documentation System is tasked with capturing high-resolution 360° imagery of the construction site, providing a holistic view of the site's ongoing activities. This feature is instrumental in enhancing accountability and tracking the project's progress with precision. The captured images must facilitate the attachment of notes, allowing stakeholders to annotate directly on the visual records for the identification and resolution of issues. This functionality ensures that critical observations are documented systematically and are easily accessible for review by all relevant parties. Additionally, the</p>	200.00	NO

system must generate detailed and comprehensive PDF reports that consolidate all observations, making it easier to communicate findings and updates in an organized manner. Continued

Reports will serve as vital references for stakeholders and project managers, providing a clear snapshot of site conditions at any given time. The system must also support date-based viewing and image comparison capabilities, providing stakeholders with tools to monitor the progress of construction activities over time. This feature is particularly useful for tracking changes on the site and ensuring that the project adheres to its planned schedule and milestones. By enabling side-by-side comparisons of images captured on different dates, the system allows project managers to identify discrepancies, assess completed work, and make informed decisions on the necessary corrective actions. This historical documentation of the construction process not only helps in resolving on-site issues but also provides valuable records for post-project analysis and reporting. A critical requirement for the contractor is the commitment to upload weekly site scans, ensuring that the system remains consistently updated with the latest visual data from the construction site. These weekly updates ensure that all stakeholders have access to up-to-date information, which is crucial for maintaining transparency and accountability. This consistent flow of data allows project managers to stay informed about on-site progress without the need for frequent physical site visits, reducing logistical challenges and improving overall efficiency. Moreover, the ability to review current site conditions remotely makes it possible for project teams to identify and address potential issues proactively, minimizing delays and mitigating risks Continued

The Automated 360° Photo Documentation System is expected to operate as a standalone solution with minimal disruption to the ongoing construction activities. Its design must be robust and user-friendly, allowing contractors and stakeholders to integrate the system into their workflows seamlessly. The system must support remote access capabilities, enabling stakeholders to log in from any location to view site images, annotate observations, and review reports. This remote accessibility ensures that all authorized users remain connected to the construction process, regardless of their physical location, promoting collaborative decision-making and effective communication across the project team. In addition to its functional capabilities, the system must demonstrate reliability and durability in capturing and processing large volumes of data over the specified 24-month period. It must be capable of operating in challenging construction site environments, handling variations in weather, lighting, and other on-site conditions. The hardware and software components of the system must be designed to withstand the rigors of the construction process while maintaining high performance and accuracy in data capture. The contractor must ensure regular maintenance and updates to the system to address any technical issues and maintain its operational efficiency. Continued

Weekly site scans serve as a crucial component of the system, ensuring that the visual data remains current and reflective of the site's actual conditions. These scans provide a reliable source of information for stakeholders, allowing them to monitor progress, identify deviations, and implement corrective measures in a timely manner. The regular updates also ensure that all observations and reports are based on the latest site data, enhancing the accuracy and reliability of the documentation process. End

209	supply installation testing and commissioning of True IP Based DDC Standalone 32 Bit Intelligent, peer to peer communication, interoperable DDC as per the specification. The compact controller shall have inbuilt 2-port Ethernet switch . The controller shall have 16 inputs/outputs inbuilt and can be expandable upto minimum 40 points by Input/Output Modules. The DDC shall have 300 Mhz processor with 128 MByte SDRAM (DDR3) and 512 MByte NAND Flash. DDC Controller shall be equipped with a battery-free real- time clock with backup for min 7 days using super capacitor. The controller shall be freely programmable and have System functions (alarming, scheduling, trending, access protection with individually definable user profiles and categories). It should have WLAN interface, Cloud connectivity for remote access and inbuilt port for POT for local interface. Note: Comissioning tool should not be dependent on any license / dongle and no extra cost should be charged. The above shall be housed in vandal proof, lockable & secure MS Cabinets to be supplied along with all necessary switchgear protections as required. Number of controllers shall have spare capacity of 10%-15% for future expansion.		
(A)	Controller for AHU system (Max 2 AHU in 1 DDC)	1.00	NO
(B)	Controller for Transformer	1.00	NO
(C)	Controller for Electrical system -HT/LT System	2.00	NO
(D)	Controller for Plumbing system-WTP/STP/RO System/Plumbing System	2.00	Lot
(E)	Controller for Fire Fighting system	1.00	NO
(F)	Controller for DG System	1.00	NO
(G)	Controller for Lift System	1.00	NO

210	supply installation testing and commissioning of True IP Based BTL & UL Listed for third party integration. The controller shall have 2-port Ethernet switch and WLAN interface. It should have BTL label (BACnet communications passed the BTL test) and consisting of Dual microprocessor with Storage capacity of 1 GByte RAM. It should support Real Time clock with backup of up to 7 Days using super capacitor and also should have option for external battery if required. It should Support of the major communication protocols: BACnet, /IP, BACnet MS/TP, Modbus IP and Modbus RTU up to 500 points. Note: 3rd party make integrator is not acceptable.	1.00	Lot
211	Supplying, installing, testing and commissioning of the following sensors / transducers / transmitters. The DDC shall support sensor with DC 0...20 mA or 4...20 mA, DC 0 ... 10 V, LG-Ni 1000, 2x LG-Ni1000, Pt 1000 , NTC 10k, NTC 100k, 1000 Ohm. All sensors should be UL Listed.		
(A)	Immersion temperature sensor 100 mm Pt1000 with Brass Thermowell.	2.00	NO
(B)	Outside air temperature + humidity sensors for measuring outside air temperature. It should be provided with sun shield and rain protection.	1.00	NO
(C)	Water Flow Switch	2.00	NO
(D)	Water pressure sensor	2.00	NO
(E)	Differential Pressure Switch Water	8.00	NO
(F)	Differential pressure switch for Blower and Filter Status	10.00	NO
(G)	Bi Level Switch	12.00	NO
(H)	Duct type temperature and RH Sensor	1.00	NO
(I)	Differential Pressure Sensor Air	1.00	NO
(J)	Space type CO2 sensor	1.00	NO
(K)	Water level sensor	8.00	NO
(L)	Absolute water pressure sensor	2.00	NO
(M)	Flameproof Level Switch	2.00	NO
(N)	Current Relay	20.00	NO
(O)	Voltage Transducer	2.00	NO
212	Supplying, laying, termination, testing and commissioning of signal cables. BMS cable, PVC insulated, Shielded tinned copper conductor cable.	500.00	RMT
213	Supplying, laying, termination, testing and commissioning of Communication cables. , PVC insulated, Unshielded twisted copper conductor cable.	500.00	RMT

214	Supplying, laying, termination, testing and commissioning of 3 Core BMS power cable , unarmoured ATC conductor multistranded, FRLS cable for Powering DDC , Actuators.	500.00	RMT
215	Supplying, laying, termination, testing & commissioning of BMS Network armoured Cables with required accessories like RJ45 connector etc.	500.00	RMT
PART-19: PA SYSTEM			
216	Supply, installation, commissioning, and testing of EN54-24 Compliant In Ceiling Speaker	75.00	NO
217	Supply, installation, commissioning, and testing of Ceramic Dome From Same OEM For isolate and protect speaker from a building fire. Shall have ceramic terminal connector that withstands high temperatures, and it also has a cable loop that allows to connect to a secondary support in case the speaker's main support gives way in the event of a fire.	75.00	NO

218	<p>Supply, installation, commissioning, and testing of Horn Loudspeaker shall be designed to provide exceptional sound clarity and reliability in demanding environments, ensuring high performance with minimal power consumption. The loudspeaker shall feature a high-efficiency rating, designed for public address systems, voice alarm systems, and professional audio installations. It must deliver clear audio with a wide frequency range of at least 490 Hz to 4500 Hz, measured at -10 dB, and an elliptical opening angle at 1 kHz of a minimum 112° horizontally and 85° vertically. The system must operate with a minimum rated impedance of 333 Ohms, and a rated voltage of 100 V. The rated power shall be a minimum of 30 W, with a maximum power capacity of 45 W and sound pressure level of at least 115 dB/108 dB (1 W, 1 kHz, 1 m) to ensure clear and intelligible audio output in noisy environments. It shall be built to withstand harsh conditions, meeting dust protection standards of IP66 as per IEC 60529, and wind resistance tested to NEM6702:2007 + A1:2008 Bft 11 (static). Climatic tests must conform to IEC 60068-x-xx, ensuring the loudspeaker's durability under temperature and humidity fluctuations. The loudspeaker shall be suitable for both indoor and outdoor use, ensuring reliability across a wide range of environmental conditions</p>	6.00	NO
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219	<p>Supply, Installation, Testing and commissioning (SITC) of 4 channel amplifier system shall be designed with a minimum power output capability of 1000W per channel at 4Ω and shall support 8Ω configurations with the same output rating of 1000W per channel, while also being compatible with 70/100V line applications at a minimum of 4x1000W or better. The amplifier shall ensure a THD+N value of less than 0.05% under typical conditions, measured across a frequency range of 20 Hz to 20 kHz with an 8Ω load and 3 dB below the rated power. The signal-to-noise ratio shall be no less than 120 dB (A-weighted), maintaining clarity and precision across the entire frequency spectrum. The frequency response shall span from 20 Hz to 20 kHz with an accuracy of ±0.25 dB or better at rated power and ±0.15 dB at 1 dB below the rated power, with an 8Ω load, ensuring high fidelity. The amplifier shall utilize a Class D output circuitry, incorporating a full-bandwidth PWM modulator for ultra-low distortion. The input impedance shall not be less than 15 kΩ balanced, with a damping factor exceeding 2000 at 8Ω load, 1 kHz, and below, guaranteeing superior control of the connected transducers. The gain and level adjustments shall be configurable, with amplifier gain selectable at minimum sensitivity levels of 0.7V, 1.0V, and 1.44V, and level adjustment for each channel available via front-panel potentiometers. A front-panel power switch shall be provided for operational control. Cooling shall be achieved through fan-based front-to-rear airflow mechanisms, maintaining optimal thermal conditions. The system shall include comprehensive protection circuits such as input limiters, short circuit protection, DC output protection, under/overvoltage protection, SOA (Safe Operating Area) protection, intelligent mains fuse protection, power stage overload protection, and temperature protection for transformers. The power supply system shall be of a universal and regulated switch-mode type, with integrated Power Factor Correction (PFC) and operational voltage compatibility ranging from 90V to 270V AC. The protection systems shall include clip limiting, SOA protection, DC protection, overcurrent detection, thermal safeguards, mains overvoltage detection, and fuse protection mechanisms. Front-panel indicators for each channel shall include 0dB, Signal, Continued</p>	1.00	NO
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	<p>Limit, and Protect status LEDs, with parallel configuration available for Channels 1 & 2 and 3 & 4. Input connectors shall comprise electronically balanced 3-pin XLRs for each channel, and output connectors shall include 4-pin Speak on connectors configured as +1/-1 for CH-1, +2/-2 for CH-2 on one Speak on and +1/-1 for CH-3, +2/-2 for CH-4 on the other. The Digital Signal Processor (DSP) shall operate at a minimum resolution of 32-bit / 96kHz, providing 4 input and 4 output channels with control available via USB. A minimum of 20 presets shall be supported, with each input featuring a 10-band equalizer (PEQ / LS6 / LS12 / HS6 / HS12 / APF), volume adjustment from -60dB to +5dB, and delay capabilities up to 4.99ms. Each output shall also feature a 10-band equalizer (PEQ / LS6 / LS12 / HS6 / HS12 / APF / APF-1), delay adjustment up to 9.99ms, limiting from -19dB to 0dB, and crossover options for HPF and LPF. Input and output linking shall be provided, with inputs linkable as A, B, C, and D and outputs linkable across channels 1 through 4. he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	
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220	<p>Supply, Installation, Testing and commissioning (SITC) of Controller operate at a minimum voltage of 230/115VAC, $\pm 15\%$, 50/60 Hz, with an inrush current not exceeding 8 A and a maximum power consumption of 600 VA or better. It must incorporate a battery power supply functionality rated at 24 VDC, $\pm 15\%$, capable of sustaining a current load of 14 A to ensure reliability. The system's output power performance shall provide a minimum of 240 W rms and a maximum of 360 W, with a power reduction under backup power of no less than -1 dB. Its frequency response must range from 60 Hz to 18 kHz (+1/-3 dB at -10 dB reference rated output), while maintaining distortion levels of $<1\%$ at rated output power, 1 kHz. The system should be equipped with bass and treble control features adjustable by at least -8/+8 dB at 100 Hz and 10 kHz, respectively. A single mic/line input must be included, featuring a connector that supports XLR and 6.3 mm jack. The input sensitivity shall not be less than 1 mV for mic mode and 1 V for line mode, with impedance values exceeding 1 kohm (mic) and 5 kohm (line). Signal-to-noise ratio (S/N) should be greater than 63 dB for mic input and 70 dB for line input at maximum volume, and exceed 75 dB when muted or at minimum volume. The system's loudspeaker outputs must provide floating connectors MSTB 2,5/16-ST with a 100 V output rated at a minimum of 700 W per zone. Volume override types should support 3-wire, 4-wire (24 V), and 4-wire failsafe configurations. Output contacts rated at 100 V, 2 A, voltage-free, must include emergency active relay, call active relay, and fault relay adhering to NO/COM/NC configurations, with fault relays normally energized</p>	1.00	NO
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221	<p>Supply, Installation, Testing and commissioning (SITC) of Desktop Call Station to operate with a voltage range of minimum 24 VDC supplied by the LBB 1990/00, or an alternative external power supply capable of providing a minimum of 18 to 24 VDC or VAC, ensuring operational reliability. The current consumption must not exceed 30 mA under standard conditions, with an additional maximum current draw of 15 mA for each connected keypad. The system's nominal sensitivity shall be a minimum of 85 dB SPL with the gain preset at 0 dB, and its nominal output level should be no less than 700 mV. The maximum input sound level that can be accommodated must reach at least 110 dB SPL, with gain preset options at +6 dB, 0 dB, and -15 dB for flexible operational configurations. A limiter threshold must be set to a minimum of 2 V with a compression ratio of 1:20, ensuring consistent performance under varying conditions. The distortion shall not exceed 0.6% even at maximum input, and the equivalent input noise level must not exceed 25 dB SPLA. The system's frequency response should range from a minimum of 100 Hz to 16 kHz, with a speech filter integrated to apply a -3 dB attenuation at 315 Hz, configured as a high-pass filter with a slope of 6 dB/octave. The output impedance must be at least 200 ohms for effective signal transmission. The system shall support the use of customizable chimes, defined by any compatible wave file, with a hierarchy of at least seven priority levels. Such specifications ensure compliance with operational and functional demands, offering versatility and maintaining high performance across diverse applications.</p>	1.00	NO
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MAKE LIST

Sr. No	Item Description	Approved Make
1	Electrical conduit pipe and accessories	BEC / Precision/finolex/PrestoplastVulkan
2	metal / junction box	National / Legrand / star india
3	wires	Lapp / finolex/KEI/Anchor
4	electrical Cables	Lapp / finolex/Torrent/RPG Asian
5	LT XLPE Insulated Cable (IS 7098: Part- I:1988)	Lapp / finolex / polycab/RPG Asian/Torrent
6	HT XLPE Insulated Cable (IS 7098: Part-II:1988)	Lapp / finolex / polycab/Torrent/RPG Asian
7	Fire Survival Cables	Lapp / finolex / polycab
8	Electric Ceiling Fans	Crompton / Bajaj
9	Fresh Air Fan	Crompton / Bajaj
10	Switches	legrand
11	MCB / MCCB /ACB	ABB / SIEMENS / EATON / HAGER / SCHNEIDER
12	CT	AE / RECO / ELMEX
13	AUTO TRANSFER SWITCH	ABB / SIEMENS / HPL SOCOMAC / SCHNEIDER /
14	CHANGE OVER SWITCH	HAGER / HPL / SOCOMAC
15	METERS (DIGITAL)	CONZERV / ELMEASURE / NEPTUNE / TRINITY
16	HRC FUSE WITH FUSE FITTING	SIEMENS / EATON / VEECO / INOGERMAN
17	POWER CONTACTOR	SIEMENS / ABB / SCHNEIDER / EATON / SALZER
18	CAPACITORS	EPCOS / SCHNEIDER / NEPTUNE / ABB / VISHAY
19	PROTECTIVE RELAY	L&T / EE / ESSUN
20	TIME SWITCH	L&T / ABB / SIEMENS / EATON / HAGER
21	AMF RELAY	C&S / PROCOM / EQ
22	COOLING FAN	EBM-NADI / REXNORD
23	TOGGLE SWITCH	SALZER / KAYCEE
24	PUSH BUTTON	SIEMENS / ABB / TEKNIC
25	SELECTOR SWITCH	SALZER / KAYCEE / TEKNIC
26	INDICATING LAMPS	SIEMENS / SURDHI / ABB / TEKNIC
27	cable junction box / cable glands	Lapp / hex
28	cable tray	OBO
29	Panel manufacturer	CPRI& IEC - 61439 approved Panel Builder
30	Lifts	Schindler / Jhonson / mitsubishi electric
31	H beam pole	approved makes of PGVCL
32	ACSR / AAAC Conductor	approved makes of PGVCL
33	D.O. Fuse unit	approved makes of PGVCL
34	Substation LA	approved makes of PGVCL
35	Ceramic Insulators (Disk / Pin)	approved makes of PGVCL
36	Substation Accessories	approved makes of PGVCL

37	Distribution Transformers	ABB / Siemens / Schneider/T & R/Voltamp
38	VCB and accessories	ABB / Siemens / Schneider
39	DG Sets with AMF panel	Engine - Cummins/Greaves/Kirlosker/Volvo/Ashok Leyland. Alternator - Stamford/Crompton Greaves/Kirlosker
40	UPS	Delta / Eaton / Schneider Electric
41	Solar PV Module	Renewsys / Goldi / Navitas / Pahal
42	Solar Inverter	Growatt / Fox ESS
43	Solar AC & DC Units	Generic
44	Bi directional meter	Approved make of PGVCL
45	All type of LCD Displays	Vestal / Sony / People Link
46	Retractable Screen	Arther Homes / IDC Connect / People Link
47	PTZ Camera	Crestron / Vadio / People Link
48	AI Camera	Crestron / Vadio / People Link
49	Ceiling Microphone System	Shennisher / Shure / Clearone/Bose
50	Integrated Audio Solution Processor	Crestron / Xilica / People Link/Bose
51	20X Document Camera	Crestron / Vadio / People Link
52	Room Kit With Touch Panel	Crestron / IDC Connect / People Link
53	Video Conferencing Codec	Polycom / Cisco / People Link
54	Conference Microphone System	Shennisher / Shure / People Link/Bose
55	12 Ch Digital Signal Processor	Crestron / Xilica / People Link/Bose
56	Classroom Speakers	Renkus Heinz / Bose / Fidelity/Bose
57	4 Channel Power Amplifier	Powersoft / Fidelity / Labgruppan/Bose
58	Motarized Podium	Stage Craft / IDC Connect / People Link
59	Quad Conference Speakerphone	Poly Com / Cisco / People Link/Bose
60	Wireless Presenter	Barco / IDC Connect / People Link
61	Video Processing & Streaming Device	Crestron / Data Video / People Link
62	7" Touch Screen	Crestron / Data Video / People Link
63	USB Switch	Crestron / IDC Connect / Aten
64	HDMI Distribution amplifier	Crestron / IDC Connect / Extron
65	HDMI Audio embedder/de-embedder	Crestron / IDC Connect / Extron
66	Wireless Microphone System	Clock Audio / Erthpot / Shure/Bose
67	HDMI Switchers	Crestron / IDC Connect / Extron
68	55" Digital Signage Display	Vestal / Sony / People Link
69	Intercative Touchscreen Kiosk	Aero Digital / Stage Craft/AHA
70	All In One Active LED 130"	Delta / Molar / People Link
71	All Type Of A/V Cables	Kordz / IDC Connect/QED
72	Meeting Participant Solution	Panasonic / IDC Connect / OEM
73	21.5" Smart Frame	Molar/ Samsung/ LG
74	All Passive Network	Shimon / Derwiser / Leviton
75	IT Switches, Routers & Access Points	Extreme Network / Zyxel / Allied Telesis
76	8 Port Gigabit + 2 Port	Extreme Network / Zyxel / CP Plus

77	Fire wall	Palo Alto / Zyxel / Sonic Wall
78	Active Servers	HP / Dell / Lenovo
79	Network Attached Storage (NAS)	Synology / Infotrend / HP
80	All-in-One PC	HP / Dell / Lenovo / Intel / Asus
81	All-in-One Printer	HP / Epson / Canon
82	Equipment rack	Tata / Valrack / Netrack
83	Network Mangement System with Workstation	Extreme Network / Zyxel / Allied Telesis
84	CCTV Camera, NVR & VMS	Tyco / CP Plus / Bosch
85	All Type Of Fire Alarm System	Bosch / Edward / Hochiki
86	Fire Survival Armoured Cable	Polycab / Finolox / KEI
87	IP-PBX Server	NEC / Epygi / Cisco
88	IP, Analogue & Desktop Phones	Panasonic / Matrix / Beetle
89	Multi Camera Switching Server	Crestron / Vadio / People Link
90	BMS Computer System	HP / Dell / Lenovo
91	IBMS Software	Schneider Electric / Siemens / Johnson Controls
92	Controller for AHU system	Schneider Electric / Siemens / Johnson Controls
93	Controller for AHU system	Schneider Electric / Siemens / Johnson Controls
94	Controller for Transformer	Nextech / Dwyer / Filpro
95	Controller for Electrical system -HT/LT System	Nextech / Dwyer / Filpro
96	Controller for Plumbing system	Nextech / Dwyer / Filpro
97	Controller for Fire Fighting system	Schneider Electric / Siemens / Johnson Controls
98	Controller for DG System	Schneider Electric / Siemens / Johnson Controls
99	Controller for Lift System	Schneider Electric / Siemens / Johnson Controls
100	Backnet Controller	Schneider Electric / Siemens / Johnson Controls
101	Immersion temperature sensor	Schneider Electric / Siemens / Johnson Controls
102	Outside air temperature + humidity sensors	Schneider Electric / Siemens / Johnson Controls
103	Water Flow Switch	Schneider Electric / Siemens / Johnson Controls
104	Water pressure sensor	Schneider Electric / Siemens / Johnson Controls/ Foxboro/Honeywell/Rosemount
105	Differential Pressure Switch Water	Schneider Electric / Siemens / Johnson Controls/ Foxboro/Honeywell/Rosemount
106	Differential pressure switch for Blower and Filter Status	Schneider Electric / Siemens / Johnson Controls/ Foxboro/Honeywell/Rosemount
107	Bi Level Switch	Schneider Electric / Siemens / Johnson Controls
108	Duct type temperature and RH Sensor	Schneider Electric / Siemens / Johnson Controls/ Foxboro/Honeywell/Rosemount
109	Differential Pressure Sensor Air	Schneider Electric / Siemens / Johnson Controls/ Foxboro/Honeywell/Rosemount
110	Space type CO2 sensor	Schneider Electric / Siemens / Johnson Controls
111	Water level sensor	Schneider Electric / Siemens / Johnson Controls/ Foxboro/Honeywell/Rosemount
112	Absolute water pressure sensor	Schneider Electric / Siemens / Johnson Controls/ Foxboro/Honeywell/Rosemount/Krone Marshall

113	Flameproof Level Switch	Schneider Electric / Siemens / Johnson Controls
114	Current Relay	Schneider Electric / Siemens / Johnson Controls
115	Voltage Transducer	Schneider Electric / Siemens / Johnson Controls

116	BMS Signal Cable	Polycab / Finolox / RR Cable
117	Communication Cable	Tyco / Belden / Molex
118	BMS Power Cable	Polycab / Finolox / RR Kable/Torrent
119	BMS Network Armoured Cable	Shimon / Derwiser / Leviton
120	Public Address Speakers and Amplifiers	Fidelity / Majorcom / Tyco
121	PA Controller	Bosch / Simplex / Majorcom/Bose
122	Desktop Call Station	Bosch / Simplex / Majorcom/Bose
123	Facade Lighting	Molar / Martin Lightings / Colour Kinatics/Philips/NERI
124	VRF System	LG/ Blue Star / Mitsubishi/Samsung
126	Lighting Fixtures (indoor)	Plus/ Delta Light/ Arcos/Philips/NERI
127	Lighting Fixtures (Outdoor)	K-Lite/Philips/NERI

Note

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- 1 All the electrical equipments must be 5 star rated and followed latest BIS norms / IS Codes.
- 2 All the electrical equipments to be used with 5 star rating and followed latest BIS norms.

Tender Authority / PMC shall give the approval of a manufacturer only after review of Technical Compliance, mock-up. In case the same is not available in the market or in case of change in trade name, equivalent makes/redesignated manufacturer then an equivalent shall be used with the approval of Tender Authority / PMC. The complete system and installation shall also be in conformity with applicable codes and standards and tender specifications. If any item Specification/brands names missing in, make list bidder need to take approval before supply or install those items. Specification/brands names of materials to be used as per the scope of work are listed here. The efforts should be made by the contractor to use indigenous products. The contractor should also consider the availability of spare parts/components for maintenance purposes while proposing any brand/ manufacturer. The materials of any other brand/manufacturer may be proposed for use by the contractor in case the brands specified below are not available

in the market and/or agency intends to use some other brand better than the brands mentioned in this list. The alternate brand can be used only after the approval of Tender Authority / PMC technical compliance of active and passive network equipment, fire detection systems, CCTV surveillance, access control solutions, audio-visual systems, Building Management Systems (BMS), and other components is of utmost importance. This compliance should be confirmed and authenticated by the respective Original Equipment Manufacturers (OEMs) to guarantee that the specified standards are met without compromise.

Sr.No	Item Description	Qty.	Unit
	PART-G : ELV SYSTEM		
1	Supply, Installation, Testing, and Commissioning (SITC) of AI Collaboration Camera system shall be designed with the following key specifications to ensure optimal performance and flexibility. The image sensor must be a minimum of 20.30 Megapixels, utilizing a 1 in. CMOS sensor to ensure high-resolution image capture. The lens shall be a high-precision, wide-angle, aspherical glass lens that guarantees superior clarity and minimal distortion across the full field of view. The field of view must be at least 103° diagonal, 92° horizontal, and 65° vertical, offering a broad perspective suitable for a wide range of applications. The aperture must be a minimum of f/2.9, allowing for efficient light capture in varying environments. Pan, tilt, and zoom functions shall be provided through a 5x digital zoom capability, facilitating smooth and precise control over the camera's viewing angle. Additionally, the system shall feature an autozoom function, known as Genius Framing, which intelligently adjusts and frames around people in the room, ensuring the optimal focus for a given subject without loss of quality. The system must be equipped with auto-flip functionality, automatically rotating the image by 180° when the camera is mounted upside down, ensuring proper orientation without manual intervention. Dynamic light optimization should be built-in, automatically adjusting light levels and white balance to maintain accurate and clear image rendering across varying lighting conditions. The output aspect ratio must be 16:9, ensuring compatibility with most modern display systems and providing a widescreen view for high-quality presentation. Noise reduction technology should be employed through bias compensating spatio-temporal filtering, wide-area chroma filtering, and flicker elimination, effectively enhancing image quality by minimizing unwanted noise and artifacts. Real-time scaling, dewarping, and perspective correction must be included, allowing for the precise adjustment of video images in dynamic environments. Continued	1.000	NO

	<p>The camera should feature people counting functionality, capable of detecting and reporting the number of people in the frame, assisting in analytics and security monitoring. The video output resolution shall support a minimum of HD 1080p at 30 frames per second, ensuring clear and smooth video performance for all recorded and live-streamed content. For connectivity, the system shall utilize an RJ45 connector, with compatible cable options including Cat 5e, 6, or 7 for reliable network communication. A USB 3.0 port must be included, enabling data transfer and connectivity through the provided USB to PoE adapter. Power requirement shall be a minimum of 5VDC, ensuring compatibility with common power sources. The housing of the system must be constructed from durable aluminum in a unibody design, providing strength, lightweight properties, and excellent heat dissipation while maintaining a sleek and professional appearance. These features must meet the essential requirements for durability, performance, and ease of use in various installation environments. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p>		
2	<p>Supply, Installation, Testing, and Commissioning (SITC) of high-performance camera system shall be equipped with a minimum optical zoom capability of 12x and a digital zoom of 16x or better. The lens shall be designed with a focal length of $f = 3.47\text{mm}$ to 41.65mm or better, and the aperture range shall be a minimum of F1.84 to F3.72 or better, ensuring superior image clarity. The horizontal angle of view shall be a minimum of 80.8° and extend to at least 7.5°, while the vertical angle of view shall range from a minimum of 49.9° to 4.3° or better. The camera shall perform optimally in low-light conditions with a minimum illumination of 0.5 Lux at (F1.8, AGC ON) or better. It shall feature a shutter speed range from a minimum of 1/30s to 1/10000s or better. White balance functionality shall include Auto, Indoor, Outdoor, One-Push, and Manual options. The system shall incorporate backlight compensation and advanced 3D digital noise reduction technology, achieving a minimum signal-to-noise ratio (SNR) of 55dB or better. The camera's horizontal rotation range shall be $\pm 170^\circ$ or better, and the vertical rotation range shall extend from -30° to $+90^\circ$ or better. The pan speed shall be adjustable within a range of 1.7° to $100^\circ/\text{s}$ or better, and the tilt speed shall range from 1.7° to $69.9^\circ/\text{s}$ or better. Essential features such as H & V flip and image freeze functionality shall be supported. The system shall support local storage and include a minimum of 255 preset positions with a preset accuracy of 0.1° or better. It shall utilize YUY2, H.264, and MJPEG compression options for the color system. YUY2 video format shall allow a maximum resolution of 1080P at 60fps, H.264 AVC and H.264 SVC formats shall support a maximum of 2160P at 60fps, and MJPEG shall support a maximum of 4K at 30fps. The camera shall support</p>	16.000	NO
	<p>audio input through USB, adhering to UVC 1.1 to 1.5 USB video communication standards. The system shall offer video compression formats including H.265, H.264, and MJPEG, and video streams shall include both main and sub-streams. The main stream resolution options shall include 3840x2160, 1920x1080, 1280x720, and 1024x576 or better. Sub-stream resolutions shall include 720x576, 720x480, and 320x240 or better. T Continued</p>		

	<p>he video bit rate shall range from a minimum of 32kbps to 102400kbps or better, with variable and fixed bit rate options. Frame rates shall support a minimum of . 50Hz from 1fps to 50fps and 60Hz from 1fps to 60fps. The system shall include audio compression formats such as AAC and G711, with audio bit rates of 48Kbps, 64Kbps, 96Kbps, and 128Kbps or better Supported protocols shall include NDI® HX, TCP/IP, HTTP, RTSP, RTMP, Onvif, DHCP, and Multicast. HD output shall feature a minimum of 1x HDMI (Version 2.0) and 1x 3G-SDI (BNC type, 800mVp-p, 75Ω) compliant with SMPTE 424M standards. The network interface shall provide a minimum of 1x RJ45 supporting 10M/100M/1000M adaptive Ethernet, and audio interfaces shall include at least 1x 3.5mm Line In and 1x USB (Type-C) port or better. communication interfaces shall include a minimum of 1x RS232 with an 8-pin Mini DIN connector supporting a distance of up to 30m and protocols such as VISCA, Pelco-D, and Pelco-P. The camera system shall be certified with BIS (Indian), CE, FCC, and RoHS. The OEM must maintain certifications including ISO 9001, 45001, 50001, 27001, and 14001 or better. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation .End</p>		
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3	<p>Supply, Installation, Testing, and Commissioning (SITC) of document camera that shall be equipped with a minimum 1/4" HD CMOS image sensor or better and a camera resolution of minimum 8 Mega Pixels (3264x2448) or better. The frame rate shall be capable of achieving minimum 15 fps at 3264x2448 resolution or better and minimum 30 fps at 1080P resolution or better. The system must be capable of minimum 20x zoom functionality, incorporating minimum 5x optical zoom and minimum 4x digital zoom or better. Connectivity options should include minimum 2x USB 2.0 ports or better, with optional HDMI output and minimum 2x VGA output ports and minimum 1x VGA input port or better. The device shall feature a scanning speed of minimum 1 second or better, video freeze capability, and support for minimum effective scanning areas including A4 and A3 (optional) or better. The shutter speed should be minimum 1 second or better, and the zooming mechanism should include mouse wheel zooming functionality or better. Image viewing shall support color and black-and-white modes, with additional options for mirroring, minimum 90-degree rotation up to 270 degrees, and previewing, and video recording in formats such as WMV or AVI or better. Continuous frame recording should be supported, with adjustable frame rates, and optional audio/video recording functionality must be included. Auto-adjustment of brightness, contrast, saturation, sharpness, and gain shall be provided, with quick image capture and support for PDF format as a minimum requirement. Scanning capabilities shall include support for single and multi-page scans, OCR functionality for multi- language recognition, and a scanning landscape area of minimum A4, A5, and A3 or better. Auxiliary lighting shall be provided by LED lights or better. Power requirements must be fulfilled via USB power, and the scan speed shall achieve minimum 10 scans per second or better. The device shall comply with certification requirements, including minimum BIS (Indian), CE, FCC, and RoHS or better. The OEM must possess certifications for ISO 9001, 45001, 27001, and 14001 or better. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation</p> <p style="text-align: center;">End</p>	1.000	NO
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4	<p>Supply, Installation, Testing, and Commissioning (SITC) of Room Kit that shall include a 10" capacitive touch screen capable of 1080p resolution at 60Hz. Power shall be sourced from the box using Power over Ethernet (PoE). The kit shall feature one HDMI input supporting 1080p at 60Hz and one RJ45 port with PoE. Additionally, it shall have two USB 2.0 ports and one USB Type C port that shall support DisplayPort input and USB 2.0 functionality, along with a power button. The compute box shall be equipped with an Intel® Core™ i5-1135G7 Processor and shall have a memory capacity configured in dual channel with 2 x 4GB. The graphics processing unit (GPU) shall utilize Intel® Iris® Xe Graphics, and storage shall consist of a 256GB SSD utilizing M.2 SATA technology. The kit shall include Wi-Fi capabilities with AX201 and Bluetooth 5.0 support. Power requirements shall be DC 19V at 5A, and the I/O configuration shall consist of three HDMI outputs capable of 4K at 60Hz, one HDMI input also supporting 4K at 60Hz, one PoE input, one audio output (headphone), one LAN port supporting 10/100/1000M self adaptive, one hub, one USB Type C port with display functionality, one USB 2.0 port, and three USB 3.0 ports. The operating temperature shall range from 0°C to 40°C, with an operating humidity of 10% to 90% non condensing. Storage temperature shall be permissible from -20°C to 60°C, and storage humidity shall range from 5% to 95% non-condensing. The operating system shall be Windows 10 or higher. The Room Kit shall be designed to accommodate various classroom configurations, including circular, square, rectangular, and semicircular arrangements. The supplier shall provide certificates confirming compliance with BIS (Indian), CE, FCC, and RoHS standards, as well as OEM certifications for ISO 9001, 45001, 50001, 27001, and 14001. An OEM certified copy of all certifications, along with an ink-signed compliance letter, must be submitted by the EPC contractor for material approval; materials lacking these documents shall not be considered for approval. This adherence to specified makes and standards shall ensure that the system functions at peak efficiency and reliability, thereby meeting the demanding needs of professional environments. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p>	5.000	NO
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5	<p>Supply, Installation, Testing and commissioning (SITC) of Wireless Presenter shall be equipped with an ARM Cortex A55 x 4 CPU or better, along with 8GB DDR and 32GB FLASH storage configuration to ensure smooth operation. The hardware ports must include 2 HDMI Outputs (1 supporting 4K @ 60Hz and 1 supporting 1080P @ 60Hz), 1 HDMI Input, 3.5mm Audio Output, 3.5mm Mic Output, 2 RS232 ports, 2 USB 3.0 Host Type-A, 2 USB 2.0 Host Type-A, 1 USB Touch, 1 Type-C port, 1 12V/3A DC Power Jack, 1 RJ45 LAN Port, 1 POE Port, and 1 Power Button with 1 Standby Button. Wireless transmission must support protocols including DLNA, Miracast, AirPlay, and Chromecast, with dual 5.8G Wi-Fi for Soft AP and Wi-Fi, supporting up to 128 simultaneous connections and a maximum transmission distance of 50m without obstacles. The system shall support BYOM features for Teams, Zoom, and GoToMeeting. Touch control shall include USB HID, mouse mode, IR touch, and capacitive touch panel functionality. Video decoding should support H.264, H.265, VP8, RV, WMV, AVS, H.263, and MPEG4 with 4K resolution decoding. The presenter must support both wireless and wired bridging, with mirroring options including AirPlay, Miracast, Chromecast, and wireless USB dongles. The Itemder is strictly required to adhere to these minimum design specifications. However, higher-performance alternatives will also be considered and are encouraged. The Itemder shall submit the Manufacturer Authorization along with the technical Item, accompanied by a compliance statement on the Manufacturer's official letterhead. If the product does not meet or exceed the minimum design requirements, the Item shall be subject to rejection without prior notice. Software mirroring for Windows, Mac, Linux, Android, and iOS is required, supporting 4K for all transmission methods and with a delay range of 60~180ms. Device management should allow centralized management with RS232 API for third-party integrations, and web GUI settings. The system must support photo rotation in 90°, 180°, and 270° increments, dynamic passwords, and adjustable audio output via HDMI or USB. Certifications required include CE, FCC, and RoHS, with compliance to ISO 9001, 45001, 27001, and 14001 standards. he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation</p>	3.000	NO
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6	<p>Supply, Installation, Testing and commissioning (SITC) of video processing and streaming device shall support a minimum of HD and SD video standards, providing robust capabilities for both video input and output. The input video formats shall include, but not be limited to, 1080p60/59.94/50, 1080p30/29.97/25/24/23.98, 1080i60/59.94/50, 720p60/59.94/50, 480i59.94, and 576i50, ensuring comprehensive support for a wide range of video sources. The output video formats shall cover, at a minimum, 1080p60/59.94/50, 1080p30/29.97/25/24/23.98, 720p60/59.94/50, and 480p29.97, ensuring high-quality video streaming capabilities. The device shall include a minimum of 1 x 3G/HD/SD-SDI input, 4 x HDMI 1.4 inputs, with Channel 1 being selectable for either SDI or HDMI input, and 1 x USB 3.0 input for flexible connectivity. It shall support 3 x RTSP/SRT/NDI HX via IP stream input, enabling seamless integration with various streaming platforms and network-based video sources. The device shall also feature a mix capability for both HD and SD video sources, ensuring compatibility with diverse video production environments. For video output, the system shall include 1 x 3G/HD/SD-SDI loop-through, 1 x HDMI 1.4 output, 1 x HDMI 1.4 output supporting Multiview, and 2 x RJ-45 female connectors for 10/100/1000M Ethernet LAN and WAN connectivity. These interfaces shall provide comprehensive options for video routing and network integration. The built-in multi-view monitoring out shall be available via HDMI, facilitating easy monitoring of multiple video sources. The device shall support analogue audio input via XLR balanced audio, RCA unbalanced audio, SDI embedded audio, HDMI embedded audio, and IP audio, ensuring broad compatibility with professional audio sources. The analogue audio output shall be available via a 3.5mm headphone jack for easy audio monitoring. Audio delay calibration shall be available for each channel, with delay time adjustable from 0-3000ms to ensure synchronization between audio and video Continued</p>	1.000	NO
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	<p>System configuration and control shall be facilitated through a web GUI, providing easy access to all settings. The device shall also support serial port control via RS-232 for integration with other systems. A built-in audio mixer shall be incorporated for on-the-fly audio adjustments, ensuring optimal sound quality during streaming. The system shall include SATA storage with support for FAT and exFAT file systems, enabling flexible file storage options. MP4 recording in H.264 video encoding and AAC-LC audio encoding shall be supported, with configurable bit rates for both video and audio. The streaming protocols supported shall include DHCP client, TS over UDP, RTSP over HTTP/TCP/UDP, RTMP, HLS, SRT, WebRTC, and NDI HX, ensuring compatibility with a wide range of streaming platforms and services. Firmware updates shall be performed via the web UI, ensuring that the system remains up-to-date with the latest features and improvements. Special features shall include vertical video crop or rotate, vertical video Multiview, and a 1RU rack-mount mainframe design or better, providing flexible deployment options for different professional environments. The supplier shall ensure that the product is compliant with all relevant certifications, including but not limited to, BIS (Indian), CE, FCC, and RoHS, with certified copies of all relevant certifications he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>		
7	<p>Supply, Installation, Testing and commissioning (SITC) of Fiber optic HDMI cable, boasting a length of 5 meters and equipped with connectors, shall be capable of maintaining a 90-degree cable angle, thereby ensuring a precise and nuanced signal transmission. This high-speed HDMI to HDMI cable, with a bandwidth of 18Gbps, shall support subsampling rates of 4:4:4/4:2:2/4:2:0, thereby facilitating the transmission of high-definition video signals, including HDTV, 3D, and 2160p/1080p resolutions. Furthermore, this cable shall be compatible with HDCP2.2, Ethernet, ARC, HDR, Ultra HD, and UHD 4K, thereby ensuring a high degree of versatility and compatibility. The cable shall support high-speed data transfer rates of 18Gbps, with capabilities for HDR, CEC, EDID, and HDCP2.2, thereby guaranteeing a precise and reliable signal transmission. Additionally, the cable shall support uncompressed audio and video sync, with a maximum resolution of 4K@60Hz, and a maximum audio sampling rate of 1536KHz he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	50.000	NO

8	<p>Supply, Installation, Testing and commissioning (SITC) of Fiber optic HDMI cable, boasting a length of 10 meters and equipped with connectors, shall be capable of maintaining a 90-degree cable angle, thereby ensuring a precise and nuanced signal transmission. This high-speed HDMI to HDMI cable, with a bandwidth of 18Gbps, shall support subsampling rates of 4:4:4/4:2:2/4:2:0, thereby facilitating the transmission of high-definition video signals, including HDTV, 3D, and 2160p/1080p resolutions. Furthermore, this cable shall be compatible with HDCP2.2, Ethernet, ARC, HDR, Ultra HD, and UHD 4K, thereby ensuring a high degree of versatility and compatibility. The cable shall support high-speed data transfer rates of 18Gbps, with capabilities for HDR, CEC, EDID, and HDCP2.2, thereby guaranteeing a precise and reliable signal transmission. Additionally, the cable shall support uncompressed audio and video sync, with a maximum resolution of 4K@60Hz, and a maximum audio sampling rate of 1536KHz he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation s End</p>	36.000	NO
9	<p>Supply, Installation, Testing and commissioning (SITC) of Fiber optic HDMI cable, boasting a length of 15 meters and equipped with connectors, shall be capable of maintaining a 90-degree cable angle, thereby ensuring a precise and nuanced signal transmission. This high-speed HDMI to HDMI cable, with a bandwidth of 18Gbps, shall support subsampling rates of 4:4:4/4:2:2/4:2:0, thereby facilitating the transmission of high-definition video signals, including HDTV, 3D, and 2160p/1080p resolutions. Furthermore, this cable shall be compatible with HDCP2.2, Ethernet, ARC, HDR, Ultra HD, and UHD 4K, thereby ensuring a high degree of versatility and compatibility. The cable shall support high-speed data transfer rates of 18Gbps, with capabilities for HDR, CEC, EDID, and HDCP2.2, thereby guaranteeing a precise and reliable signal transmission. Additionally, the cable shall support uncompressed audio and video sync, with a maximum resolution of 4K@60Hz, and a maximum audio sampling rate of 1536KHz he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	36.000	NO

10	<p>Supply, Installation, Testing and commissioning (SITC) of Category 6A cable 30-year end-to-end channel performance warranty that shall be constructed with a 23 AWG bare copper solid conductor, designed as U/UTP unshielded, and shall feature an LSZH jacket. The cable shall comply with ANSI/TIA 568 C.2 standards and shall support a minimum bandwidth of 500 MHz, enabling a minimum speed of 10 Gbps shall be suitable for 10GBASE-T applications, with a minimum bandwidth of 500 MHz. It shall consist of four twisted pairs, complemented by a PE or PVC cross separator. The conductors shall be made of 23 AWG solid annealed bare copper. The conductor diameter shall be maintained at 0.57 ± 0.03 mm. Insulation shall be made from high-density polyethylene, with a diameter of 1.08 ± 0.05 mm. The LSZH jacket shall comply with IEC 60332-1 for flame rating, IEC 60754-1/2 for halogen acid tests, and IEC 61034-2 for smoke density tests. The nominal jacket thickness shall be a minimum of 0.80 mm, and the cable's outer diameter shall be 7.2 ± 0.5 mm. Operating temperature for the cable shall range from -20°C to $+75^{\circ}\text{C}$, with a CPR Euroclass rating of Class Eca. The cable shall comply with IEEE 802.3bt standards for Type 1, Type 2, Type 3, and Type 4 Power over Ethernet (PoE). Furthermore, the cable shall not contain any form of non-metallic barrier tape or metallic shielding inside. The flame rating shall meet or exceed IEC 60332-1, and the temperature index and oxygen index shall conform to ASTM D 2863 standards. The minimum bend radius for the cable shall be eig resistance shall not exceed 7.5Ω per 100 meters, with a maximum resistance unbalance of 5%. The mutual capacitance shall not exceed 5.6 nF per 100 meters, and the propagation velocity shall be nominally 69%. The dielectric strength shall be tested at 1500 V DC per minute. The minimum elongation at break for the insulation shall be 300%, and the minimum tensile strength for the jacket shall be 10 N/mm² (MPa). he specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p>	5000.000	MTR.
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11	<p>Supply, Installation, Testing and commissioning (SITC) of 24-Port 1U Unloaded Universal Modular Straight Patch Panel with 30-year end-to-end channel performance warranty that shall be preloaded with a cable support bar. The support bar shall include slots for properly tying individual cables, ensuring organized and secure cable management. Shuttered input/output (I/O) ports are not recommended, as malfunctioning shutters would render the entire I/O unusable patch panel shall be universal, e. featuring a stainless steel rear metal frame capable of supporting both Unshielded Twisted Pair (UTP) and Shielded Twisted Pair (STP) solutions. It shall be equipped with a cable strain relief retention tray, which shall also serve as the cable support bar with slots for tying individual cables securely Each port of the panel shall feature an individual transparent labeling point, facilitating easy identification of connections. The panel shall include inbuilt transparent spring shutters for dust protection on each port, ensuring cleanliness and functionality. However, it must be noted that shuttered I/O ports are not recommended due to the risk of malfunction affecting usability patch panel shall comply with RoHS and UL 94V-0 standards, demonstrating its adherence to safety and environmental regulations. Additionally, the panel shall be UL 1863 rated, and certification shall be provided along with the bid to verify compliance. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	20.000	NO
12	<p>Supply, Installation, Testing, and Commissioning (SITC) of Category 6A RJ45 Unshielded Modular Jack that shall comply with ISO/IEC 11801: 2nd edition, EN 50173-1, ANSI/TIA/EIA 568-C.2, and IEC 60603-7 (603-7). The jack shall be interoperable and backward compatible with Cat 6 standards, supporting both Universal 110 impact tool and tool-less termination methods for installation flexibility. It shall feature a minimum bandwidth of 500 MHz and a minimum speed of 10 Gbps, supporting at least 200 re-terminations and 750 plug mating cycles, with a current rating of 1.5 A and a plug retention force of 30 lbs. The jack shall be UL certified per UL 1863 and suitable for 10G Base-T applications per IEEE 802.3an up to 500 MHz. It shall be compatible with RJ standard plugs, including RJ11, RJ12, and RJ45, and provide PCB-based Universal 110 impact tool and tool-less connections for AWG 24-23 solid conductors. Each jack shall include a strain relief boot for pairs and an additional bend-limiting boot with an integrated locking clip for cable protection. The IDC termination shall feature color coding per EIA/TIA 568-A/B standards and gold-plated contacts to ensure 750 mating cycles and at least 200 IDC insertion cycles. Materials shall comply with RoHS standards, with housing made of polycarbonate or flame-retardant PVC (UL-94-V0). The modular jack shall endure DC/AC voltages of DC 1000V/AC 750V for 1 minute, exhibit a</p>	700.000	NO

	<p>maximum DC resistance of 0.3 Ohm, and operate within -10 to +60°C. The specifications outlined indicate the minimum requirements for the design. The bidder is strictly required to adhere to these minimum design specifications. The bidder shall submit the OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation.</p> <p>.End</p>		
13	<p>Supply, Installation, Testing, and Commissioning (SITC) of The Cat6 Patch Cords shall be designed with a U/UTP unshielded construction and shall feature an LSZH (Low Smoke Zero Halogen) jacket to ensure compliance with safety standards. The minimum conductor size shall be 24 AWG, with an overall diameter of less than 6.0 mm or better. The patch cords shall be provided in a length of 1 meter, or better, to accommodate diverse installation requirements. The operational temperature range must be a minimum of -20 to +60 degrees Celsius, or better, ensuring reliable functionality under varying environmental conditions. The cable structure shall incorporate a U/UTP LSZH material composition with eight conductors organized into four twisted pairs. The conductors must be of bare copper, with stranded 24 AWG specifications or better. The insulation should consist of high-density polyethylene (HDPE), providing minimum durability and safeguarding against environmental stress. The specifications below outline the minimum design requirements, which the bidder must strictly adhere to. Higher-performance alternatives are encouraged and will be considered. The bidder must submit Manufacturer Authorization with the technical bid, along with a compliance statement on the Manufacturer's letterhead. Products failing to meet or exceed these requirements will be rejected without notice. The Cat 6A patch cord plug shall incorporate a round cable holder strain relief, with a transparent boot designed to prevent bending and maintain longevity and performance integrity. The jacket material shall be LSZH and comply with a minimum flame rating of IEC 60332-1 or better to emphasize safety in fire-prone scenarios. The patch cord plug shall ensure high repeatability in crosstalk performance with a minimum rating of 750 cycles, guaranteeing reliability and durability. Further, the patch cords must be verified by an ETL/NABL lab to certify adherence to industry standards for quality and performance. Compliance with these specified standards will ensure optimal system efficiency and reliability in demanding professional applications. OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p>	150.000	NO

14	<p>Supply, Installation, Testing, and Commissioning (SITC) of The Cat6 Patch Cords shall be designed with a U/UTP unshielded construction and shall feature an LSZH (Low Smoke Zero Halogen) jacket to ensure compliance with safety standards. The minimum conductor size shall be 24 AWG, with an overall diameter of less than 6.0 mm or better. The patch cords shall be provided in a length of 1 meter, or better, to accommodate diverse installation requirements. The operational temperature range must be a minimum of -20 to +60 degrees Celsius, or better, ensuring reliable functionality under varying environmental conditions. The cable structure shall incorporate a U/UTP LSZH material composition with eight conductors organized into four twisted pairs. The conductors must be of bare copper, with stranded 24 AWG specifications or better. The insulation should consist of high-density polyethylene (HDPE), providing minimum durability and safeguarding against environmental stress. The specifications below outline the minimum design requirements, which the bidder must strictly adhere to. Higher-performance alternatives are encouraged and will be considered. The bidder must submit Manufacturer Authorization with the technical bid, along with a compliance statement on the Manufacturer's letterhead. Products failing to meet or exceed these requirements will be rejected without notice. The Cat 6A patch cord plug shall incorporate a round cable holder strain relief, with a transparent boot designed to prevent bending and maintain longevity and performance integrity. The jacket material shall be LSZH and comply with a minimum flame rating of IEC 60332-1 or better to emphasize safety in fire-prone scenarios. The patch cord plug shall ensure high repeatability in crosstalk performance with a minimum rating of 750 cycles, guaranteeing reliability and durability. Further, the patch cords must be verified by an ETL/NABL lab to certify adherence to industry standards for quality and performance. Compliance with these specified standards will ensure optimal system efficiency and reliability in demanding professional applications OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p>	150.000	NO
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15	<p>Supply, Installation, Testing, and Commissioning (SITC) of The Cat6 Patch Cords shall be designed with a U/UTP unshielded construction and shall feature an LSZH (Low Smoke Zero Halogen) jacket to ensure compliance with safety standards. The minimum conductor size shall be 24 AWG, with an overall diameter of less than 6.0 mm or better. The patch cords shall be provided in a length of 1 meter, or better, to accommodate diverse installation requirements. The operational temperature range must be a minimum of -20 to +60 degrees Celsius, or better, ensuring reliable functionality under varying environmental conditions. The cable structure shall incorporate a U/UTP LSZH material composition with eight conductors organized into four twisted pairs. The conductors must be of bare copper, with stranded 24 AWG specifications or better. The insulation should consist of high-density polyethylene (HDPE), providing minimum durability and safeguarding against environmental stress. The specifications below outline the minimum design requirements, which the bidder must strictly adhere to. Higher-performance alternatives are encouraged and will be considered. The bidder must submit Manufacturer Authorization with the technical bid, along with a compliance statement on the Manufacturer's letterhead. Products failing to meet or exceed these requirements will be rejected without notice. The Cat 6A patch cord plug shall incorporate a round cable holder strain relief, with a transparent boot designed to prevent bending and maintain longevity and performance integrity. The jacket material shall be LSZH and comply with a minimum flame rating of IEC 60332-1 or better to emphasize safety in fire-prone scenarios. The patch cord plug shall ensure high repeatability in crosstalk performance with a minimum rating of 750 cycles, guaranteeing reliability and durability. Further, the patch cords must be verified by an ETL/NABL lab to certify adherence to industry standards for quality and performance. Compliance with these specified standards will ensure optimal system efficiency and reliability in demanding professional applications OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p>	150.000	NO
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16	<p>Supply, Installation, Testing, and Commissioning (SITC) of face plates that shall be of the style classified as square, specifically keystone-type shuttered faceplates, available in configurations of 1 ports. The faceplates shall be of UK style (square) and shall be offered in a white color finish Each faceplate shall be equipped with a spring shutter for each port to ensure protection and maintain a clean appearance when ports are not in use. The faceplates shall feature an elegant two-piece (2 plate) design that enhances aesthetics while providing functionality. The specifications below outline the minimum design requirements, which the bidder must strictly adhere to. Higher-performance alternatives are encouraged and will be considered. The bidder must submit Manufacturer Authorization with the technical bid, along with a compliance statement on the Manufacturer's letterhead. Products failing to meet or exceed these requirements will be rejected without notice. The cover and base materials of the faceplates shall meet a minimum standard of ABS-UL94-V2, ensuring durability and safety in installation. Additionally, the faceplates shall be suitable for both flush and wall-mounted gang boxes, offering flexibility in installation options dimensions of the faceplates shall be 86 x 86 x 12.8 mm, providing a standard fit for common installations. This adherence to specified makes and standards will ensure that the system functions at peak efficiency and reliability, meeting the demanding needs of professional environments OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>	75.000	NO
17	<p>Supply, Installation, Testing, and Commissioning (SITC) of face plates that shall be of the style classified as square, specifically keystone-type shuttered faceplates, available in configurations of 2, ports. The faceplates shall be of UK style (square) and shall be offered in a white color finish Each faceplate shall be equipped with a spring shutter for each port to ensure protection and maintain a clean appearance when ports are not in use. The specifications below outline the minimum design requirements, which the bidder must strictly adhere to. Higher-performance alternatives are encouraged and will be considered. The bidder must submit Manufacturer Authorization with the technical bid, along with a compliance statement on the Manufacturer's letterhead. Products failing to meet or exceed these requirements will be rejected without notice. The faceplates shall feature an elegant two-piece (2 plate) design that enhances aesthetics while providing functionality. The cover and base materials of the faceplates shall meet a minimum standard of ABS-UL94-V2, ensuring durability and safety in installation. Additionally, the faceplates shall be suitable for both flush and wall-mounted gang boxes, offering flexibility in installation options dimensions of the faceplates shall be 86 x 86 x 12.8 mm, providing a standard fit for common installations. This adherence to specified makes and standards will ensure that the system functions at peak efficiency and reliability, meeting the demanding needs of professional environments. OEM Authorization and Confirmation of</p>	50.000	NO

	Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End		
18	Supply, Installation, Testing, and Commissioning (SITC) of face plates that shall be of the style classified as square, specifically keystone-type shuttered faceplates, available in configurations of 4 ports. The faceplates shall be of UK style (square) and shall be offered in a white color finish Each faceplate shall be equipped with a spring shutter for each port to ensure protection and maintain a clean appearance when ports are not in use. The specifications below outline the minimum design requirements, which the bidder must strictly adhere to. Higher-performance alternatives are encouraged and will be considered. The bidder must submit Manufacturer Authorization with the technical bid, along with a compliance statement on the Manufacturer's letterhead. Products failing to meet or exceed these requirements will be rejected without notice. The faceplates shall feature an elegant two-piece (2 plate) design that enhances aesthetics while providing functionality. The cover and base materials of the faceplates shall meet a minimum standard of ABS-UL94-V2, ensuring durability and safety in installation. Additionally, the faceplates shall be suitable for both flush and wall-mounted gang boxes, offering flexibility in installation options dimensions of the faceplates shall be 86 x 86 x 12.8 mm, providing a standard fit for common installations. This adherence to specified makes and standards will ensure that the system functions at peak efficiency and reliability, meeting the demanding needs of professional environments OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation .End	20.000	NO

19	<p>Supply, Installation, Testing, and Commissioning (SITC) of armoured fiber cable with 6/12 core single mode (OS2) configuration, compliant with ITU G.652.D and G.657A1 standards. This outdoor ECCS armoured fiber cable shall feature a PBT loose tube filled with thixotropic jelly, designed for durability and protection in harsh environments. The cable construction shall include a uni-tube design with color-coded fibres according to EIA/TIA 598 standards, ensuring ease of identification during installation. The loose tube shall have a nominal diameter of 2.5mm and be armoured with corrugated ECCS tape, having a nominal thickness of 0.155mm, providing excellent tensile and crush resistance. The outer sheath shall be made of UV-resistant HDPE, with a moisture barrier provided by water-blocking tape located under the Armor. Glass yarns shall serve as the strength member over the central tube, enhancing the cable's overall mechanical integrity. Physical and mechanical characteristics of the fiber cable shall include an outer diameter of 9.0 +/- 1.0 mm and a nominal jacket thickness of 1.5 mm. The cable shall demonstrate a tensile strength of ≥ 2220 Newton (as per IEC 60794-1-2-E1) and a bending radius not exceeding 20 times the outer diameter (OD) (as per IEC 60794-1-2-E11). Crush resistance shall be at least 2200 Newton/100mm (as per IEC 60794-1-2-E3) and the cable shall meet the water penetration requirements outlined in IEC 60974-1-2 (24 Hr, 3 Meter Sample, 1 Meter Height). The weight of the cable shall not exceed 95 Kg/km. Environmental characteristics shall indicate an operating temperature range of -30°C to +70°C (as per IEC 60794-1-2-F1), a storage temperature range of -10°C to +60°C, and an installation temperature range of -30°C to +70°C. The cable shall be ROHS compliant, as stated in the data sheet. Optical characteristics shall specify that the fiber type is SM (9/125) OS2, with a maximum attenuation of 0.36 dB/km at 1310nm and 0.23 dB/km at 1550nm. The mode field diameter at 1310nm shall be 8.8 +/- 0.4 μm, and dispersion shall be ≤ 3.5 ps/nm.km and ≤ 17.5 ps/nm.km. Continued</p>	300.000	MTR.
	<p>. The fiber cut-off wavelength shall be ≤ 1320 nm, while the cable cut-off wavelength shall be ≤ 1260 nm. The zero dispersion wavelength shall fall between 1300-1324 nm, with a zero dispersion slope of ≤ 0.090 ps/nm².km. Coating diameter shall measure 250 ± 15 μm, and the cladding diameter shall be 125 ± 0.7 μm. The fiber curl shall have a radius of ≥ 4 m, while the cladding non-circularity shall be $\leq 1\%$. The mode field concentricity error shall be ≤ 0.8 μm, and the coating/cladding concentricity error shall not exceed ≤ 12 μm. The cable shall be packaged in a wooden spool with a minimum roll length of 2KM. This adherence to specified makes and standards will ensure that the fiber optic cable functions at peak efficiency and reliability, meeting the demanding needs of professional environments. OEM Authorization and confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End</p>		

20	<p>Supply, Installation, Testing, and Commissioning (SITC) of 6 port 1U x 19" Line Interface Unit (LIU) that is fully loaded with single mode OS2 LC UPC adapters and LSZH pigtails, including splice trays. This unit will feature a minimum of four circular cable entry points, equipped with rubber grommets or glands to seal any open entries. Inside the panel, there will be cable holders to facilitate proper cable entry and management, heat shrink tubes for splices, and tubes for open fibers, ensuring a tidy and organized installation. The panel shall be constructed from a minimum of 1.2mm metal sheathing and finished with a powder coating to enhance durability and aesthetics, and it will carry a 30-year channel warranty. The factory-loaded LC UPC type LSZH pigtails will conform to various IEC standards, including IEC 61034-1, IEC 60332-1, and IEC 60754-1. The insertion loss for the pigtails will not exceed 0.35 dB, while the return loss will be greater than or equal to 50 dB for UPC and 65 dB for APC configurations. The attenuation will be specified at 0.3 dB/km for 1310 nm and 0.2 dB/km for 1550 nm, maintaining a repeatability of 0.2 dB over 1,000 mating cycles. Compliance with RoHS standards is mandatory, and the pigtails will also meet the requirements set forth in ANSI/TIA 568.3-D. The fiber panel will include a telescopic sliding shelf that allows for easy access and smooth operational changes, whether for additions or modifications. Cable holders to ensure efficient cable management. LIU to be completely enclosed, the unit will prevent any open areas that could allow rodent entry, thereby ensuring the integrity and longevity of the installation. The pigtail buffer jacket material will adhere to LSZH specifications compliant with IEC 61034-1, IEC 60332-1, and IEC 60754-1. The performance parameters for the pigtails will be rigorously maintained, including connector insertion loss, which will be better than 0.35 dB, and the return loss, which should be greater than or equal to 50 dB for UPC and 65 dB for APC configurations. The unit's attenuation specifications will confirm performance at 1310 nm and 1550 nm, ensuring reliability and efficiency. The specifications below outline the minimum design requirements, which the bidder must strictly adhere to. Higher-performance alternatives are encouraged and will be considered. The bidder must submit Manufacturer Authorization with the technical bid, along with a compliance statement on the Manufacturer's letterhead. Products failing to meet or exceed these requirements will be rejected without notice. End</p>	6.000	NO
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21	<p>Supply, Installation, Testing, and Commissioning (SITC) of 12 port 1U x 19" Line Interface Unit (LIU) that is fully loaded with single mode OS2 LC UPC adapters and LSZH pigtails, including splice trays. This unit will feature a minimum of four circular cable entry points, equipped with rubber grommets or glands to seal any open entries. Inside the panel, there will be cable holders to facilitate proper cable entry and management, heat shrink tubes for splices, and tubes for open fibers, ensuring a tidy and organized installation. The panel shall be constructed from a minimum of 1.2mm metal sheathing and finished with a powder coating to enhance durability and aesthetics, and it will carry a 30-year channel warranty The factory-loaded LC UPC type LSZH pigtails will conform to various IEC standards, including IEC 61034-1, IEC 60332-1, and IEC 60754-1, with performance specifications ensuring optimal functionality. The insertion loss for the pigtails will not exceed 0.35 dB, while the return loss will be greater than or equal to 50 dB for UPC and 65 dB for APC configurations. The attenuation will be specified at 0.3 dB/km for 1310 nm and 0.2 dB/km for 1550 nm, maintaining a repeatability of 0.2 dB over 1,000 mating cycles. Compliance with RoHS standards is mandatory, and the pigtails will also meet the requirements set forth in ANSI/TIA 568.3-D the fiber panel will include a telescopic sliding shelf that allows for easy access and smooth operational changes, whether for additions or modifications. The optical fiber pigtails will be factory-loaded within each individual port of Continued</p>	5.000	NO
	<p>the panel, utilizing LSZH material for the buffer jacket to ensure compliance with relevant IEC standards. Furthermore, the panel will feature a minimum of four cable entry slots located at the back, supplied with cable holders to ensure efficient cable management LIU to be completely enclosed, the unit will prevent any open areas that could allow rodent entry, thereby ensuring the integrity and longevity of the installation. The pigtail buffer jacket material will adhere to LSZH specifications compliant with IEC 61034-1, IEC 60332-1, and IEC 60754-1. The performance parameters for the pigtails will be rigorously maintained, including connector insertion loss, which will be better than 0.35 dB, and the return loss, which should be greater than or equal to 50 dB for UPC and 65 dB for APC configurations. The unit's attenuation specifications will confirm performance at 1310 nm and 1550 nm, ensuring reliability and efficiency OEM Authorization and confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End..</p>		

22	<p>Supply, Installation, Testing, and Commissioning (SITC) of Fiber Patch Cord 2 Mtr, specifically LC Duplex - LC Duplex, will feature 9/125µm OS2 single-mode duplex zip cord with a maximum outer diameter of 2.0mm. This fiber patch cord will meet stringent performance specifications, ensuring an insertion loss (IL) of no more than 0.35 dB and a return loss (RL) of at least 50 dB. The patch cord will be constructed with an LSZH (Low Smoke Zero Halogen) jacket that complies with IEC 60332-1, ensuring safety in environments where fire hazards are a concern. Operating within a temperature range of -40°C to +85°C, this fiber patch cord is designed to perform reliably in extreme conditions. It will adhere to the specifications outlined in ANSI/TIA 568.3-D, ensuring compatibility and performance in high-speed data transmission applications. The length of each patch cord will be 3 meters, suitable for a variety of installation needs. The cables can be configured as LC/LC, LC/SC, or SC/SC, and will consist of single-mode 9/125µm fiber for optimal performance. Each patch cord will have its OEM name prominently printed on the cable, ensuring authenticity and traceability. The attenuation specifications will be set at 0.35 dB/km for 1310 nm and 0.20 dB/km for 1550 nm, contributing to efficient data transmission over long distances. The repeatability of the connectors will guarantee a performance threshold of no more than 0.2 dB across 1,000 mating cycles, confirming durability and reliability in repeated use. Lastly, compliance with RoHS standards ensures that the materials used in the patch cords are free from hazardous substances, aligning with environmental safety regulations. The overall design and specifications of the Fiber Patch Cord will meet the highest industry standards, making them an ideal choice for professional networking environments. OEM Authorization and confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation. End....</p>	50.000	NO
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23	<p>Supply, Installation, Testing, and Commissioning (SITC) of Core Switch shall be equipped with advanced functionalities including flow control, port mirroring, MAC address filtering, and robust support for IPv6 and IP address filtering. It shall incorporate stacking Technology, sFlow, and support for various spanning tree protocols including Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), and Multiple Spanning Tree Protocol (MSTP). VRRP support shall be mandatory for high availability. Additional features such as DHCP snooping, Access Control List (ACL) support, Quality of Service (QoS), Class of Service (CoS), Equal-Cost Multipath (ECMP) routing, DHCP relay, GARP VLAN Registration Protocol (GVRP), and Err Disable Recovery are required switch must also include One Network (ZON) for simplified management, CPU protection, IP source guard, ARP inspection, Network Timing Protocol (NTP), and advanced security protocols like Loop Guard and Smart Connect. Guest VLAN support is necessary for secure access management. The switch shall support flexible Multi-Gigabit connections, ranging from 100M to 10G speeds, and should include a console port (DB9). It shall come with a minimum of three fans to ensure proper cooling. The switch should deliver non blocking wire-speed performance with a minimum switching capacity of 560 Gbps and a forwarding rate of 416 Mpps Memory and storage requirements include support for a minimum of 32K MAC addresses, 4K VLANs, a 4M on-chip packet buffer (both Egress and Ingress), dual flash storage (64 MB), and 8GB of RAM. The switch should handle 12K byte jumbo frames and comply with the EEE (802.3az) standard for energy efficiency, minimizing power consumption. Dual software image support is required for reliability during upgrades. Power management should include support for an optional external redundant power supply and removable fans, with an acoustic noise level of 58 dBA or better. It must comply with IEEE standards including IEEE 802.3, IEEE 802.3u, IEEE 802.3ab, IEEE 802.3z, IEEE 802.3x, IEEE 802.1p, IEEE 802.1X, and IEEE 802.3ad for traffic management and aggregation For traffic management and QoS, the switch must support rate limiting with 64 kbps granularity, port-based egress traffic shaping, and broadcast storm control. It should support IEEE 802.1p with 8 priority queues per port and various scheduling algorithms like WRR, SPQ, and WFQ. Continued</p>	5.000	NO
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	<p>It must also support DSCP and DSCP to 802.1p priority mapping, along with IGMP snooping for versions v1, v2, and v3, with congestion control on all ports. VLAN capabilities should include port- based, protocol-based, and private VLANs, 802.1ad VLAN stacking (Q-in-Q), and automatic VLAN member registration (GVRP). The switch shall support static and dynamic VLANs, with at least 1K static VLANs and up to 4K dynamic VLANs. The switch must provide high bandwidth with true physical stacking capability, supporting up to 4 units for redundancy and resilience. It must support a total port density of 28 or more, including 4 ports compatible with 100M/1G/2.5G/5G/10G speeds. It should include 16 SFP+ (10Giga Fiber) ports and 8 additional 10Giga Ethernet ports for high-speed uplink and connectivity advanced security, management, and Layer- 3 capabilities for robust network performance and manageability. It supports port-based VLANs and VLAN isolation, enhancing segmentation within the network. For security, it features an intrusion lock along with static and dynamic MAC binding, ensuring that only authorized devices can connect. The switch supports specific MAC forwarding per port, which allows only designated MAC addresses to access the network, thereby enhancing security through strict access controls. Additionally, it supports a limited MAC number per port with configurable MAC aging times, IP source guard, and loop guard. It also incorporates RADIUS for MAC login, IP filtering, TCP/UDP socket filtering, and BPDU transparency. The switch implements 802.1X port-based authentication, allowing compensated assignment over VLANs and bandwidth for valid access, alongside support for TACACS+ and password encryption. Network administration security is reinforced through username/password requirements for web, Telnet, and local console access, two-level security by specific SNMP read/write community, and multiple login sessions with varying access permissions. The switch supports SSH v1/v2, SSL, IPv6 over Ethernet, and various IPv6 addressing features, including dual-stack and Neighbor discovery Layer-3 capabilities include VRRP for redundancy, ECMP for multipath routing, and static routing with a minimum of 1,000 entries for both IPv4 and IPv6. Continued</p>		
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	<p>It features a management software suite for centralized control of multiple switches, supports a clustering of at least 20 switches under a single IP address, and offers web-based management, Telnet CLI, SNMP v1, v2c, v3, and RS-232c local console access. The switch includes IP management options for static IP or DHCP clients, RMON for enhanced traffic management, port mirroring capabilities, and intelligent ACLs based on various criteria, including MAC address, VLAN, IP address, protocol type, and TCP/UDP type. Overall, the Core Switch is built to meet rigorous standards for performance, security, and flexibility in a modern networking environment Core Switch complies with industry standards and specifications, including support for RFC 1643 Ethernet MIB, RFC 2358 Ethernet-like MIB, and RFC 1757 RMON groups 1, 2, 3, and 9, along with RFC 2819 and 2925 for remote management. It adheres to various regulatory certifications such as LVD, SNMI, FCC Part 15 (Class A), CE EMC (Class A), BSMI ENC, and RoHS (Level A). The OEM brand must possess valid ISO 9000, ISO 14000, and ISO 50001 certificates, which should be submitted with the technical bid to ensure quality and environmental compliance. The operating temperature range for the switch is between 0°C to 50°C, with a storage temperature of -40°C to 70°C, and it operates efficiently in humidity levels of 10% to 95% (non condensing) features an internal dual AC power supply and boasts a Mean Time Between Failures (MTBF) of 65,620 hours or better. The switch is equipped with auto-detection capabilities to identify connected devices, providing information such as model, firmware version, MAC address, IP address, and system name on a web-based management interface. Users can access web redirection to connected devices and reset them to factory defaults if necessary. A centralized management utility is available to facilitate the discovery and configuration of network devices, simplifying network maintenance. To ensure seamless compatibility, all active components, including switches, access points, and SFP modules, must be of the same make and manufacturer and backed by the same OEM warranty. Additionally, the latest datasheet must be attached to the tender documentation OEM Authorization and confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>		
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24	<p>Supply, Installation, Testing, and Commissioning (SITC) of Data Distribution Switches low control, VLAN support, IGMP snooping, Syslog support, port mirroring, Weighted Round Robin (WRR) queuing, MAC address filtering, Broadcast Storm Control, IPv6 support, URL filtering, IP address filtering, Multicast Storm Control, firmware upgradable, Weighted Fair Queuing (WFQ), Stacking Technology, sFlow, Spanning Tree Protocol (STP) support, Rapid Spanning Tree Protocol(RSTP) support, Multiple Spanning Tree Protocol (MSTP) support, DHCP snooping, Access Control List (ACL) support, Quality of Service (QoS), MLD snooping, STP Root Guard, IPv4 support, DHCP relay, Port Security, IP-MAC binding, SNMP trap, DHCP client, Energy Efficient Ethernet, Management Information Base (MIB), Multicast VLAN Registration (MVR), dual firmware images, Strict Priority Queuing (SPQ), Neighbor Discovery Protocol (NDP), loop prevention, NTP time synchronization, port isolation, Class of Service (CoS), tagged Anagenetic VLAN Registration Protocol switch shall have a total of 30 Gigabit ports, including 24 units of 10/100/1000 Mbps RJ-45 Ethernet ports and 4 x 1G SFP/10G SFP+ slots modulated with SFP. It shall feature a non-blocking wire-speed switch fabric with a minimum backplane capacity of 168 Gbps or more and a minimum forwarding capacity of 125 Mpps or more. The switch shall be flexible enough to be managed in both cloud and standalone modes, with basic cloud management available from day one. It shall support a minimum of 32K MAC addresses and 4K VLANs switch shall include a USB-C out-of-band console port, a 2 MB packet buffer (egress/ingress), 64 MB flash memory, and 1 GB RAM or more. It shall support 1K IPv4 static routes and 512K IPv6 static routes. Furthermore, the switch shall comply with the Energy Efficient Ethernet (EEE) standard (802.3az) to minimize power consumption and shall support dual software (firmware) images. The switch shall have the capability to perform virtual stacking of up to 20 units per IP. It shall support the following standards: IEEE 802.3 (10BASE-T Ethernet), IEEE 802.3u (100BASE-TX Ethernet), IEEE 802.3ab (1000BASE-T Ethernet), IEEE 802.3z (1000BASE-X Ethernet), and IEEE 802.3x (flow control). It shall also comply with IEEE 802.1p class of service and priority protocols, IEEE 802.1X port authentication, and IEEE 802.3ad LACP aggregation Continued</p>	22.000	NO
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	<p>switch shall support rate limiting with rule-based and port-based bandwidth control at 64 kbps granularity. It shall provide port-based egress traffic shaping and broadcast storm control. IEEE 802.1p shall be implemented with 8 priority queues per port for different traffic types, employing Weighted Round Robin (WRR), Strict Priority Queuing (SPQ), and Weighted Fair Queuing (WFQ) scheduling algorithms. The switch shall support DSCP and DSCP to 802.1p priority mapping. Additionally, it shall support IGMP snooping (versions 1, 2, and 3) with congestion control on all ports. Compliance with IEEE 802.3ad LACP for link aggregation shall be required, allowing for static manual port trunking of up to 8 aggregation groups with 8 ports per group selected randomly switch shall support MAC filtering per port to secure access to each port. It shall support IEEE 802.1Q tag-based and port-based VLAN configurations, as well as guest VLANs (port-based and MAC-based). The switch shall accommodate at least 9 MAC addresses per port (exclusive of protocol-based and IP subnet based VLANs for 8/24 port devices). It shall support GVRP for automatic VLAN member registration, providing a minimum of 4K static VLANs, up to 4K dynamic VLANs, and full range 4K PVID support. The switch shall also support port-based VLAN and VLAN isolation, along with protocol- and IP-based VLANs, including guest VLANs, private VLANs, MAC-based VLANs, voice VLANs, dynamic VLANs, GARP with GVRP/GMRP, and double tagging (QinQ) switch shall support intrusion lock for enhanced security and shall implement static and dynamic MAC binding. It shall enable specific MAC forwarding per port, allowing only specified MAC addresses to access the network (port security). The switch shall limit the number of MAC addresses per port and be capable of setting MAC aging time. It shall support IP source guard and loop guard functionalities. Additionally, the switch shall incorporate RADIUS MAC login and IP filtering capabilities, along with TCP/UDP socket filtering and BPDU transparency. The switch shall comply with IEEE 802.1X port-based authentication and shall facilitate compensated assignment over VLANs and bandwidth for valid access. It shall also support TACACS+ and password encryption for network security. switch shall require a username and password for web, Telnet, and local console administrators, providing two-level security through specific SNMP read/write community configurations. It shall allow multiple login sessions and support multiple access permission management. Continued</p>		
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	<p>The switch shall also support SSH versions 1 and 2, as well as SSL for secure management. The switch shall support IPv6 over Ethernet, including IPv6 addressing, IPv6 Path MTU, ICMPv6, dual stack functionality, Neighbor discovery, and DHCPv6 client and relay support switch shall be supplied with management software capable of managing and maintaining multiple switches from a central location. It shall support MED (Media Endpoint Discovery) and clustering for at least 20 switches, allowing management through a single IP address. The switch shall provide web-based management, Telnet CLI, and SNMP versions 1, 2c, and 3, as well as a USB-C out-of-band console port. It shall support both static IP and DHCP client configurations and shall function as a DHCP server with mirror CPU capabilities. The switch shall implement RMON with four groups (1, 2, 3, 9) for enhanced traffic management, monitoring, and analysis. Port mirroring shall support source, destination, and both port mirroring switch shall include intelligent ACL (Access Control List) functionality for L2, L3, and L4, based on MAC address, VLAN, IP address, protocol type, TCP/UDP type, and DSCP. Compliance with relevant standards and protocols shall include RFC 1066 (TCP/IP-based MIB), RFC 1213, RFC 1157 (SNMP v2c/v3 MIB), RFC 2011, 2012, 2013 (SNMP v2 MIB), RFC 1493 (bridge MIB), RFC 2674 (bridge MIB extension), RFC 1643 (Ethernet MIB), RFC 2358 (Ethernet-like MIB), RFC 1757 (RMON groups 1, 2, 3, 9), RFC 2819, and RFC 2925 (Remote Management MIB) switch shall be CE-LVD, FCC, CE, BSMI, and RoHS compliant. The OEM brand shall possess valid ISO 9000 and ISO 14000 certifications, with all certificates submitted in the technical bid. The operating temperature shall range from 0°C to 50°C, with a storage temperature of -40°C to 70°C and an operating humidity range of 10% to 95% (non-condensing). The input power requirements shall be 100-240V AC at 50/60 Hz. OEM Authorization and confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>		
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25	<p>Supply, Installation, Testing, and Commissioning (SITC) of POE + Switches 24-port GbE L3 Access PoE+ Switch with 6 10G Uplink (400 W) shall be designed to serve as a robust Layer 3 access solution, featuring a total port count of 30. This switch must include 24 ports that support 100/1000 Mbps Ethernet connectivity, along with 2 additional ports for 1G/2.5G/5G/10G Ethernet (RJ-45), and 4 ports designated for Power over Ethernet (PoE) applications. Furthermore, the device shall be equipped with 2 ports for 1G SFP/10G SFP+ uplinks n terms of power and PoE capabilities, the switch must provide a total PoE budget of 400 watts. Specifically, ports 1 through 16 shall support IEEE 802.3at (PoE+), while ports 17 through 24 shall support IEEE 802.3bt (PoE++, 60 W). The maximum power consumption of the switch shall not exceed 477 watts to ensure efficient operation. Performance-wise, the switch shall have a switching capacity of 168 Gbps and a forwarding rate of at least 125 Mbps. Additionally, the packet buffer must be a minimum of 2 MB, supporting the smooth handling of network traffic. The MAC address table shall support up to 32,000 addresses, while the switch must accommodate jumbo frames of up to 9 KB. For routing capabilities, the switch shall include a Layer 3 forwarding table with a maximum of 1,024 IPv4 entries and 512 IPv6 entries. The routing table must provide support for 64 IP interfaces switch shall operate within an input power range of 100 - 240 V AC, 50/60 Hz and must include robust surge protection features, such as 2 kV for Ethernet ports and 1 kV for line-to-line protection. Furthermore, the Ethernet port must feature ESD protection ratings of 8 kV for air discharge and 6 kV for contact discharge. For environmental resilience, the switch must operate effectively in temperatures ranging from 20°C to 50°C (-40°F to 122°F) and humidity levels between 10% to 95% (non-condensing). Storage conditions shall allow for temperatures from -40°C to 70°C (-40°F to 158°F), with humidity levels maintained between 10% to 90% (non-condensing). To ensure reliability, the switch shall demonstrate a mean time between failures (MTBF) of at least 268,305 hours and a heat dissipation rating of 1626.57 BTU/hr. Acoustic noise levels at 25°C must not exceed 30.21 dBA (minimum) and 50.21 dBA (maximum) switch shall be compliant with various IEEE standards, including but not limited to IEEE 802.3z (1000BASE-X), IEEE 802.3ab (1000BASE-T Ethernet), IEEE 802.3an (10G BASE-T Ethernet), Continued</p>	20.000	NO
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	<p>IEEE 802.3ae (10 Gbit/s Ethernet over fiber), IEEE 802.3af (PoE), IEEE 802.3at (PoE+), IEEE 802.3bt (60 W) PoE over 4 pair, IEEE 802.3az (EEE), IEEE 802.3x (flow control), IEEE 802.1AB (LLDP/LLDP-MED), IEEE 802.1Q (VLAN tagging), IEEE 802.1p (CoS prioritization), and IEEE 802.1X (port authentication) resilience and availability features shall include IEEE 802.1D (Spanning Tree Protocol), IEEE 802.1w (Rapid Spanning Tree Protocol), and IEEE 802.1s (Multiple Spanning Tree Protocol), along with static port trunking, IEEE 802.3ad (LACP), loop guard, root guard, BPDU guard, and err disable recovery. The switch shall support flexible stacking via 2 or 4 ports and must allow for both static and dynamic VLANs, with a limit of 4,000 VLANs. The switch must also provide advanced traffic control mechanisms, including port-based VLANs, VLAN isolation, vendor ID-based VLANs, protocol-based VLANs, IP subnet-based VLANs, MAC-based VLANs, private VLANs, and voice VLANs. The switch shall support flexible stacking via 2 or 4 ports and must allow for both static and dynamic VLANs, with a limit of 4,000 VLANs. The switch must also provide advanced traffic control mechanisms, including port-based VLANs, VLAN isolation, vendor ID-based VLANs, protocol-based VLANs, IP subnet-based VLANs, MAC-based VLANs, private VLANs, and voice VLANs. Independent VLAN Learning (IVL) to ensure the flexibility of VLAN management. Additionally, it shall provide VLAN Translation, VLAN trunking, VLAN mapping, and support for IEEE 802.1AD VLAN stacking (QinQ), allowing for a comprehensive VLAN configuration. The switch must implement VLAN ingress filtering to enhance network security and management capabilities. For link aggregation, the switch shall utilize the LACP algorithm for source/destination IP or MAC, ensuring optimal bandwidth utilization and redundancy. The switch must also support GVRP for dynamic VLAN registration and L2PT Security to protect against unauthorized access. Security features shall include port security, Layer 2 MAC filtering, Layer 3 IP filtering, and Layer 4 TCP/UDP socket filtering. Furthermore, static MAC forwarding shall be supported to ensure reliable traffic routing. To enhance authentication and authorization, the switch shall accommodate multiple RADIUS and TACACS+ servers, enabling 802.1x VLAN and 802.1p assignment by RADIUS. It must provide login authentication via both RADIUS and TACACS+, along with accounting capabilities for both protocols. Compound authentication and authorization via RADIUS and TACACS+ shall be supported to strengthen security protocols. The switch must support SSH v2 and SSL for secure communications. Continued</p>		
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	<p>the switch shall feature MAC freeze, IP source guard (for both IPv4 and IPv6), DHCP snooping, and DHCP Server Guard to mitigate the risk of unauthorized network access. ARP inspection, ARP freeze, and anti-ARP scan functionalities must be included to protect against ARP spoofing. The switch shall support static IP-MAC-Port binding and policy-based security filtering to provide granular control over network access. Furthermore, features such as port isolation and MAC search shall enhance network segmentation and security. Guest VLAN functionality must also be included to support secure guest access Access Control Lists (ACL) for packet filtering (both IPv4 and IPv6) shall be implemented to manage incoming and outgoing traffic effectively. The switch must provide CPU protection and allow for interface-related traps to be enabled or disabled by port. MAC-based authentication per VLAN and BPDU transparency shall be supported to streamline network management. The switch must also offer PPPoE relay agent support and option 82 for effective PPPoE management, as well as Wake-on-LAN (WoL) and WoL relay capabilities In terms of Quality of Service (QoS), the switch shall feature a minimum of 8 hardware queues per port for standalone configurations and 6 queues for stacking, ensuring optimal traffic management. Storm control and event logging for broadcast, multicast, and unknown unicast (DLF) traffic must be included to monitor and manage network performance. Port-based rate limiting for both ingress and egress traffic shall be supported, alongside rate limiting per IP, TCP, and UDP per port. The switch must incorporate policy-based rate limiting and implement 802.3x flow control to manage congestion effectively For Layer 2 multicast support, the switch shall feature L2 multicast functionality, along with IGMP snooping (versions 1, 2, and 3) and related features such as fast leave and immediate leave. The switch must support configurable IGMP snooping timers and priorities, along with IGMP snooping statistics, throttling, and filtering. Selection between IGMP proxy mode and snooping mode shall also be available, along with multicast load sharing over trunking ports and static multicast support. Additionally, Multicast VLAN Registration (MVR) and MLD snooping (MLD v1 and v2) must be supported for enhanced multicast management Routing capabilities shall include static routes, IP port moving functionalities, and DHCP relay to streamline network operations. For manageability, Continued</p>		
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	<p>the switch must support SNMP versions 1, 2c, and 3, with SNMP trap groups and RMON (1, 2, 3, and 9) for monitoring and reporting. ICMP echo and echo reply functionalities shall be implemented, along with Syslog support for both IPv4 and IPv6. The switch shall feature IEEE 802.1AB LLDP and LLDP-MED for device discovery and network mapping, with customizable defaults for ease of management. switch shall support IPv6 over Ethernet as specified in RFC 2464 and adhere to the IPv6 addressing architecture defined in RFC 4291. It must implement dual stack capability in accordance with RFC 4213, facilitating seamless operation in both IPv4 and IPv6 environments. The switch shall support ICMPv6 as per RFC 4443 and Path MTU discovery based on RFC 1981, with a minimum path MTU size of 1280 bytes as specified in RFC 5095. It must ensure encapsulation for a maximum PMTU of 1500 bytes. Additionally, the switch shall implement Neighbor Discovery as per RFC 4861, support DHCPv6 snooping, and provide IPv6 binding for both static and dynamic configurations. It shall extend RADIUS server capabilities for IPv6 and support DHCPv6 relay along with a default DHCP client mode. Device management capabilities must include standalone management through a web interface and cloud management via the Control Center. The switch shall feature a networked AV mode accessible through the web interface, providing an intuitive cloud connection status. Stacking technology must be supported for simplified management. Management options shall include console access, Telnet, and SNMP for versatile control. The switch shall facilitate remote firmware upgrades via FTP, web, or TFTP, as well as configuration saving and retrieving functionalities. Support for multiple logins must be included, along with a configure clone option and custom default configuration capabilities.</p> <p>Continued</p>		
	<p>A multilevel CLI and a Cisco-like CLI shall be provided for ease of management. The switch must support DHCP relay per VLAN, DHCP client for both IPv4 and IPv6, and DHCP client option 60, along with DHCP option 82 for enhanced configuration. Features such as Daylight Saving Time, DHCP relay MAC proxy, Auto PD Recovery, and NTP support for both IPv4 and IPv6 shall also be included. Additional management functionalities must comprise port mirroring (policy-based, VLAN-based, and mirror CPU), a USB-C out-of-band console port, scheduled PoE, PoE default consumption mode, continuous PoE, LLDP power via MDI, and sFlow for network traffic analysis. switch must comply with various certifications to ensure safety and electromagnetic compatibility (EMC). Safety certifications shall include LVD and BSMI. EMC certifications shall adhere to FCC Part 15 (Class A), CE EMC (Class A), and BSMI EMC standards. Additionally, the switch must comply with RoHS Level A regulations for environmentally friendly design. OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation.</p> <p>End</p>		

26	<p>Supply, Installation, Testing, and Commissioning (SITC) of 8 Port Gigabit + 2 Port Gigabit SFP Managed Industrial PoE Switch The detailed technical specifications for the network switch are as follows: Network Ports: The device must feature 8 x 10/100/1000Mbps Ethernet ports, 2 x 1000Mbps Small Form-factor Pluggable (SFP) ports, and 1 console port. Additionally, it should support a group of alarm output and relay output, which can be configured for various custom condition triggers. Network Standards: It must adhere to the IEEE standards, including IEEE 802.3i, IEEE 802.3u, IEEE802.3ab, IEEE802.3x, IEEE802.3az, IEEE802.3af, and IEEE802.3at. Twisted Pair Transmission: It should support transmission over 10BASE-T (Cat3, 4, 5 UTP up to 100 meters), 100BASE-TX (Cat5 or higher UTP up to 100 meters), and 1000BASE-T (Cat5 or higher UTP up to 100 meters).Optical Cable: For optical transmission, it must support multi-mode (850nm up to 550 meters), single-mode (1310nm up to 40 kilometres, 1550nm up to 120 kilometres).Transfer Method: Store-and Forward. MAC Address Table: It should support a MAC address table with a capacity of 8K addresses. Switching Capacity and Forwarding Rate: The switching capacity should be 20Gbps, and the forwarding rate must reach 14.88Mpps (million packets per second).Packet Buffer and Jumbo Frame: A packet buffer of 4 Mbits is required, with support for jumbo frames up to 12K bytes.ndicators: The switch must have network indicators for link status (yellow), SFP status (green), PoE status (green), and a system indicator (green).Power Specifications: The switch must have a maximum PoE power budget of 120W and support a 4-core power supply using pins 1/2 (+) and 3/6 (-). The power input should be dual DC 48~55V suitable for industrial-grade power supplies. The maximum per port power consumption is 30W, with overall power consumption being less than 10W in standby mode and less than 240W at full load8 Port Gigabit + 2 Port Gigabit SFP Managed Industrial PoE Switch The detailed technical specifications for the network switch are as follows: Network Ports: The device must feature 8 x 10/100/1000Mbps Ethernet ports, 2 x 1000Mbps Small Form-factor Pluggable (SFP) ports, and 1 console port. Additionally, it should support a group of alarm output and relay output, Continued</p>	8.000	NO
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	<p>which can be configured for various custom condition triggers.</p> <p>Network Standards: It must adhere to the IEEE standards, including IEEE 802.3i, IEEE 802.3u, IEEE802.3ab, IEEE802.3x, IEEE802.3az, IEEE802.3af, and IEEE802.3at.</p> <p>Twisted Pair Transmission: It should support transmission over 10BASE-T (Cat3, 4, 5 UTP up to 100 meters), 100BASE-TX (Cat5 or higher UTP up to 100 meters), and 1000BASE-T (Cat5 or higher UTP up to 100 meters).</p> <p>Optical Cable: For optical transmission It should support a MAC address table with a capacity of 8K addresses.</p> <p>Switching Capacity and Forwarding Rate: The switching capacity should be 20Gbps, and the forwarding rate must reach 14.88Mpps (million packets per second).</p> <p>Packet Buffer and Jumbo Frame: A packet buffer of 4 Mbits is required, with support for jumbo frames up to 12K bytes.</p> <p>Indicators: The switch must have network indicators for link status (yellow), SFP status (green), PoE status (green), and a system indicator (green).</p> <p>Power Specifications: The switch must have a maximum PoE power budget of 120W and support a 4-core power supply using pins 1/2 (+) and 3/6 (-). The power input should be dual DC 48~55V suitable for industrial-grade power supplies. The maximum per port power consumption is 30W, with overall power consumption being less than 10W in standby mode and less than 240W at full load. The switch must have a maximum PoE power budget of 120W and support a 4-core power supply using pins 1/2 (+) and 3/6 (-). The power input should be dual DC 48~55V suitable for industrial-grade power supplies. The maximum per port power consumption is 30W, with overall power consumption being less than 10W in standby mode and less than 240W at full load.</p> <p>Port Features: It should support IEEE802.3x flow control, broadcast storm suppression, speed limit control with a minimum granularity of 64Kbps, and power-saving EEE settings.</p> <p>PoE Management: The device must include PoE power limit configuration, allocation per port, power status display, priority settings, and scheduling functions.</p> <p>LAN Support: It should support port-based VLAN (up to 4K VLANs), IEEE802.1q, MAC based VLANs, voice VLANs, and include Access, Trunk, Hybrid configurations, as well as QinQ and GVRP.</p> <p>Resiliency: Support for loopback detection, IEEE 802.1AB for LLDP, and EAPS/ERPS protocols must be present. Continued</p>		
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	<p>Layer 3 Functions: It should support L2+ network management functions including IPv4/IPv6 management, soft routing for communication across different network segments, static routing, and ARP software forwarding. Port Aggregation: It should support LACP and static aggregation, with a maximum of 8 aggregation groups and up to 8 ports per group Spanning Tree and Industrial Ring: It must support STP (IEEE802.1d), RSTP (IEEE802.1w), and MSTP (IEEE802.1s). it must support multi-mode (850nm up to 550 meters), single-mode (1310nm up to 40 kilometres, 1550nm up to 120 kilometres). Transfer Method: Store-and Forward. MAC Address Table: It should also support G.8032 (ERPS) with a capacity of up to 255 loops and 1024 devices per ring, with a self-healing time of less than 20ms.QoS: The switch should support Diff-Serv QoS, 802.1p/DSCP priority mapping, and a queue scheduling mechanism including SP, WRR, and SP+WRR. It should also support traffic shaping and prioritization features. Security Features: Required security measures include user grading management, AAA and RADIUS authentication, MAC address learning restrictions, IEEE802.1X authentication, ARP intrusion detection, and DoS attack protection, among others IPv6: The device must support IPv6 features including ICMPv6, DHCPv6, ACLv6, Telnet, and Neighbor Discovery. Multicast: It must support IGMP Snooping V1/V2, with support for up to 1024 multicast groups, MLD Snooping V1/V2, and multicast VLANs.ACL: Support for L2 to L4 packet filtering, based on various criteria such as MAC and IP addresses, TCP/UDP ports, VLANs, etc. Mirroring and Management: The device should support bi-directional port mirroring, DHCP options, SNMP, and various remote management protocols including SSH and HTTPS. Maintenance features should include system logging, ping tests, and support for network time protocols Operating Temperature and Humidity: The switch should operate reliably in temperatures ranging from -40°C to +75°C, with a relative humidity range of 5% to 90% (non-condensing).These detailed specifications ensure that the switch meets the industrial requirements for network performance, durability, and security in diverse environments OEM Authorization and confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>		
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27	<p>Supply, Installation, Testing, and Commissioning (SITC) of Indoor wireless access point shall comply with the IEEE 802.11 standards, including ax, ac, n, g, b, and a, ensuring comprehensive wireless connectivity. It must support MIMO (Multiple Input Multiple Output) and MU-MIMO (Multi-User MIMO) technologies to enhance performance and capacity. The device is designed to provide wireless speeds of 575 Mbps at 2.4 GHz and 2400 Mbps at 5 GHz. Operating within the frequency bands of 2.4 GHz, which encompasses 2.412 to 2.462 GHz in the USA (FCC) and 2.412 to 2.472 GHz in Europe (ETSI), as well as 5 GHz, which covers 5.15 to 5.35 GHz and 5.470 to 5.850 GHz in the USA and 5.15 to 5.35 GHz and 5.470 to 5.725 GHz in Europe, the access point ensures compatibility across regions device must also support various bandwidth options, including 20, 40, 80, and 160 MHz, to optimize network performance. Typical transmit output power is limited by local regulatory requirements, with maximum values set at 23 dBm for 2.4 GHz and 28 dBm for 5 GHz in the US, while in the EU, these values are 19 dBm for 2.4 GHz and 25 dBm for 5 GHz. The RF design features a dual-optimized antenna configuration, comprising 4x4 and 2x2 setups, achieving peak antenna gains of 5 dBi at 2.4 GHz and 6 dBi at 5 GHz, with a minimum receive sensitivity of -101 dBm wireless access point shall include several key features such as band steering, WDS/Mesh support, and fast roaming capabilities, including pre-authentication and PMK caching according to 802.11r/k/v. Dynamic Channel Selection (DCS) and load balancing functionalities must be available, alongside robust encryption options including WEP, WPA, WPA2, and WPA3. Authentication will be facilitated through IEEE 802.1X/RADIUS, while access management features like L2 isolation, MAC filtering, and rogue AP detection shall be incorporated to enhance security Networking capabilities must include support for IPv6, VLANs, WMM, U-APSD, and Diffserv marking, ensuring comprehensive traffic management. The operating mode of the access point shall allow for Cloud management, controller management, and standalone operation. Additionally, the ZON Utility is essential for the discovery of switches, APs, and gateways, along with centralized batch configurations such as IP configuration, IP renew, device reboot, locating devices, web GUI access, firmware upgrades, and password configurations. Wireless Optimizer must provide functionalities for Wi-Fi AP planning, coverage detection, and wireless health management interfaces shall include a web UI and CLI, with SNMP support for effective network monitoring. Continued</p>	50.000	NO
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	<p>he access point will feature one 10/100/1000/2500M LAN port and another 10/100/1000M LAN port, with power requirements including PoE (802.3) drawing 19.5 W or a DC input of 12 VDC at 2 A. Environmental specifications must adhere to operating temperatures ranging from 0°C to 50°C (32°F to 122°F) and humidity levels of 10% to 95% (non-condensing), while storage conditions shall be maintained between -30°C to 70°C (-22°F to 158°F) with humidity levels of 10% to 90% (non-condensing). Certifications for the device shall include compliance with radio standards such as FCC Part 15C, FCC Part 15E, ETSI EN 300 328, EN 301 893, and LP0002. For EMC compliance, it must meet FCC Part 15B, EN 301 489-1, EN 301 489-17, EN55022, EN55024, and EN61000-3-2/-3, as well as EN60601-1-2 and BSMI CNS13438. Safety certifications shall align with EN 60950-1, IEC 60950-1, and BSMI CNS14336-1, ensuring the device meets stringent safety and performance standards OEM Authorization and confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>		
28	<p>Supply, Installation, Testing, and Commissioning (SITC) of outdoor wi fi shall have 802.11ac Dual Radio External Antenna 3x3 Outdoor Access Point should be provide reliable wireless connectivity across both the 2.4 GHz and 5 GHz frequency bands. This device shall feature a dual radio configuration, supporting the 2.4 GHz band in compliance with IEEE 802.11 b/g/n standards. the operational frequency should range from 2.412 to 2.462 GHz, while in Europe, it shall span from 2.412 to 2.472 GHz, For the 5 GHz band, the access point should comply with IEEE 802.11 a/n/ac standards, with operational frequencies ranging from 5.15 to 5.35 GHz and 5.725 to 5.850 GHz., the band must range from 5.15 to 5.35 GHz and 5.470 to 5.725 GHz, consistent with the specifications access point must have advanced 802.11n/ac features, including 3x3 Multiple-Input Multiple-Output (MIMO) technology, which should utilize three spatial streams to enhance data throughput and reliability. It shall also support Maximal Ratio Combining (MRC), 20-, 40-, and 80-MHz channels, packet aggregation via A-MPDU and A-MSDU, as well as Cyclic Delay Diversity (CSD) and Maximum Likelihood Demodulation (MLD). Additionally, it should support Low-Density Parity Check (LDPC) to improve error correction device must include six N-type connectors for antenna deployment, facilitating enhanced signal quality. The supported data rates should vary across different standards, with 802.11a/g offering rates from 1 Mbps up to 54 Mbps, while 802.11b must support rates up to 11 Mbps. Under 802.11n, data rates should reach up to 450 Mbps, and under 802.11ac, they shall go up to 1300 Mbps, depending on the channel bandwidth receiver sensitivity for the device must be a minimum of -102 dBm, ensuring robust performance in challenging environments. The typical transmit power for 11b/g/n/a standards should be specified at 29 dBm in the FCC region, with the European regulations capping it at 15 dBm for 2.4 GHz and 23 dBm for 5 GHz access point shall feature one 10/100/1000M LAN interface and</p>	8.000	NO

	<p>must include a console port for management purposes. Power over Ethernet (PoE) should be supported, with a power draw of 25 watts. The WLAN capabilities shall enable a maximum throughput of up to 900 Mbps, and the device must support multiple SSIDs and VLANs to enhance network segmentation and security. Security features should include WEP, WPA/WPA2-PSK, and various EAP types for enterprise-level security, ensuring that the device meets the demanding needs of various applications Continued</p>		
	<p>Management capabilities must be robust, with utilities available for centralized configurations, monitoring, and management through a web GUI, CLI, and SNMP protocols. The access point should also support integration with third-party applications and facilitate smooth communication and management among multiple devices within a network In terms of physical specifications, the device must have a plenum rating for safety and should support a Kensington lock for added security. It shall be compliant with multiple industry standards, including IEEE 802.3 and IEEE 802.11 protocols. The operating temperature range should extend from -40°C to 60°C ensuring functionality in harsh weather conditions, while storage temperatures must range from -40°C to 70°C. The device should be rated for IP66 weather protection, allowing it to withstand outdoor conditions effectively. Included with the access point must be accessories such as pole and wall mounting kits, a PoE injector, and a power cord, ensuring that all necessary components for installation and operation are provided OEM Authorization and Confirmation of Technical Compliances on OEM's official letterhead item and design must be approved by Consultant without approval material is not considered for installation End</p>		

29	<p>Supply, Installation, Testing, and Commissioning (SITC) of Fire wall with Minimum 3-year Subscription the device shall feature a flexible interface configuration with 12 configurable ports and 2 x SFP (configurable) ports, allowing for versatile connectivity options tailored to various network architectures. It must include 2 USB 3.0 ports for peripheral support and a DB9 console port for efficient management. The device shall be rack-mountable, facilitating deployment in server racks. Furthermore, the design shall be Fanless, ensuring silent operation and energy efficiency. System Capacity and Performance device must deliver exceptional performance metrics, including a SPI firewall throughput of 8,000 Mbps and a VPN throughput of 1,500 Mbps. The IPS throughput shall reach 2,700 Mbps, while the Anti-Malware throughput must be 2,000 Mbps. For comprehensive security with Unified Threat Management (UTM) capabilities, the throughput shall be 1,900 Mbps, enabling multi-layered protection without compromising performance. The system shall support a maximum of 2,000,000 TCP concurrent sessions and up to 1,000 concurrent IPsec VPN tunnels, with a recommended configuration of 300 gateway-to-gateway IPsec VPN tunnels and 500 concurrent SSL VPN users It shall accommodate 128 VLAN interfaces, facilitating effective segmentation and traffic management. Various essential security services, including Sandboxing, Web Filtering, Application Patrol, Anti-Malware, IPS, Reputation Filter, Geo Enforcer, Secure porter, Collaborative Detection & Response, and Device Insight, must be integrated to ensure comprehensive security Features and WLAN Management The VPN functionality shall support multiple protocols, including IKEv2, IPSec, SSL, and L2TP/IPSec, ensuring compatibility with a wide range of environments, including Microsoft Azure and Amazon VPC. For WLAN management, the device must support a default number of 8 managed access points, with a recommended maximum of 300 APs in a single group. The secure WiFi service shall allow for a maximum of 130 tunnel mode access points and up to 520 managed APs, ensuring robust wireless coverage The device must support Cloud Mode for comprehensive central management, offering unlimited registration of devices and seamless monitoring. It shall include features such as Device HA Pro, Link Aggregation (LAG), and support for a maximum of 1,500 concurrent device logins with a burst login rate of 220 users every 30 seconds. Continued</p>	2.000	NO
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	<p>Maximum power consumption shall be capped at 46 watts, with an efficient heat dissipation rate of 120.1 BTU/hr Operating conditions must allow for a temperature range of 0°C to 40°C (32°F to 104°F) with humidity levels from 10% to 90% (non-condensing), while storage conditions must support temperatures from -30°C to 70°C (-22°F to 158°F). The device shall have a mean time between failures (MTBF) of approximately 947,736 hours, ensuring high reliability. The device must comply with various certifications, including FCC Part 15 (Class A), CE EMC (Class A), C-Tick (Class A), and BSMI for EMC. Safety certifications shall include LVD (EN60950-1) and BSMI compliance, ensuring adherence to industry standards firewall capabilities must support both routing and transparent (bridge) modes, including stateful packet inspection, SIP NAT traversal, and H.323 NAT traversal. Advanced features such as traffic anomaly detection, DoS/DDoS protection, and a unified policy management interface for content filtering, application patrol, and SSL inspection must be included to ensure a robust security posture. The Intrusion Prevention System (IPS) capabilities shall include both detection and prevention functionalities, supporting allow lists and rate based signatures to effectively mitigate risks. The Application Patrol feature must identify and control thousands of applications and behaviors, while Sandboxing should provide cloud-based multi-engine inspection for comprehensive threat analysis. The Anti-Malware scanning engine shall support a wide range of file types and protocols, ensuring efficient threat detection and remediation Additional features such as IP Reputation Filters, DNS Threat Filters, and Web Filtering must enhance the overall security framework, providing granular control over network traffic. The system shall offer Geo IP blocking and Device Insight for agentless scanning and classification of network devices, enhancing visibility. Networking functionalities shall include support for Multi-WAN and dual-WAN setups, ensuring robust failover and load balancing capabilities. The device must allow for WAN connection failover via 3G and 4G USB modems, providing added reliability in connectivity. Furthermore, it shall support IPv6 compatibility, ensuring readiness for the next generation of internet protocols Continued</p>		
	<p>device shall feature Cloud Mode for comprehensive management, enabling unlimited registration and centralized control over configurations, monitoring, and reporting. The authentication framework must include a local user database, cloud user database, and support for external user databases such as Microsoft Windows Active Directory, RADIUS, and LDAP. It shall also support IEEE 802.1x authentication, captive portal web authentication, and single sign-on (SSO) capabilities for enhanced security. Logging and monitoring capabilities must include comprehensive local logging, syslog support for up to four servers, and real-time traffic monitoring. The device shall provide built-in daily reports and support email alerts to up to two servers, ensuring operational transparency and quick response to incidents End</p>		

30	<p>Supply, Installation, Testing, and Commissioning (SITC) of Active Directory support a dual CPU configuration, with each CPU having a thermal design power (TDP) of less than 180W. The memory configuration shall include four (4) 32GB RDIMM modules operating at 3200MT/s in a dual-rank arrangement, ensuring optimal performance and memory capacity. The storage solution shall incorporate two (2) 1.2TB SAS ISE 12Gbps 10,000 RPM hard drives with 512n sector size in a 2.5-inch format, compatible with a 3.5 inch hybrid carrier Power supply requirements shall consist of dual, hot-plug, non-redundant power supplies, each rated at 1400W. The server shall be equipped with two (2) jumper cords, specifically C13/C14 rated for 250V and 10A, compliant with India BIS standards, and measuring 4 meters in length. The riser configuration shall be designated as 0, utilizing a half-length, low-profile design with five (5) 16-pin slots and one (1) 4-pin slot, supporting seamless integration and expansion capabilities. server management capabilities shall include Open Manage Enterprise Advanced and iDRAC9 Enterprise 15G, ensuring robust system management and monitoring. Networking shall be supported by Ethernet mezzanine adapters, specifically the Broadcom 57412 dual-port 10GbE SFP+, along with an OCP NIC 3.0 BOSS-S2 controller card that includes two (2) M.2 240GB drives configured in RAID 1 for optimized storage. Additionally, the server shall feature hot-plug capabilities, sliding rails with a cable management arm for efficient organization, and an internal optical drive with DVD±RW and SATA connectivity The system shall support a second M.2 storage device, specifically a 480GB stick, without RAID configuration, alongside a PERC H745 front-load controller managing the two (2) 1.2TB SAS hard drives. The server shall include BIOS and advanced system configuration settings, featuring a performance BIOS setting and UEFI BIOS boot mode with GPT partition support for enhanced flexibility and performance. A minimum of six (6) standard fans shall be incorporated for adequate cooling, with additional provisions for power cords (two (2) C13/C14 jumper cords, 2 meters in length, rated for 250V and 10A per India BIS standards) Furthermore, the server shall support PCIe riser configuration 2, accommodating half- length cards with four (4) x8 slots. Embedded systems management shall be facilitated through multi iDRAC9 Enterprise 15G support, and the server shall include network adapters as specified in the network design documentation to ensure comprehensive connectivity and performance End</p>	1.000	NO
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31	<p>Supply, Installation, Testing, and Commissioning (SITC) of Data server processor designed for a dual CPU configuration, with each CPU having a thermal design power (TDP) of less than 180W. The server shall support four (4) 32GB RDIMM modules operating at 3200MT/s in a dual-rank configuration, ensuring optimal memory performance and capacity. Additionally, the storage solution shall comprise two (2) 1.2TB SAS ISE 12Gbps 10,000 RPM hard drives with a 512n sector size in a 2.5-inch format, compatible with a 3.5-inch hybrid carrier power supply system shall include dual, hot-plug power supplies, each rated at 1400W. The server shall be equipped with two (2) jumper cords, C13/C14 rated for 250V and 10A, compliant with India BIS standards, measuring 4 meters in length. The riser configuration shall be designated as 0, utilizing a half-length, low profile design featuring five (5) 16-pin slots and one (1) 4-pin slot to facilitate seamless integration and expansion capabilities Management capabilities shall include Open Manage Enterprise Advanced and iDRAC9 Enterprise 15G to ensure robust system management and monitoring. Networking shall be supported by Ethernet mezzanine adapters, specifically the Broadcom 57412 dual-port 10GbE SFP+, alongside an OCP NIC 3.0 BOSS-S2 controller card, which shall include two (2) M.2 240GB drives configured in RAID 1 for optimized storage performance. The server shall feature hot-plug capabilities, ready rails with a cable management arm for efficient organization, and an internal optical drive with DVD±RW and SATA connectivity The server shall support a PCIe Riser configuration, specifically riser configuration 2, accommodating half length cards with four (4) x8 slots. Embedded systems management shall be facilitated through multi iDRAC9 Enterprise 15G support, and network adapters shall be provided as per the project design specifications to ensure comprehensive connectivity and performance. ProSupport and Next Business Day Onsite Service shall be included, covering a period of 84 months for hardware support to ensure reliable operational continuity End</p>	1.000	NO
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32	<p>Supply, Installation, Testing, and Commissioning (SITC) of Network Attached Storage The form factor of the proposed storage solution shall be a 2U 8-bay controller, featuring a single controller configuration. The controller shall be equipped with default DDR3 cache memory of 4GB, with an upgrade option available to a maximum capacity of 16GB, ensuring efficient data handling and performance. Connectivity shall be facilitated through four 1GbE (RJ 45) host ports, enabling robust network integration The controller shall support a 6Gb/s SATA drive interface and accommodate both 2.5" SATA SSDs and 3.5" 7,200 RPM SATA HDDs. Advanced features shall include support for S.M.A.R.T., automatic bad-sector reassignment, and dedicated bandwidth allocation to each connected drive, enhancing the reliability and performance of the storage system. RAID options shall be extensive, allowing configurations for RAID 0, RAID 1, RAID 3, RAID 5, RAID 6, RAID 10, RAID 30, RAID 50, and RAID 60 to meet various redundancy and performance needs Data services shall encompass default software features such as SSD caching (both block and file level), thin provisioning (block level), and snapshot capabilities with 64 snapshots per source volume and 128 per system. Local replication shall be supported with four instances per source volume and up to 16 per system. Additionally, remote replication shall be enabled at the file level, supporting Rsync with 128-bit SSH encryption. Optional software features requiring an additional license shall include automated storage tiering (up to four tiers per pool), advanced snapshot management (up to 1,024 per folder), and advanced local and remote replication capabilities. The system shall support major operating systems, including Microsoft Windows Server, Red Hat Enterprise Linux, macOS X, and VMware Supported protocols shall include file-level access through CIFS/SMB, NFS, AFP, FTP/FXP, and WebDAV, while block-level access shall be provided via iSCSI. Management of the storage solution shall be facilitated through web-based management software, enabling user account management, group management, folder access control, quota management, and folder encryption with AES. Integration with Microsoft Active Directory (AD) and Linux LDAP shall be included, along with storage resource management for historical resource usage analysis. The system shall employ a multi-factor authentication login mechanism, Continued</p>	1.000	NO
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	<p>with notification capabilities via email and SNMP traps The proposed solution shall ensure high availability and reliability through features such as immutable object storage, hot-swappable hardware modules, a device mapper, antivirus protection, trunk group configuration, UPS support, and WORM (file level only). Safety standards shall comply with UL, BSMI, and CB certifications, while electromagnetic compatibility shall meet CE, BSMI, and FCC standards. The system shall also adhere to green design principles, utilizing 80 PLUS-certified power supplies delivering over 80% energy efficiency and intelligent multi-level drive spin-down Power supplies shall be redundant and hot-swappable, with a capacity of 250W. The operating AC voltage range shall be from 100VAC at 5A to 240VAC at 2.5A with PFC (auto-switching), and the frequency shall range from 50 to 60 Hz. Environmental specifications shall dictate an operating temperature range of 0°C to 40°C and a non-operating range of -40°C to 60°C. The controller shall be designed to operate at altitudes up to 3,660 m (12,000 ft) and can withstand non-operating conditions up to 12,192 m (40,000 ft). Relative humidity shall be maintained between 5% to 95% non-condensing for both operating and non-operating conditions. NAS Should be 64 TB Populated from Day first End</p>		
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33	<p>Supply, Installation, Testing, and Commissioning (SITC) of All-in-One PC shall support the Windows 11 Home operating system, ensuring compatibility with modern applications and a user-friendly interface. It must be powered by the Intel® Core™ N-series processor, specifically the Intel® Processor N100, which should operate at speeds of up to 3.4 GHz, utilizing Intel® Turbo Boost Technology. This processor shall include a minimum of 6 MB L3 cache, with four cores and four threads, to enhance multitasking capabilities and overall performance. Memory capacity must be no less than 8 GB of DDR5-4800 MHz RAM, organized in a single SODIMM slot. The system shall support a total of two SODIMM slots to allow for future upgrades. Storage must include a minimum of 512 GB PCIe® NVMe™ M.2 SSD to provide fast data access speeds and sufficient storage capacity for applications and files. The display shall measure 54.5 cm (21.45 inches) diagonally, with a Full HD resolution of 1920 x 1080 pixels. The display technology must be VA with an anti-glare coating, and the brightness should be at least 250 nits. The bezel design must feature a three-sided micro-edge layout to maximize the screen-to-body ratio, which shall be no less than 98.88%. Touchscreen capability is not required, but the display must be flicker-free to enhance user comfort during extended use. Multimedia capabilities shall include dual 2 W speakers to ensure adequate audio output for communication and entertainment. Input devices must consist of a wired USB mouse and keyboard to , the device must integrate a 10/100/1000 GbE LAN network interface along with a Realtek Wi-Fi 6 (1x1) and Bluetooth® 5.3 wireless card. These features should ensure fast and reliable wireless connections, compliant with local wireless access point availability. The rear I/O ports must include at least one USB Type-C® port with a 5Gbps signalling rate, two USB Type-A ports with the same signaling rate, two USB 2.0 Type-A ports, one headphone/microphone combo jack, and one RJ-45 port. Expansion capabilities must be supported with a minimum of two M.2 slots, one for SSD and another for WLAN, along with a single HDMI-out 1.4 video connector. The integrated webcam shall be a minimum of 720p HD with temporal noise reduction and should feature dual array digital microphones for clear audio during video calls. The power supply must be a 65 W Smart AC adapter. The unit should meet energy efficiency standards, including EPEAT® registration and ENERGY STAR® certification. In addition, the system shall include a lifetime subscription to Microsoft Office Home & Student 2021, ensuring essential productivity tools are readily available. End</p>	5.000	NO
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34	<p>Supply, Installation, Testing, and Commissioning (SITC) of printer shall function as a multifunctional all-in-one device with a monthly duty cycle capable of handling up to 30,000 pages for both letter and A4 formats. It is recommended that the number of printed pages per month be maintained within the stated range of 250 to 1,500 pages for optimum device performance. The printer shall include a single paper tray with a standard capacity of 250 sheets and shall not feature an envelope feeder support wireless printing, allowing users to print directly from mobile devices. It shall include an automatic document feeder, support for two-sided printing, and offer scanning capabilities to email and PDF formats. A user-friendly touchscreen interface shall enhance the overall experience, while a quiet mode shall be available to reduce noise during operation printer shall utilize Thermal Inkjet technology, offering automatic duplex printing for A4 and letter sizes. It shall support multitasking; however, it shall not include an automatic paper sensor shall achieve a print speed of up to 22 pages per minute (ppm) for black and 18 ppm for color in standard ISO quality. In draft mode, print speeds shall increase to 34 ppm for both black and color prints. Connectivity and Communications Mobile printing capabilities shall include support for Chrome OS, a Smart app, Apple AirPrint™, and Mopria™ Certified solutions. The printer shall feature built-in dual-band Wi Fi (802.11 a/b/g/n/ac) with a self-heal solution for reliable wireless connectivity. Wired connections shall include one Ethernet port and one Hi-Speed USB 2.0 port The printer shall use a four-cartridge system (black, cyan, magenta, yellow) with pigment-based ink. The black cartridge shall yield approximately 1,250 pages, while each color cartridge shall yield around 800 pages. The total number of print head nozzles shall be 6,272, with four cartridges—one each for black, cyan, magenta, and yellow. Printing Media Handling The printer shall support a maximum input capacity of up to 250 sheets and offer output capacities of up to 75 sheets. It shall accommodate various media sizes including A4, A5, A6, B5 (JIS), and envelopes (DL, C5, C6, Chou #3, Chou #4). Print Area Margins shall be set at 3.3 mm for the top, left, right, and bottom for A4 printing The printer shall deliver a print quality of up to 1200 x 1200 rendered dpi for black and up to 4800 by 1200 optimized dpi on HP Advance Photo Paper .Copier Specifications Continued</p>	4.000	NO
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	<p>The maximum number of copies shall be up to 99, with settings available for copies, size, quality, lighter/darker adjustments, paper size, resizing, two-sided copies, ID copy, collating, binding margins, enhancements, cropping, and a copy preview function. The copy speed for black shall be up to 18 copies per minute (cpm) scanner shall utilize CIS technology and support color scanning. Maximum scan size shall be 216 x 356 mm, with a bit depth of 24 bits and 256 levels of grayscale. Supported file formats for scanning shall include JPEG, TIFF, PDF, BMP, and PNG. The hardware scan resolution shall be up to 1200 x 1200 dpi, while the optical scan resolution shall also be up to 1200 dpi. printer shall be compatible with Windows 11, Windows 10, macOS 11 Big Sur, macOS 12 Monterey, macOS 13 Ventura, Linux, and Chrome OS. Memory The printer shall have 512MB of memory without any memory slots. Advanced Features The printer shall include digital fax capabilities for sending faxes to a PC, available with Windows software. System Components The control panel shall feature a 2.7" (6.86 cm) touchscreen with a color graphic display, LED indicator light, and three buttons for home, help, and back The maximum dimensions shall be 581 x 849 x 306 mm when the cleanout and output tray are fully extended. When not extended, dimensions shall be 581 x 445 x 306 mm. Power Consumption The printer shall consume 0.11 watts (Manual-Off), 4.67 watts (Standby), and 1.17 watts (Sleep). It shall include an internal built-in universal power supply. Software and Applications The printer shall support various applications and provide a seamless printing experience across compatible devices End</p>		
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35	<p>Supply, Installation, Testing, and Commissioning (SITC) of standard rack shall be constructed with a welded frame comprising four pillars made of 1.5 mm thick Cold Rolled Close Annealed (CRCA) sheet, utilizing a five-fold profile for enhanced structural integrity. The frame shall be reinforced through welding from the top to the bottom and connected to top and bottom covers featuring air- cooled ventilation to facilitate the exhaust of hot air. The front door shall incorporate provisions for both glass and perforation, ensuring adequate ventilation, while the rear door shall also be perforated for optimal airflow. Both side panels shall be fitted with slam latches to allow for easy removal Frame The rack shall utilize a 1.5 mm CRCA multi-fold fabricated frame designed to achieve high structural strength, capable of supporting a load of up to 1250 kg. The design shall facilitate easy assembly with a semi knocked-down (SKD) configuration Doors The rack shall feature a single front perforated dual door and a rear dual perforated door to provide It shall also support the installation of a cable tray. 19" Rails The rack shall include four U-marked rails made of 2 mm CRCA sheet, adjustable to accommodate varying depths Ingress Protection Certifications IP 20 in accordance with IEC 60529 Impact Protection: IK 08 in accordance with IEC 62262 Corrosion Resistance: Tested via the Salt Spray test per ISO 9227 for 168 hours Process validations conducted through NABL accredited laboratories to ensure compliance and robustness rack shall have a weight capacity of up to 1250 kg. Painting Shade The rack shall be finished in RAL 9005 with a fine texture, achieving a thickness of 60 to 80 microns. Powder Coating A fine texture finish shall be achieved through the application of an epoxy polyester hybrid powder coating, with a deposit thickness of 60 to 80 microns. The finish shall provide a high degree of scratch resistance against sharp objects side panels shall be removable and constructed from sheet steel, featuring a single-point locking mechanism with quick-release latches. Cooling Fans Cooling fans shall operate at 230V AC, delivering a flow rate of 90 CFM with a noise level of 42 dB. Power Box The rack shall include a power distribution unit capable of accommodating 06/13 or 6/16 Amp multi-standard sockets, providing a total of 12 sockets shall be equipped with a set of four castors (2"/3" height), with two featuring brakes on the front side and two without brakes for mobility. Mounting Hardware The rack shall be supplied with a mounting hardware packet, including a set of M6 screws, cage nuts, and washers, in quantities of either 10 or 20 End</p>	5.000	NO
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36	<p>Supply, Installation, Testing, and Commissioning (SITC) of Network Management System (NMS) shall provide a comprehensive suite of supported protocols out of the box, including but not limited to SNMP, JSON, WinRM, XML, SQL, JMX, SFTP, FTP, JDBC, HTTP, HTTPS, VMware, WS-Management, and Prometheus. This system must support any type of provisioning, encompassing automatic, directed, topology, interface, and service discovery. Additionally, it shall interoperate seamlessly with virtually any configuration management system to ensure broad compatibility and functionality</p> <p>Fault Management The NMS shall incorporate robust fault management capabilities, including service assurance via intelligent periodic polling. It must support autonomous device problem reporting and message enrichment to facilitate accurate and timely issue identification</p> <p>Performance Management The system must excel in performance management by providing the broadest suite of data collection protocols, including 14 distinct options, thus eliminating the need for third-party tools. The NMS shall enable streaming telemetry, real-time custom thresholding, trend analysis, and forecasting. Furthermore, it must facilitate time-series performance data analysis, visual plotting, and operational forecasting in real-time, allowing for comprehensive performance insights</p> <p>Application Perspective Monitoring The NMS shall enable monitoring of service availability from multiple perspectives. It must pinpoint not only where issues occur but also assess their impact on the digital experience of users and machines, ensuring a holistic view of application performance</p> <p>BGP Monitoring Protocol (BMP) Support The system shall support monitoring of Border Gateway Protocol (BGP) sessions and routing information on routing devices. This capability is essential for leveraging status updates and statistics to enhance advanced monitoring and management functions.</p> <p>Business Service Monitoring The NMS shall offer monitoring and modelling capabilities for high-level business services, allowing users to swiftly identify critical problems that may affect these services. This feature is vital for maintaining operational integrity and service quality</p> <p>NMS shall include a remote data collection feature that provides access to previously inaccessible areas. This capability will be complemented by application perspective monitoring, which will monitor service availability at specific locations from diverse perspectives</p> <p>system must support five flow protocols, with the ability to handle over 350,000 flows per second. It shall provide deep-dive analysis and enterprise-level</p> <p>Continued</p>	1.000	NO
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	<p>T reporting, ensuring that users have access to comprehensive traffic data NMS shall allow for the configuration of most features through a user-friendly web interface or XML scripting. Customization options must enable users to tailor the NMS to meet specific operational requirements effectively NMS must be designed for scalability, enabling the monitoring of tens of thousands of devices through a distributed and tiered architecture. It shall manage 1.2 million data points every five minutes, monitor over 5,000 interfaces, and handle hundreds of thousands of discrete devices, millions of performance metrics, and thousands of events per second, thereby supporting enterprise-level operations Enterprise Reporting and Visualization The NMS shall provide real-time notifications for high-priority responses and customizable Grafana dashboards. It must include resource graphs, database reports, and various charting capabilities to ensure users have a clear view of their network performance. Topology Maps The system must support the definition of complex layered topologies, utilizing semantics and focal point features that allow for rapid adjustments and enhancements to the maps. Integration of topology maps into service problem ensure timely communication of important alerts. Alarm Correlation The system shall incorporate an artificial intelligence framework that logically groups related faults (alarms) into higher-level objects (situations). This functionality must enable users to quickly detect, visualize, prioritize, and resolve situations across the entire IT infrastructure, thereby enhancing overall incident management NMS shall be compatible with Java versions 8 through 11, with the most recent version of JDK 11 strongly recommended. It must support PostgreSQL version 10 or higher (up to and including 13). For proof of-concept workloads, the system shall require a minimum configuration of 4GB RAM and 2 CPUs. Supported operating systems shall include RHEL 7.x and 8.x, as well as CentOS 7.x and 8.x. Common Outbound Ports The NMS must not be limited to, but shall include common outbound ports such as ICMP (echo-request), SNMP (161/udp), SSH (22/tcp), HTTP (80/tcp), and HTTPS (443/tcp). Monitoring Capabilities Finally, the NMS shall be capable of monitoring virtually any service on any device, ensuring a versatile and comprehensive network management solution that meets the evolving needs of modern IT environments. End</p>		
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37	<p>Supply, Installation, Testing, and Commissioning (SITC) of PTZ Camera Shall have image sensor must be a minimum of 1/2.8-inch Progressive Scan Complementary Metal-Oxide-Semiconductor (0.9071 cm) with a minimum resolution of 2 Megapixels, and it must provide effective pixel output of at least 1920(H) x 1080(V). The video output shall include a minimum of one Bayonet Neill-Concelman (BNC) connector port, delivering a signal of 1.0 volts peak-to-peak at 75 ohms. The signal-to-noise ratio must exceed 56 decibels, ensuring clarity in captured footage. The minimum illumination capacity must include 0.005 Lux in color mode and 0.0005 Lux in black and white mode at F1.6, with 0 Lux capability when infrared is activated. Focal length should range from 3.95mm to 177.7mm. White balance must offer options for automatic, automatic tracking, indoor, outdoor, and manual modes. Focus control must support both auto and manual adjustments, while the close focus distance must be at least 100mm to 1000mm. The angle of view should range from a horizontal minimum of 70.3° to 1.8°. The camera must support an electronic shutter speed between 1/1 second and 1/30,000 seconds, with automatic gain control available in both auto and manual modes. The backlight compensation must include options for backlight compensation, high light compensation, and wide dynamic range (WDR) with a minimum of 120 decibels. Optical zoom must be no less than 45x, and digital zoom must be at least 16x. Pan travel shall support a range of 0° to 360° endlessly, with a speed range of 0.1° to 200°/second, while tilt travel must range from -20° to 90° with auto-flip at 180° and a speed range of 0.1° to 120°/second. The camera shall support manual speed adjustments for pan and tilt as specified. The unit must include at least 300 presets with a preset speed of 240°/second for pan and 200°/second for tilt. Special features shall include infrared coverage up to 300 meters, defog capabilities, 5 patterns, 8 tours, auto pan, and auto scan functionalities. It must support up to 24 privacy mask areas. A power-up action feature must restore the camera to its previous Pan-Tilt-Zoom (PTZ) and lens status after a power loss, and the idle motion feature shall activate preset, scan, tour, or pattern modes if idle for a user-defined period. Continued</p>	3.000	NO
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	<p>The camera must include a Day/Night Infrared Cut Filter (ICR) with auto (ICR), color, and black and white settings. Video compression formats should include a minimum of H.265+, H.265, H.264+, and H.264. The video streaming capabilities must accommodate a main stream with 1080P/1.3 Megapixels/720P at 150/60 frames per second, and sub-stream support should be available at D1/CIF with 125/30 frames per second, with another sub-stream option for various resolutions at frame rates of 1 to 25/30 frames per second. Motion detection and Region of Interest (ROI) functionalities must be supported. The camera must have audio streaming capabilities with a minimum of 1 input and 1 output channel. Networking requirements include Registered Jack 45 for 10Base-T/100Base-TX connections, along with a recommended RS-485 port for communication. Intelligent Video Surveillance (IVS) must support tripwire detection, intrusion detection, abandoned or missing objects detection, face detection, and heat map analysis. Supported protocols should include IPv4/IPv6, HTTP, HTTPS, SSL, TCP/IP, UDP, UPnP, ICMP, IGMP, SNMP, RTSP, RTP, SMTP, NTP, DHCP, DNS, PPPoE, DDNS, FTP, IP filtering, QoS, Bonjour, 802.1x, ONVIF Profiles S&G, and an API. Alarm functionality must include a minimum of 7 input channels and 2 output channels. Infrared range must reach at least 300 meters. The operational temperature must range between -40°C and 60°C, with a relative humidity of less than 95%. The camera should be compatible with smartphones, including iPhone, iPad, and Android phones. The memory slot must support network-attached storage, local PC instant recording, and a microSD card up to 256GB. The weatherproof rating must comply with International Protection Marking 67 standards, ensuring resilience in harsh conditions. • Additionally, the equipment must be accompanied by OEM authorization and compliance certification provided on the OEM letterhead. Furthermore, a copy of the Standardisation Testing and Quality Certification (STQC) must be submitted with the technical bid to verify adherence to required quality standards End.....</p>		
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38	<p>Supply, Installation, Testing, and Commissioning (SITC) of Camera must incorporate a 1/2.8" 2MP PS CMOS image sensor with an effective pixel resolution of 1920 (H) × 1080 (V), providing optimal image quality. It must operate effectively with a minimum illumination of 0.006 Lux@F1.6 in color mode at 30 IRE, 0.0006 Lux@F1.6 in B/W at 30 IRE, and 0 lux when IR is on, ensuring clarity even in low-light conditions. Shutter speed settings must be adjustable between auto and manual from 1/3 s to 1/100,000 s for flexible image capture. The device should provide angle adjustments of 0°-355° for pan and rotation, and 0°-65° for tilt to accommodate various installation scenarios. The device must include 512 MB RAM and 128 MB ROM, allowing for efficient operation. White balance options should include auto, natural, streetlamp, outdoor, manual, and regional custom settings to adapt to different lighting environments. The motorized lens must feature a variable focal length of 2.7mm to 13.5mm with a fixed iris type and a maximum aperture of F1.6, offering a close focus distance of 0.8 meters for detailed imaging. DORI distances must be up to 144.8 meters for detection, 57.9 meters for observation, 29.0 meters for recognition, and 14.5 meters for identification, ensuring effective coverage. Backlight compensation must support BLC, HLC, and WDR (120dB), enabling optimal performance in challenging lighting situations. The device must provide a horizontal angle of view ranging from 109° to 30°, a vertical angle of 56° to 17°, and a diagonal angle of 131° to 35°, ensuring comprehensive scene coverage. It should support H.265 Quad Stream for efficient video streaming and deliver a signal-to-noise ratio (S/N) greater than 56 dB, ensuring clear video output. Video format compatibility must include both PAL and NTSC, with support for various video compression methods like Interstream, H.264+, H.265, H.264, H.264H, H.264B, and MJPEG (available only through the substream). Resolution capabilities must include options from 2MP down to CIF, with adjustable bit rate control modes (CBR/VBR) ranging from 3 kbps to 6144 kbps for H.264 and H.265 formats. The device should provide 3D DNR for noise reduction and electronic image stabilization (EIS) for steady image capture. Motion detection must support up to 4 rectangular areas, while privacy masking must allow for 4 customizable zones. • Audio functionalities should include two-way talk, a built-in mic, and support for audio input and output through RCA ports. Continued</p>	97.000	NO
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	<p>Audio compression options must encompass PCM, G.711a, G.711Mu, G.726, MPEG2 Layer2, and G.722.1 formats, ensuring flexible audio management. Alarm capabilities must include 1 input channel (5mA, 3V-5V DC) and 1 output channel (300mA, 12V DC). The OSD must allow for the display of camera titles, date, and time. The device should support a range of network protocols, including SFTP, IPv6, IPv4, DNS, RTCP, NTP, RTP, HTTP, HTTPS, SNMP V1/V2/V3, TCP/IP, PPPoE, UPnP, NFS, UDP, ICMP, SSL, DHCP, SMTP, RTSPS, ONVIF (Profile S, Profile G, Profile T), unicast, and multicast, ensuring compatibility with diverse network environments. It must also support IVS features like tripwire, intrusion detection, object abandonment or missing detection, SMD, and face detection. Ethernet connectivity should be provided through an RJ-45 port with 10/100Base-T support, and the device must function in day/night mode with options for Auto(ICR), color, or B/W. Alarm events should cover motion detection, tampering, audio detection, network disconnection, IP conflicts, memory card state, and space detection. Cybersecurity features must include AES 256-bit encryption, configuration encryption, trusted execution, security logs, WSSE, account lockout, syslog, video encryption, IP/MAC filtering, HTTPS, trusted upgrade, and trusted boot, providing a secure environment for data transmission. The device should support up to 20 users or hosts with a total bandwidth capacity of 80 Mbps. Browser compatibility must include Microsoft Edge and Chrome. It should also offer a mirror function, storage options via SFTP, micro SD card support up to 512 GB, and NAS compatibility. Frame rate flexibility is essential, supporting main and sub-stream configurations up to 30fps across various resolutions. The IR functionality must provide an effective range of 40 meters with three IR LEDs for night vision. Image rotation capabilities must include 0°, 90°, 180°, and 270° orientations, supporting 90° and 270° rotations at resolutions of 1080p and lower. Defog functionality must be included for enhanced image clarity in adverse weather conditions. Weatherproof and vandal-resistant standards should be IP67 and IK10, respectively, ensuring reliable operation in challenging environments. Continued</p>		
	<p>The device must operate within a temperature range of -30 °C to +60 °C (-22 °F to +140 °F) with an operating humidity level of up to ≤95% RH non-condensing. Storage temperature should range from -40 °C to +60 °C (-40 °F to +140 °F), and storage humidity must support 10%-95% RH non-condensing. Power options should include 12 VDC, 24 VAC, or PoE (802.3af) with a basic power consumption of 1.6 W (12 VDC), 1.9 W (24 VAC), and 3.1 W (PoE). The maximum power consumption should be 7.9 W (12 VDC), 9.5 W (24 VAC), and 9.9 W (PoE) when operating with H.265, WDR, intelligence, and IR functionalities enabled. End</p>		

39	<p>Supply, Installation, Testing, and Commissioning (SITC) of Video management Software with Licenses 200 From Day 1st) The system must be scalable, allowing easy expansion up to 20,000 channels and a 2 GB storage capacity through a distributed system. System should serve as the upper-level platform to manage and cascade Series of products, ensuring smooth scalability. For high availability, the system must support hot standby and N + M redundancy, allowing failover servers to back up primary recording and event servers, ensuring continuous operation System should be AI-driven, providing intelligent search capabilities for locating humans and vehicles across specific times and locations. It must enable the archive to manage events, pictures, videos, and documents uniformly, with the capability to conduct cross-event tracking. Customizability is essential; the system must allow integration with other systems and devices using API/SDK/ONVIF/Bridge to meet user-specific requirements, thus enhancing market competitiveness. System capabilities must include support for hot standby for the main server, distributed deployment, N + M redundancy, cascading deployment, and compatibility with both LAN and WAN setups. Independent database deployment should also be supported for optimal system organization. The PC client configuration should facilitate online and offline activation and deactivation of licenses System parameters must allow configuration of data storage duration for logs, alarms, POS records, and other relevant data. Time synchronization capabilities must include timed synchronization and device connection synchronization, ensuring accuracy. The system should support email server and active directory configurations, the import of HTTPS certificates, setting POS end signs, device login modes, and remote logging capabilities, with support for independent database deployment. Backup capabilities must include both automatic and manual options, with flexibility in backing up system databases daily, weekly, or monthly, and restoration options from server or local files. The synthesis feature must enable event synchronization, acting as middleware to connect with third-party systems, configure event schemes, and trigger linkages. It must also support data synchronization with third- party databases for attendance and access control records. Device management functionalities should support initializing devices, adding devices via multiple methods such as IP, domain, or automatic registration (including 3G, 4G, and DHCP devices), and managing CP Plus and third-party devices through ONVIF protocol.</p> <p>Continued</p>	1.000	NO
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	<p>The system must facilitate importing devices in batches, linking cameras for alarm display, and configuring encoder parameters like image, video, snapshot, OSD, and audio. Additionally, the system should support intelligence configurations, including IVS, face detection, people counting, and heatmaps User management should be role-based, offering three types of roles: super administrator, administrator, and common role, with customizable permissions. Users should be able to log into different clients simultaneously using the same account and be restricted by MAC addresses or expiration details if required. The system must ensure password security through expiry dates, forced changes at first login, and the ability to lock users storage management feature must support both edge and central storage, with central storage expandable via iSCSI. It should include disk quota management, allowing the allocation of cameras to different disk groups for effective storage utilization. Application configuration must allow flexible recording plans, setting storage destinations, recording stream types, and creating templates based on various time frames. It must also support backing up videos and retrieving body-worn files personnel and vehicle management feature should facilitate adding, editing, and deleting personnel information, with the capability to import data like ID, card, fingerprint, and face from devices or templates. It should enable issuing cards or fingerprints via USB readers and managing access through door and vehicle groups. The system should provide robust watch list management for both personnel and vehicles, including start and end times for vehicle monitoring The monitoring center must provide real-time video viewing capabilities with customizable layouts and PTZ control. It should support electric focus, remote barrier operations, digital zoom, fisheye dewarping, smart tracking for panoramic cameras, and audio talk functionalities. The system must allow for alarm management, real-time event display, and region of interest division for detailed video analysis. Playback features must include playing back recordings from devices or central storage, applying video filters, reverse playback, digital zoom, frame-by-frame viewing, and locking or marking important recordings. Users should be able to download videos in multiple formats and decode videos to video walls. The system must support smart and thumbnail searches to improve retrieval efficiency</p> <p>Continued</p>		
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	<p>For video wall management, the system must facilitate creating and managing different video wall tasks, decoding real-time video, and scheduling tasks. It should include remote access to video streams, supporting up to 64 video channels per screen. The system must allow for stream adjustments, audio management, and video channel tours Mapping capabilities should support both online and offline maps with GIS integration. It must provide features like hot spot configuration, live or recorded video viewing on maps, and distance measurement. Alarm sources must be visible on the map, with remote door controls available. Event management must include various event types, customizable event schemes, priority settings, and linkage actions like recording, snapshot, and alarm outputs. It should support real-time event monitoring and history tracking, with the ability to forward events to relevant users for efficient response The system must include comprehensive event statistics that can be analyzed on a daily, weekly, and monthly basis. It should provide detailed event information statistics, including the total count, processing status, and processed events, allowing for efficient tracking of events based on priority levels—high, medium, and low. Users must be able to generate event trend reports, which will help in analyzing the types and resources associated with frequently occurring ents. The DeepXplore feature should facilitate rapid retrieval of historical records and target location, enabling searches for faces and human bodies using specific features or images. The system must allow users to search person and vehicle archives effectively and generate tracks based on person, vehicle, and access control records The Case Bank function is essential for creating a centralized case database to manage case-related events, pictures, videos, and documents efficiently. This functionality must support quick report generation and case archiving, with the ability to customize case report logos and maintain records of case updates, including modification history details such as user, time, and specifics of changes. Users should also be able to upload videos and pictures related to cases and analyze case statistics, including total, open, and closed case counts Continued</p>		
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	<p>A robust Maintenance Center must be integrated, providing real-time monitoring of server status, including CPU, RAM, disk, network, and service health. Device status should cover a variety of components such as encoders, ANPR systems, access control devices, video intercoms, alarm controllers, and others. The system must provide detailed source and storage information for video channels, face/alarm pictures, and incident files, along with the capability to conduct exception searches and export detailed reports. Scheduled reporting should allow for daily, weekly, and monthly summaries. Additionally, the system must support batch upgrades for CP Plus IPCs and access control devices. Access Management features should include the ability to add, edit, and delete door groups, granting access permissions associated with those groups. The system must support advanced access control rules, including anti-passback, first card unlock, inter-door locks, multiple card unlocks, and remote verifications. Monitoring door status and events should be facilitated with related video visibility and the capability to lock or unlock doors with a single command. Global operations for door management, including opening or closing all doors simultaneously, should also be available, alongside comprehensive log information and record extraction capabilities. In terms of video intercom functionality, the system should manage call configurations, including device groups and management relations, as well as provide the ability to issue and manage contact lists. Users must be able to conduct video intercom communications based on SIP protocol with video intercom devices, and the system must enable users to view, delete, or freeze user accounts as needed. Recording and exporting video intercom records should also be supported. The attendance module must allow the configuration of access control devices to function as attendance stations, including time period and holiday management, as well as attendance shift arrangements. Attendance reports should encompass various types of records, including anomaly and card-swiping reports, with export capabilities and synchronization for offline attendance records. Visitor management features must support visit and appointment registration, allowing for access permissions to be issued via card or face recognition. The system should enable automated visitor management for arrivals and departures, maintain visitor records, and configure default permissions and email templates. For entrance management, Continued</p>		
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	<p>the system must facilitate parking lot configuration, displaying total and available parking spaces and binding parking space displays to information screens. It should provide real-time license plate recognition capabilities and allow barrier control via card or remote access. Users should be able to manage on-site vehicle records and ANPR details, with search and export functionalities for vehicle records. The intelligent analysis component must provide real-time counts and historical data analysis, generating reports on a daily, weekly, monthly, and yearly basis. Users should be able to visualize and export area specific people counting analyses and access video intercom records, along with heat maps. The alarm controller must support arming and disarming of devices, subsystems, and partitions, with options for forced arming and bypassing zones. Users must be able to isolate zones as needed In EVMS Pro V2.0, history records should allow users to view recently accessed channels, enabling quick access to live video or playback of those records. The system must support multiple channel views simultaneously, with a maximum of 16 channels, and provide various stream quality options (HD, SD, and fluency).Live view functionalities must include PTZ control, snapshot capabilities, local recording, and audio communication. The system should allow for horizontal screen playback and support fisheye dewarp features for enhanced visualization For playback, users should be able to access both device and center recordings, with a visual calendar indicating available videos. The playback features must include a range of speeds, including up to 8X and 1/8X, and support manual recording and snapshot functions. Mapping capabilities should integrate Google maps and raster maps, allowing users to visualize video channels and access live and recorded video feeds Access control management must display relevant device information, with remote door management capabilities, including states like always open or always closed. Users should be able to revert doors to these default settings easily. Face recognition functionalities must enable users to search the face database or snapshot records for targets by uploading face images, alongside effective management of the face database The system should also support video metadata classification for easy searches of targets, distinguishing between people, vehicles, and non-motor vehicles. Video intercom information must be accessible, detailing device names, types, and numbers, along with call histories for tracking communication activity Continued</p>		
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	<p>Alarm management features should include alarm subscription capabilities, offline notification pushes, and the ability to search and handle alarm messages effectively, including access to historical alarm data Favourites management should enable users to quickly view videos from channels marked as favourites, streamlining access to preferred content. File management should support viewing pictures and videos saved locally, with export options to mobile devices, and allow for the deletion of media as needed. Message functions should provide access to unlocking records and alarm messages for comprehensive event tracking. The system settings must allow users to view account information, enable event subscriptions, set stream encryption, and configure gesture passwords for enhanced security. Lastly, visitor management should support the generation of visitor passes and facilitate the search for visitor records to maintain an organized visitor tracking system End</p>		
40	<p>Supply, Installation, Testing, and Commissioning (SITC) of Network Video Recorder The device must feature an industrial-grade embedded processor and operate on an embedded LINUX operating system. It should support input from up to 128 IP camera channels and offer user access through a web interface or a local GUI. Video output capabilities should include 2-channel VGA and 4- channel HDMI, with resolutions as follows: VGA outputs must support up to 1080p, HDMI1 and HDMI2 up to 4K, HDMI3 up to 8K, and HDMI4 up to 1080p in simultaneous mode. In heterogeneous mode, VGA1 and HDMI1, as well as VGA2 and HDMI2, should output video simultaneously, with VGA maintaining a resolution of 1080p and HDMI outputs reaching up to 4K for HDMI1, HDMI2, and HDMI3, while HDMI4 supports up to 1080p The device must support a variety of compression formats, including H.265, Smart H.264+, H.264, MPEG4, and MJPEG, and should utilize an Interstream encoding strategy. It should have a single RCA channel for audio input and output, with audio compression in G.711a, G.711u, PCM, and G726 formats. For Automatic Number Plate Recognition (ANPR), it must accommodate up to 32 channels, with a database capacity of up to 20,000 entries for blocklist and allow list management. It should include advanced AI capabilities, supporting up to 24 channels for perimeter performance AI with 10 IVS rules per channel, and provide support for 64 channels of perimeter AI processing directly from the camera. The Smart Motion Detection Plus (SMD Plus) functionality must be available for up to 32 channels through the NVR and up to 64 channels through the camera, offering enhanced filtering of human and motor vehicle movements to minimize false alarms The AI functionality by the camera must encompass capabilities such as face detection, face recognition, video metadata generation (for humans, motor vehicles, and non- motor vehicles), stereo analysis, crowd distribution, people counting, ANPR, vehicle density analysis, and object monitoring. The NVR's AI functionality should similarly support face detection, recognition, and video metadata analysis, including human attributes like gender, age, and the presence of accessories like glasses or masks. The</p>	1.000	NO
	<p>face database should accommodate up to 40 databases, storing a maximum of 300,000 images with a total capacity of 48 GB. Each image should allow for associated details like name, gender, date of birth, address, credential information, and regional data. Continued</p>		

	<p>Face recognition performance by the NVR must support configurations of 20 channels for face detection by camera with face recognition by the recorder, processing 20 images per second, or 4 channels of face detection and recognition by the recorder itself, processing 12 images per second. The device should also support up to 8 channels of metadata performance through the NVR and up to 32 channels through the camera. In terms of network capabilities, the device must handle a bandwidth of 1024 Mbps for incoming, recording, and outgoing data streams when AI is disabled, and 512 Mbps when AI is enabled. Video display options should include a variety of splits for both the main screen (up to 64 splits) and sub-screen (up to 36 splits), with support for multi-channel playback of up to 16 channels. The device should offer decoding capabilities ranging from 2-channel 32 MP at 30 fps down to 160-channel D1 at 30 fps. Playback features must include standard functions like play, pause, stop, and fast forward, as well as frame-by-frame viewing and partial zoom. It should support various recording modes, such as manual, alarm-triggered, motion-detection, and scheduled recording, with multiple backup options including portable hard drives, eSATA disks, burners, USB devices, and network backups. Alarm management should support 16 input channels and 8 output channels, with a range of alarm types including motion detection, video tampering, video loss, scene changes, and more. Anomalous conditions like camera offline status, storage errors, and IP conflicts must also be supported, alongside intelligent alarms for face detection, perimeter protection, and other AI-driven notifications. Alarm linkage features should include recording, snapshots, external alarm outputs, and various alerts like buzzer and email notifications. The device should support iOS and Android smartphones for remote access, include RAID support for RAID 0/1/5/6/10 with hot-swapping capabilities, and allow for the installation of up to 16 SATA hard disks with a capacity of 16TB each. The available ports must include 4 USB (2 front USB 2.0 and 2 rear USB 3.0), RS485 and RS232 interfaces, an eSATA port, and 4 HDMI and 2 VGA video output ports. It should support network configurations with 4 Ethernet ports (10/100/2500 Mbps RJ-45) and various network modes such as multi-address mode, load balancing, and fault tolerance. Continued</p>		
	<p>For communication protocols, the device must support HTTP, HTTPS, TCP/IP, IPv4, RTSP, UDP, NTP, DHCP, DNS, SMTP, UPnP, DDNS, Alarm Server, IP Search, Multicast, InstaOn cloud, Auto Registration, iSCSI, ONVIF 2.2.06 (Profile S/T/G), CGI, and SDK. It should be compatible with web browsers like Chrome, IE 9 or later, and Firefox. Power requirements include a range of 100-240V AC at 50Hz, with support for redundant power supply options. The power consumption should be less than 18W without hard disks installed, and the device must operate within a temperature range of -10°C to +55°C and a humidity range of 10%-93% non-condensing. End</p>		

41	<p>Supply, installation, commissioning, and testing of Multi-Camera Switching Server system shall provide full support for titles, graphics, and layouts, with the ability to incorporate titles, logos, and backgrounds easily. An intuitive graphic designer shall be included to facilitate the creation of multi-source layouts, enhancing visual flexibility and user experience. The program recording capability must support MP4 files using the H.264 codec, with a user-selectable bitrate of up to a minimum of 10 Mbps. The system shall also offer ISO recording functionality, allowing MOV file formats. The recording capacity must incorporate a minimum of 316 GB SSD internal storage, allowing for efficient and reliable storage of recorded content. For streaming capabilities, the system must support streaming to any RTMP server, ensuring compatibility with a wide range of streaming platforms. Additionally, NDI® support shall be mandatory, covering both inputs and program output for flexible connectivity options. Camera control features shall enable management of Crestron 1 Beyond PTZ cameras and tracking cameras over IP, with compatibility to be verified against a complete list of supported cameras. For comprehensive third-party control, the system shall offer REST API over network (TCP). The system must support a wide range of compatible codecs, including output via 3G-SDI, with SDI to USB-A 3.0 converters included, facilitating connections to external conferencing codecs such as Microsoft Teams® software, Zoom Rooms® software, and others. The system configuration shall be browser-based, with secure login and user administration features. Customizable preset options must be provided for sleep, wake, and scenario actions, allowing for efficient management and customization of system behavior. For communication, Ethernet support must include minimum 100/1000/2500Mbps throughput, ensuring optimal network speed for all operations. USB connectivity shall provide a minimum of USB 3.2 host ports, compatible with devices such as mouse, keyboard, data drives, and camera signals. Continued</p>	1.000	NO
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	<p>The system shall be equipped with NDI® HX support, enabling up to a minimum of 12 NDI® HX inputs and 1 NDI® HX output, ensuring flexibility for high-quality video communication. USB connectivity shall include (2) USB Type-A 3.2 (Gen 2) connectors on the front, and (5) USB Type-A 3.2 (Gen 2) connectors, along with (1) USB Type-C 3.2 (Gen 2, 5V/3A) connector on the rear for various peripherals and camera connections. SDI input/output capabilities must include (7) 3G-SDI mini DIN connectors for camera video input and (1) 3G-SDI mini DIN connector for output, supporting high-quality video connections. HDMI output shall consist of (2) HDMI 2.0b connectors to provide HDMI digital video/audio output, while (4) DisplayPort™ 1.4a connectors shall be included for monitor connections. The LAN ports shall be no less than (3) RJ-45 connectors, supporting 10/100/1000/2500 Mbps Ethernet connections for reliable network communication. Audio input and output functionalities shall incorporate (1) 1/8 in. 3.5 mm TRS connectors for unbalanced line-level audio input and output, ensuring high-quality audio signal handling. Additionally, Dante® networking audio input and output shall be supported to integrate with professional audio systems. In terms of environmental compliance, the system shall operate within a temperature range of 32° to 104° F (0° to 40° C) and humidity range of 5% to 90% RH (non-condensing), ensuring optimal functionality across various environments. Heat dissipation shall be a minimum of 477 BTU/hr, with a maximum of 1706 BTU/hr to manage heat efficiently during operation. The device shall comply with all necessary regulatory standards, including Part 15 Class A, IC Class A, CE, and Intertek® ensuring that it meets industry-wide safety and performance standards. Specifications outlined above reflect the minimum required standards for the system's design, and the itemder must ensure all design parameters are adhered to without compromise. Any deviations from these specifications must be accompanied by detailed justifications and will be subject to review and approval. End</p>		
42	<p>supply installation testing and commissioning of BMS Computer System: i7 Processor or Equivalet Server PC, Intel(R) Xeon(R) Processor, 2.93GHz, 4MB Cache with 32 GB RAM, & 1 TB HDD, 10/100 Mbps Ethernet card, USB connection & internal modem, Microsoft(R) Windows(R) 7 OS Professional Enterprise, Web server software, DVD-ROM Drive (with RAM), 100/1000 Mbps NIC for Network connection and anti virus software with 32" colour graphics monitor as per Tender Specifications. Accessories included Optical Mouse, Key Pad, Laserjet colour A4 printer with the above BMS System configuration. Windows Licensed software compatible with the BMS platform etc. complete as required.</p>	1.000	NO

Sr. No.	Description of Item	Unit	Qty
	Baggage and ID Card and Management Software control Panel		
43	<p>Supply, Installation, Testing and commissioning (SITC) of The printing system shall be of minimum dye sublimation or resin thermal transfer technology, ensuring a resolution of minimum 300 dpi (11.8 dots/mm) continuous tone while supporting a minimum color depth of up to 16.7 million colors and 256 shades per pixel or better. The print ribbon configuration must be such that it provides both a disposable ribbon cartridge (EZ) and an economical, eco-friendly refill ribbon for cartridge (ECO), with both variants supporting a full-color resin black and overlay panel, with a minimum yield of 250 prints (YMCKO*), while additional options shall include but not be limited to resin black standard with a minimum 1000 prints, full-color half-panel with resin black and overlay panel (YMCKO*) supporting a minimum of 350 prints, with exclusive EZ configurations including full-color with two resin black panels and overlay panel (YMCKOK*) supporting a minimum of 200 prints, resin black with overlay panel (KO*) supporting a minimum of 500 prints, resin black premium with a minimum of 1000 prints, resin white with a minimum of 1000 prints, and metallic gold with a minimum of 450 prints or better. The system shall exhibit a minimum printing speed of 6 seconds per card for K*, 8 seconds per card for KO*, 16 seconds per card for YMCKO*, and 24 seconds per card for YMCKOK* or faster. It must be equipped with security features including but not limited to resin scramble technology to obscure any resin panel-printed information making it unreadable, with minimum AES 256 encryption compliance or better. The system shall support minimum standard card sizes of CR-80 (3.375"L x 2.125"W / 85.6 mm L x 54 mm W) and CR-79 adhesive back (3.313"L x 2.063"W / 84.1 mm L x 52.4 mm W) while ensuring a minimum print area of CR-80 edge-to-edge (3.36"L x 2.11"W / 85.3 mm L x 53.7 mm W) and CR-79 (3.3"L x 2.04"W / 83.8 mm L x 51.8 mm W) or better. It must accept minimum card thickness from .009" - .040" / 9 mil - 40 mil / .229 mm - 1.016 mm and support minimum PVC or polyester cards with polished PVC finish, requiring monochrome resin for 100% polyester cards or rewrite functionality. The system shall possess an input hopper capacity supporting a minimum of 100 cards (.030" / .762 mm) and an output hopper capacity supporting a minimum of 30 cards for single-sided and 100 cards for dual-sided printing (.030" / .762 mm) or higher. Card cleaning shall be automated with a card cleaning roller integrated within the ribbon cartridge and replaced automatically at each ribbon change or better.</p>	Each	1
	<p>The system shall include a minimum memory of 32 MB RAM and support drivers for Windows 7, 10, 11, Server 2012, Server 2016, Server 2019, Server 2022, or better. The interface shall include USB 2.0 with an optional Ethernet configuration featuring an internal print server or better. The operating temperature shall range between a minimum of 65° to 80° F (18° to 27° C) with a humidity tolerance of minimum 20–80% non-condensing or better. The physical dimensions of the system shall be as follows: for a single-sided printer, a minimum of 8.8"H x 13.7"W x 7.9"D (224 mm H x 348 mm W x 201 mm D), and for a dual-sided printer, a minimum of 9.8"H x 18.7"W x 9.2"D (249 mm H x 475 mm W x 234 mm D) or smaller. The system shall maintain a minimum weight of 7.5 lbs. (3.4 Kg) for single-sided and 10 lbs. (4.54 Kg) for dual-sided configurations or lighter. It shall comply with minimum safety and environmental agency listings including but not limited to UL 60950-2, CSA C22.2 (60950-07), CE, FCC Class A, EN 55022 Class A, EN 55024, CCC, BSMI, KC or better. The system must be designed for energy efficiency, supporting refillable supply cartridges (ECO) and card rewrite functionality or better. The minimum supply voltage shall be 100-240Vac, 50-60Hz, with a maximum current draw of 1.6 Amps or better. The supply frequency must be a minimum of 50 Hz / 60 Hz. The warranty shall include a minimum of three years coverage for the printer and an additional three years with unlimited card passes for the print head with UltraCard™ or better.</p> <p>Encoding capabilities must include support for smart card and magnetic stripe encoding technologies at a minimum, including 125 kHz HID Prox reader; 13.56 MHz iCLASS® Standard / SE / SR / Seos, MIFARE Classic®, MIFARE Plus®, MIFARE DESFire®,</p>		

	<p>MIFARE DESFire EV1/EV2, ISO 14443 A/B, ISO 15693 read/write encoder; contact smart card encoding supporting ISO7816 1/2/3/4 memory and microprocessor smart cards (T=0, T=1) and synchronous cards, ISO magnetic stripe encoding, dual high- and low-coercivity supporting tracks 1, 2, and 3 or better. The system must support access control credential programming for a minimum of iCLASS Standard/SE/SR/Seos, MIFARE Classic, MIFARE DESFire EV1, and HID Prox or better. Additional optional features must include but not be limited to dual-sided printing, smart card encoding (contact/contactless), magnetic stripe encoding, printer cleaning kit, Ethernet with internal print server, and secure proprietary consumables system or better. The included software shall be a minimum of diagnostic utility with Color Assist spot color matching functionality or better. The printer display shall feature color-changing status buttons or better, ensuring seamless operational monitoring and ease of use Workbench Software Approved Make - Zebra / HID/ Suprima</p>		
44	<p>Supply, Installation, Testing and commissioning (SITC) of system under consideration must be capable of supporting RF options operating at a minimum of 125 kHz EM and 13.56 MHz, encompassing technologies such as MIFARE, MIFARE Plus, DESFire, DESFire EV1/EV2/EV3, along with FeliCa Mobile card NFC and BLE. The unit should be rated with a minimum of IP65 or better for ingress protection and a minimum of IK08 or better for impact resistance. The installation type shall be for mullion mounting. Communication protocols must include at least 1-channel RS-485, with a minimum of 1-channel TTL interface, while supporting OSDP V2 compliance and Wiegand as optional. The device must include a minimum of 1 tamper output, with at least 3 channels for LED control, as well as a buzzer control that supports multi-tone functionality. The operational temperature range must span from a minimum of -35°C to a maximum of 65°C or better, while the humidity tolerance should be at least 0% to 95% non-condensing. The power supply should operate at a minimum of 12 V DC with a current consumption of no more than 0.3 A. Compliance with relevant certifications is mandatory, including CE, UKCA, KC, FCC, IC, RCM, BIS, SIG, RoHS, REACH, WEEE, and ETL, with the system listed to UL 294 standards. All parameters described must be met or exceeded in the final product. Approved Make - Kentec / Suprima / Bosch</p>	Each	20
45	<p>Supply, Installation, Testing and commissioning (SITC) of Control panel electrical specifications for the system must meet the following criteria: The input voltage must be 12V DC (-15%/+20%) or 24V DC (-15%/+20%), and the input current for the board should be a minimum of 500 mA at 12V DC or 250 mA at 24V DC. The maximum power for the system, accounting for boards and attached devices, shall be 5A at both 12V DC and 24V DC. The system shall be capable of dissipating a typical heat output of 140 BTU/hr. In terms of optional PoE+ module support, the system must be compliant with PoE (802.3af) delivering a maximum of 12.95 W and PoE Plus (802.3at) offering a maximum of 25.5 W. Power negotiation must use a two-state physical discovery or LLDP-MED protocol. The available power for attached devices through PoE must be 550 mA at 12V, while PoE Plus must deliver 1,600 mA at 12V. The physical dimensions for the enclosure must be 305 x 305 x 101 mm (12 x 12 x 4 inches), and the board must be 190 x 146 x 25 mm (7.5 x 5.75 x 1 inches). The shipping box dimensions should be 381 x 330 x 178 mm (15 x 13 x 7 inches), and the system must weigh no more than 4.2 kg (9.3 lbs) with the enclosure. The enclosure shall include a lock and tamper switch, with mounting standoffs for two expansion modules (I8, I8-CSI, R8, or RM-4). In terms of environmental performance, the system must operate within a temperature range of 0°C to 50°C (32°F to 122°F) and be capable of withstanding humidity levels from 5% to 95% RH. The system must include a network port for PoE (Port 1). Operationally, the system memory must consist of a minimum of 16GB Flash eMMC and 2GB RAM. The cardholder capacity shall be 1,000,000 with ten clearances and five cards per person, supporting 40-digit cards. The processor must be an NXP iMX7, and the operating system should feature a hardened Linux kernel based on the Yocto Project (YP). The system must support dual GigE LAN ports, and network authentication must use TLS 1.3 with AES256 symmetric encryption and unique certificates. Port authentication must comply with the 802.1X port authentication protocol.</p>	Each	4

	<p>The system shall support four readers, with compatibility for OSDP, RM, Wiegand, and Touchscreen (a maximum of two touchscreens and two Wiegand onboard). The maximum distance to the reader must be 1,200 m (4,000 ft) for OSDP and RM, with power varying according to the application for touchscreen RM Mode (1,200 m or 4,000 ft) and Smart Mode (10 m or 33 ft). Wiegand connections should support a maximum of 150 m (500 ft). For reader power, the system shall provide 12V DC at 750 mA for Wiegand and 12V DC at 1.2A for RS485. The system must offer eight supervised inputs, including tamper, low battery, and power fail notifications. Auxiliary input power must support 12V DC with two inputs at 350 mA each. The system should support input expansion of up to 64 additional inputs using I8 expansion modules. For outputs, the system shall provide four individually configurable outputs via jumper, supporting either power sourcing (wet) or dry contact relay. The system shall allow for output expansion of up to 64 additional Form C outputs using R8 expansion modules. The output power for wet outputs must be 12V DC or 24V DC, providing a minimum of 0.75A per port. Output protection must include a load switch rated for 0.75A, with snubber and transzorb protection. For dry contact outputs, the system should handle a rating of 30V AC/DC at 3A. Approved Make - Tyco / Suprima /Bosch</p>		
46	Supply, Installation, Testing and commissioning (SITC) of Time & Attendance Module Per 1000 Visited	Each	1

SECTION 7

SPECIAL CONDITIONS OF THE CONTRACT

WITH RESPECT TO ACHIEVING GRIHA 5- STAR

RATING GREEN RATING FOR INTEGRATED

HABITAT ASSESSMENT (GRIHA)

SPECIAL CONDITIONS OF THE CONTRACT WITH RESPECT TO ACHIEVING GRIHA 5- STAR RATING

GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT (GRIHA):

- **SPECIAL CONDITIONS OF CONTRACTS IN VIEW OF GREEN BUILDING CERTIFICATION**

1. The Project has targeted for Green building certification under GRIHA v2019.
2. The Contractor has to facilitate all measures to be taken on site achieve green building certification under GRIHA v2019. The Contractor is advised to refer GRIHA v2019 reference guide in detail and take all measures on site falling under the purview of the contractor as per this reference guide in order to achieve minimum 5 Star rating, further the contractor is advised to refer NBC 2016 for all the GRIHA criteria.

- **Preserve and protect landscape during construction & Soil conservation till post-construction**

1. All Existing trees on site has to be preserved and protected by putting barricade along the trunk. Utmost care has to be taken for existing trees do not damage during construction activity. The contractor shall minimize the disruption of the natural eco system.
2. The Top soil till the depth of 20 cm has to be excavated and stacked separately in the layers of not more than 40cm. This top soil has to be preserved against erosion by way of covering it with green net, mulching and through vegetation or any other means which can prevent soil erosion. This top soil is fertile soil and has to be used in Landscaping or as directed by Engr-in-Charge. In case of unfertile top soil the contractor shall submit a soil fertility test reports of site's top soil from an ICAR (Indian Council of Agricultural Research)-accredited laboratory. The contractor has to cover entire excavated soil with green net to prevent soil erosion through wind.
3. The entire site has to be barricaded with 3m high non porous sheets to prevent soil erosion and pollution to surrounding area.



Figure 1 Preservation of Existing Tree



Figure 2 Preservation of Existing Tree



Figure 3 THIS IS STRICTLY NOT ALLOW



Figure 4 THIS IS STRICTLY NOT ALLOW



Figure 5 30 cms of Topsoil to Be Stacked in the Layer of 40 cms And Covered with Green Net to Prevent Soil Erosion



Figure 6 30 cms of Topsoil to Be Stacked in the Layer of 40 cms And Covered with Green Net to Prevent Soil Erosion



Figure 7 Prevention of Soil Erosion of Top Soil Stacked By Turfing



Figure 8 This INot Allowed mproper Way to Stack Top Soil or Excavated

• Construction Management Practices

1. The measures are such as implementing Construction management plan, segregating & stacking of all construction waste, empty tins, cardboards, cement bags, Steel waste, cartoon, packaging material etc. construction waste on site and document the same by way of dated photographs of the above actions being taken on site.
2. Nil.

3. The contractor has to strictly implement construction management plan as approved by GRIHA during pre-certification on site. The copy of construction management plan as approved by GRIHA during pre-certification is attached.
4. The construction waste has to be measured and stage separately on site. This construction waste has to be reuse during construction if possible. The construction waste reuse in construction has also to be measured. The leftover construction waste has to be sent to recyclable industry and document the same by way of dated photographs and receipts. The leftover construction waste cannot be thrown in the open or sent to landfill sites. The contractor shall make all efforts for achieving zero waste generation by adopting appropriate resource recovery measures.
5. The contractor has to document all the activities in form of dated photographs, produce copy of challans of building material brought on site, building waste material reused on site and all such activities directed by Engineer-in-Charge. This is mandatory and has to be done meticulously
6. Contaminated material and hazardous wastes like pesticides, paints, cleaners, and petroleum products should be separated and contain safely in the constructed area.
7. Staging should be done to separate undisturbed land from disturbed land by construction activity and material storage. The staging areas/construction areas should be barricaded to prevent spilling of contaminated areas.

- **Reduce Air & Water Pollution during construction**

- Provide 3m high continuous impervious barricading along the site boundary/virtual boundary.
- Ensure sprinkling of water on unpaved pathways on the site with non-potable water.
- Wheels of all vehicles should be washed at the entrance by creating wheel washing facility to prevent air pollution.
- Ensure that fine aggregate, excavated earth, and other construction materials with a tendency to get airborne are covered or are sprinkled regularly with non-potable water.
- Sand and other fine aggregate should be store in the demarcated areas and given a covering.
- Loose cement should be stored in silos.
- Limit vehicular speed on-site to 10 km/h when construction is in progress.
- All diesel generator on site to have a proper chimney with their outlet facing away from the site.
- The contractor shall undertake the responsibility to prevent air pollution (dust & smoke), ensure availability of adequate water supply for dust suppression, devise methodology to minimize impact of dust on the surrounding environment and ensure that these methods are implemented.
- The contract shall develop and implement a spill prevention plan (to control effects of spill from hazardous materials like bitumen, diesel etc. on site)
- Ensure that vehicles carrying waste materials out of the site are covered.
- Ensure that the soil erosion channels are constructed, and they are connected to a sedimentation tank in order to reduce movement of soil outside the site throughout the construction phase of the project. Soil erosion control measures taken before construction and during construction must conform to the best management practices highlighted in the National Building Code (NBC) of India 2005, Part 10, Section 1, Chapter 4 - Protection of Landscape during Construction and Chapter 5 - Soil and Water Conservation



Figure 9 Good Examples of Stacking Building Material on Site



Figure 10 Good Examples of Stacking Building Material on Site



Figure 11 The Sand And Aggregates Are To Be Stored In A Way So That They Do Not Spread Over The Surroundings. Keeping Watering the Fine and Course Aggregates against Any Erosion



Figure 12 Bad Example of Stacking Building Material on Site



Figure 13 Bad Example of Stacking Building Material on Site



Figure 14 THIS IS NOT ALLOWED Construction Waste Improperly St



Figure 15 THIS IS NOT ALLOWED Mismanagement of Construction Water



Figure 16 3m High Continuous Impervious Barricading Along the Site Virtual



Figure 17 Wheel Washing Trough at Entrance



Figure 18 Wheel Washing Trough at Entrance



Figure 19 Covering of fine aggregate and excavated earth on site



Figure 20 Covering of fine aggregate and excavated earth on site



Figure 21 This Is Not Allowed- Implement a Spill Prevention Plan is how



Figure 22 This petroleum products have to be stored



Figure 23 - Correct practices - spill prevention plan



Figure 24 Ensure Safe Disposal of Waste Generated During Construction various construction waste



Figure 25 Compartments formed to collect



Figure 26 Ensure Safe Disposal of Waste Generated



Figure 27 Ensure Safe Disposal of



Figure 28 Speed of vehicles on site to

During Construction

Waste Generated During Construction 10 km/h.



Figure 29 Ensure Diesel Generator Sets Are In Compliance With CPCB Norms And Have An Exhaust With Stack Height Of At Least 2 M From The Top Of The Generator With A Cap.



Figure 30 Ensure diesel generator sets are in compliance with CPCB norms and have an exhaust with stack height of at least 2 m from the top of the generator with a cap.



Figure 31 Ensure that vehicles carrying sand or waste materials are covered



Figure 32 Ensure that vehicles carrying sand or waste materials are covered



Figure 33 NOT DESIRABLE AND ACCEPTABLE



Figure 34 Soil Erosion Channels



Figure 35 Soil Erosion Channels



Figure 36 Soil Erosion Channels



Figure 37 Soil Erosion Channels



Figure 38 Sedimentation tank

- **Efficient Water use during construction**

- The contractor shall prevent wastage of water during curing. The contractor shall also make efforts to minimize use of potable water during construction by proper & efficient construction water management practices as follows

- I. Using gunny bags for curing and using pounding for curing
- II. Monitoring to avoid leaks and water wastage
- III. Use of additives to reduce water requirements during curing
- IV. Use of treated waste water/captured storm water

- **Provide minimum level of sanitation/safety facilities for construction workers**

- The contractor shall strictly follow the provisions contained in general conditions of contract for providing basic amenities to the workers. The contractor shall ensure cleanliness of workplace with regard to the disposal of waste and efficient provide clean drinking water and latrines and urinals as per applicable standard.
- The contractor shall install a safety demonstration facility on site (in consultation with Green Building Consultant) and arrange training programmes for construction workers to use safety gears and safety procedures.
- The contractor shall comply with the National Building Code 2016 norms on construction safety for ensuring safety during construction. The National Building Code 2016 have provisions for clean and hygienic accommodation, toilet facilities, purified drinking water, crèche facility, general store, a subsidized canteen, medical facilities and onsite safety equipment's, etc.

- **Water quality**

- The contractor shall get the water (Drinking water for workers and water used for construction) tested with regard to its suitability of use in the works and get written approval from the Engineer-in-charge before he proceeds with the use of same of execution of works. If the water is not suitable, the contractor shall arrange Municipal water or from any other sources at his own cost and nothing extra shall be paid to the contractor on this account. The water shall be got tested at frequency specified in latest CPWD specifications/BIS code.
- The contractor shall ensure that the noise levels during construction shall not exceed CPCB norms and key noise source on site (like DG sets etc.) should have sufficient acoustic insulation as per NBC 2005 norms.
- Third-party outdoor noise test report (from NABL/Central Pollution Control Board-accredited laboratory) highlighting the noise levels should be conducted on-site before commencement of construction.

- **Avoid Noise Pollutions:**

- Water: Use of Low Flow fixtures and systems

The Low flow fixtures must have minimum 40% reduction over the below given Base case Flow Rate.

Fixture Type	Base Case Flow Rate/ Consumption
Water Closets (Full Flush)	6 LPF
Water Closet (Half-Flush)	3 LPF
Lavatory Faucets/Taps	8 LPM
Showerhead/ Handheld Spray	10 LPM
Urinals	3.8 LPF
Kitchen Faucets	8 LPM

- Ground Water Recharge, Rainwater Harvesting and Reuse of Treated Water
- Ensure that all roof rain water spouts are connected to UG Sump through pop-up filters.

- Entire surface run-off to be managed through Ground Water Recharge bores as per the tender item OR entire surface run-off can be diverted into the abandonment open well or bore.
- Treated water from STP to be used for irrigating landscape or flushing.

- **Use of Low- VOC paints & other compounds in Building interiors**

- The contractor shall use zero/low-VOC paints duly approved by Engineer-in-Charge. The contractor shall use water-based acrylic paints duly approved by Engineer-in-Charge and shall not use solvent based oil paints. The contractor shall also submit certificates & vouchers from suppliers/manufacturers that the paint used are zero/low-VOC paints. The prescribed VOC limits for paints to be used are given in the table below:
- The prescribed VOC limits for paints to be used are given in the table below:-

Paint applications	VOV limits (g of VOC per litre)	
Interior coatings	Flat	<50
	Non-Flat	<150
Exterior coatings	Flat	<200
	Non-Flat	<100
Anti-corrosive	Glass/Semi-gloss/flat	<250

- Limits for Low-VOC content in Adhesives in interior applications

Architectural Adhesive application	VOC content limit (g of VOC/litre)
Ceramic tile	65
Structural glazing	100
Multi-purpose construction	70
Sub-floor	50
Wall boards/panel	50
PVC welding	285
Sub-specific use metal to metal	30
Wood	30
Fibre glass	80
Plastic foams/porous materials (except wood)	50

- Limits for low-VOC content in interior sealants

Sealant Application	VOC Content limit (grams of VOC per litre)
Single-ply roof material installation/repair	450
Others	420
Sealant Primer applications architectural non- porous	250
Sealant Primer applications architectural porous	775
Other sealant primer applications architectural	750

- The contractor shall use water based low-VOC sealants (acrylics, silicones and siliconized acrylics) & adhesives (acrylics or phenolic resins) duly approved by Engineer-in-charge. The solvent oil based/low in oil solvent content sealants (urethanes and butyls) & adhesives shall not be used in the construction. The contractor shall also submit certificates & vouchers from suppliers/manufacturers that the sealants/ adhesives used are low-VOC sealants/adhesives as given in above table.
- The composite wood products (particle board, blackboard, plywood) shall be free from urea-formaldehyde resins. The contractor shall also submit certificates & vouchers from suppliers/manufacturers that the composite wood products are free from urea-formaldehyde resins.

- **Sustainable Building Materials**

- Utilization of BIS recommended waste materials in building structure
 - I. Minimum 30% replacement of OPC with fly ash or any BIS recommended waste or PPC by weight of cement used in structural concrete.
 - II. 40-60 % of materials (by volume) in building blocks/bricks should be fly ash or any BIS recommended waste, for 100% load bearing and non-load bearing walls.
 - III. Minimum than 30% replacement of OPC with fly ash or any BIS recommended waste in plaster/masonry mortar.
 - IV. AAC Blocks with 40% of Fly Ash and Thermal conductivity of 0.18 W/mK.
- Use of low-environmental impact materials in building interiors
 - Following materials will be accepted as low-environmental impact:
 - I. Stones from India
 - II. Composite wood-based products
 - III. FSC Chain of Custody certified products
 - IV. Manufactured products with at least 5% recycled content
 - V. Products with EPD (cradle to gate) analyzed and published as per ISO 14025 / ISO 21930
 - VI. Products with water footprint (cradle to gate) analyzed and published as per ISO 14046
- Alternative Materials for External Site Development
 - Ensure that at least 70% of all roads and vehicular pathways within site premises are constructed & Ensure that 100% of the pavement/footpath including kerb stone constructed on-site are constructed with one, or any combination, of the following:
 - I. Bituminous road with minimum 6% plastic waste content by weight of bitumen
 - II. Cast in-situ cement concrete road with minimum 30% fly ash content by weight of total cementitious material
 - III. Concrete blocks with minimum 40% fly ash content by weight of block
 - IV. Paver blocks containing minimum 10% C&D waste content by weight of block
 - V. Stones from India
 - VI. Any other product with minimum 10% recycled content by weight

- **Solid waste management**

- Avoided post-construction landfill

Provide infrastructure (multi-coloured dustbins) to building occupants to ensure segregation of waste at source. Contractual tie-ups shall be done by the contractor with waste recyclers for safe recycling of recyclable wastes such as metal, paper, plastic, glass etc.

- Treat organic waste on site

Provide Composite pits for organic waste / Kitchen Waste/ Landscape as shown in Construction management plan or at appropriate location as directed by engineer-in-charge

- Increase in environmental awareness

Adopt measures to create environmental awareness among workers, visitors.

- I. Vigorous campaign would also be adopted to bring awareness among the public
- II. Conduction of awareness programme with the co-ordination of Self Help Groups, Welfare Associations, and NGO.
- III. Erection of hoardings displaying the importance and benefits of the Environment Awareness.

- **Landscape**

- Ensure that no existing mature tree is cut. In case of cutting of trees is required for construction activity transplantation of the existing trees within the site OR planting three trees for every one tree cut of the same native species is mandatory.

- Plantation of minimum one tree for every 80 sq. m. of the site area shall be taken in account for landscaping.

- Turf and each type of bedding area must be segregated into independent zones based on watering needs.

- Preference to be given to native plants and trees.

- More Preference to be given to draught tolerant species.

- Organic Manure to be used for developing the Landscape.

- Before procuring garden soil it is advised to use and consume fertile top soil preserved at the time of excavation.

- Preference to be given to Native Grass.

- Native/ draught tolerant trees should be planted on both side of the road for shading purpose.

- Paver blocks containing minimum 10% waste content by weight of material with High SRI (> 0.6)

- Kerbing containing minimum 10% waste content by weight of material.

- Water efficient irrigation system in form of drip irrigation, sprinklers, and moisture sensor and root zone treatment shall be adopted.

- **Metering and Monitoring**

- Source of energy meter
 - I. Utility Grid
 - II. Onsite Renewable Energy
 - III. DG set (if applicable)
 - IV. Each building level
 - V. Indoor and outdoor lighting (office/ hospitalities/ retail/ healthcare typology)
 - VI. Lifts and common areas (residential typology)

- Source of Water meter
 - I. Municipal supply
 - II. Bore well
 - III. Treated water outlet from STP (if applicable)
 - IV. Captured rainwater for reuse in project
 - V. Flushing (at each building level)
 - VI. Domestic (at each building level)
 - VII. Irrigation

- **Miscellaneous**

- Topsoil from the disturbed areas on the site is to be preserved, stabilized and its fertility is to be maintained throughout the construction period. 100% of the preserved topsoil is to be utilized for landscape purposes.
- The Glazing must have properties matching properties minimum 0.50 VLT, maximum 0.25 SHGC and maximum 1.8 W/m²k U-value. These figures may vary as per the site conditions and project typology.
 - ❖ Provide E-Vehicle parking facility for minimum 10% of the total 4-wheeler parking and along with charging facility for E-vehicles and adequate signages.
 - ❖ The total building material used in the building are manufactured locally within a distance of 400 km.
 - ❖ The contractor to use green anti-termite solution/chemical.
 - ❖ Various Signages in English and Local Language for speed limit, save water, danger zone etc. on site.
 - ❖ Ensure that tobacco smoking is prohibited on-site during the entire construction phase.
 - ❖ All the insulation used in the building envelope and for HVAC systems must be CFC and HCFC free
 - ❖ The refrigerant used in the HVAC systems and refrigeration equipment must be CFC and HCFC free.
 - ❖ The fire suppression systems and fire extinguishers installed in the project must be

halon free.

- ❖ All the insulation used in the building envelope and for HVAC systems; refrigerant used in the HVAC systems and refrigeration equipment must be HFC free.
 - ❖ Use of green cleaning products for housekeeping (During Construction and Post Construction)
 - ❖ The lift must have a facility for sound and braille system for Universal Accessibility.
 - ❖ Provision of dedicated parking space, ramp with railing and toilet for differently able as mentioned in NBC 2016 shall be provided.
 - ❖ Provision of dedicated rest rooms and toilets for service staff as per fixtures mentioned in NBC 2016, Volume 2, Part 9, Section 2, Clause 4.2.
 - ❖ Minimum requirements of CPCB norms for assessing quality of fresh air shall be fulfilled.
 - ❖ Minimum requirements of NBC 2016, Volume 2, Part 8, Section 3, for assessing quantity of fresh air shall be fulfilled.
 - ❖ Solar panel shall be provided on rooftop to offset annual energy consumption of the building as per GRIHA v 2019.
 - ❖ Install sensor for each space $\geq 30\text{m}^2$ and $\leq 100\text{m}^2$ OR additional sensor for every 100m^2 sensor. Install digital display showing monitored values for CO, CO₂, temperature, and RH at each floor level (common areas).
 - ❖ ECBC mandatory compliance requirements for following:
 - Comfort systems and controls
 - Lighting and controls
 - Electrical and renewable energy systems- such as transformers, motors and pump
 - ❖ List of BEE 5 star-labelled equipment are as below:
 - LED/TFL
 - Unitary/Split air-conditioners
 - Ceiling Fans
 - Geysers
 - UPS
 - Solid State Inverter
 - ❖ Consider china mosaic/ white cement tile or high SRI paint > 80 on roof finish.
- Green infrastructure, low impact design strategies and design to mitigate UHIE as stated in sustainable site planning as per GRIHA /IGBC shall be followed during designing and execution stage of the project.
- Please refer GRIHA/IGBC reference manual for daylight simulation, energy simulation, natural ventilation assessment, energy audit and green audit as prescribed tools for Green Building Compliance.
- Please refer GRIHA/IGBC reference manual before quoting the rates as this has to be implemented during designing and execution stage of the project.

- The contractor shall mandatorily follow the above guidelines so that the GRIHA/IGBC Highest rating is not suffered on account of acts and action, omission, negligence of the contractor or his team or otherwise.
- The cost of all these additional conditions provisions for GRIHA/IGBC rating is demanded to be included in the cost quoted by the contractor for the entire building portion and nothing extra is admissible.
- The contractor shall submit all documentation (Dated Photographs, Test Reports, Challans or Bills and Material Vendor Certificates etc.) as and when required / instructed by Green Building Consultant or Engineer in Charge.

- **CHECKLIST FOR CONTRACTOR TO FOLLOW ON SITE**

- Complied with the safety procedures, norms and guidelines as outlined in NBC 2005 (BIS 2005c), Part 7.
- Personnel Protective Equipment provided like safety helmets, harness & safety nets etc.
- First-Aid box provided
- All parts of dangerous machinery shall be guarded.
- Precautions for working on machinery
- Hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition
- Walking surfaces or boards at height are of sound construction and are provided with safety rails or belts.
- Providing measures to prevent fires.
- Fire extinguishers and buckets of sand to be provided in a fire-prone area and elsewhere
- Providing sufficient and suitable light for working during the night
- Safety policies of the construction firm/division/ company
- Labour camp (if applicable)
- Canteen for Workers (if applicable)
- Crèche
- Latrines
- Drinking water

- **CHECKLIST FOR WASTE SEGREGATION & DISPOSAL DURING CONSTRUCTION:**

The civil contractor shall have adequate measures to reuse & recycle following possible construction waste. Recycling includes donation or reuse at some other location with dated photographs and receipts.

- Asbestos products – insulation, tiles, and so on.
- Fuels and heating oil and other volatile/ flammable liquids, such as coolants and grease.
- Tar and tar products (such as bitumen, felt, and water proofing compounds)
- Centring and Shuttering
- Wood dust
- Lead
- Plastics, acrylics, silica, and PVC
- Hazardous gases released on burning of waste
- Chemical admixtures, sealants, adhesives solvents, among others (should never be burnt)
- Paints, pigments, dyes, and primers
- Carbon black
- Pesticides
- Tarpaulin
- Explosives and related products and equipment used in excavations
- Product packaging (such as cement bags, cartons, containers, and plastic covers)
- Compressed gases/cylinders
- H2S emission

- Mercury containing lamps and tubes – fluorescent lamps intact and crushed, halogen lamps, arc lamps, UV lamps, high-pressure sodium lamps, mercury vapour lamps, neon lamps, and incandescent lamps.
- Mercury containing devices – mercury switches, relays, regulators, thermostats, thermometers, manometers and debris containing mercury
- All types of batteries
- Electronic ballasts, PCBs, transformers, capacitors, switchgear, lead cable, and oil-filled/ gel- filled cables.
- Electronic waste – computer products, circuit boards, CRTs, electronic parts, solder dross, and weld waste

Contractor

**EXECUTIVE ENGINEER (C-I)
DEENDAYAL PORT AUTHORITY**

SECTION 8

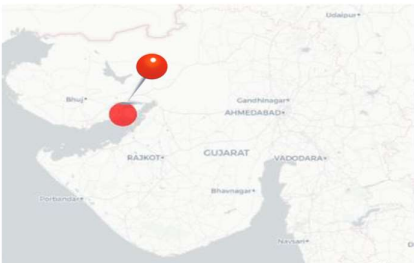
DRAWING

SITE CONTEXT



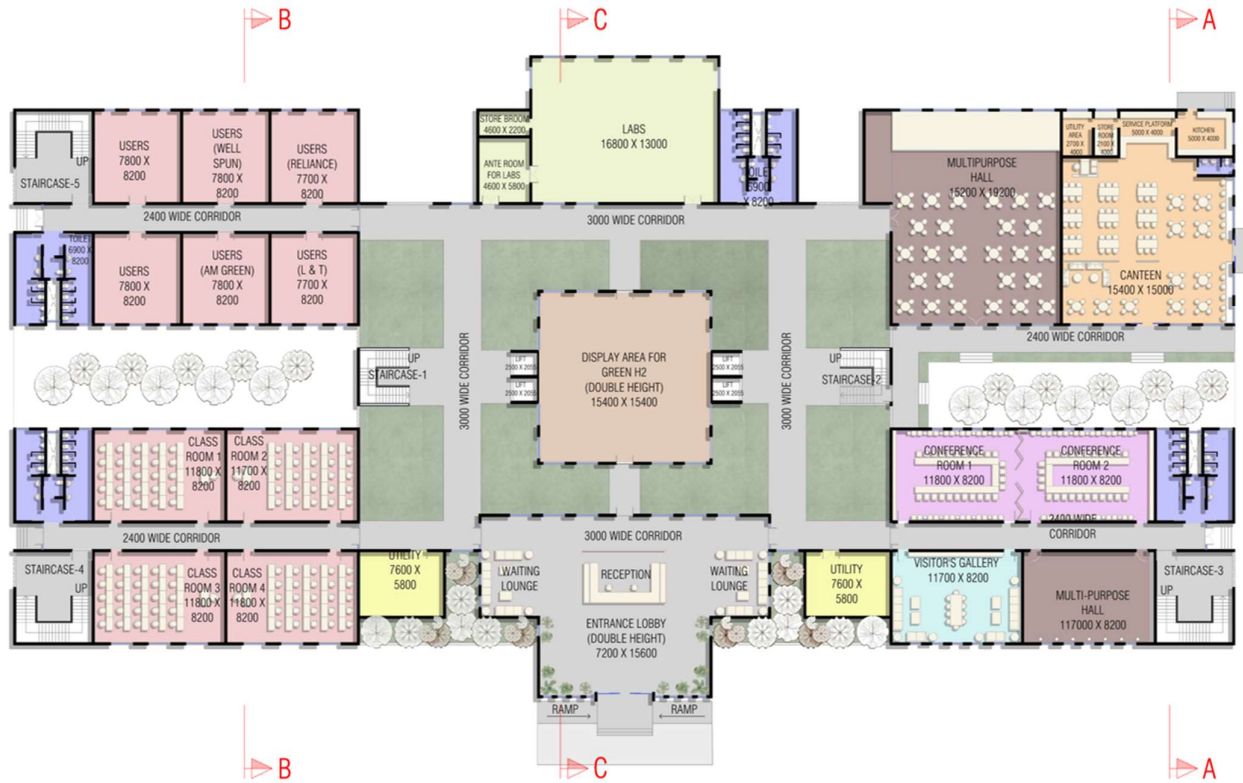
SITE CONTEXT :

PLOT AREA : 21 469.73 sq.m (aprox)

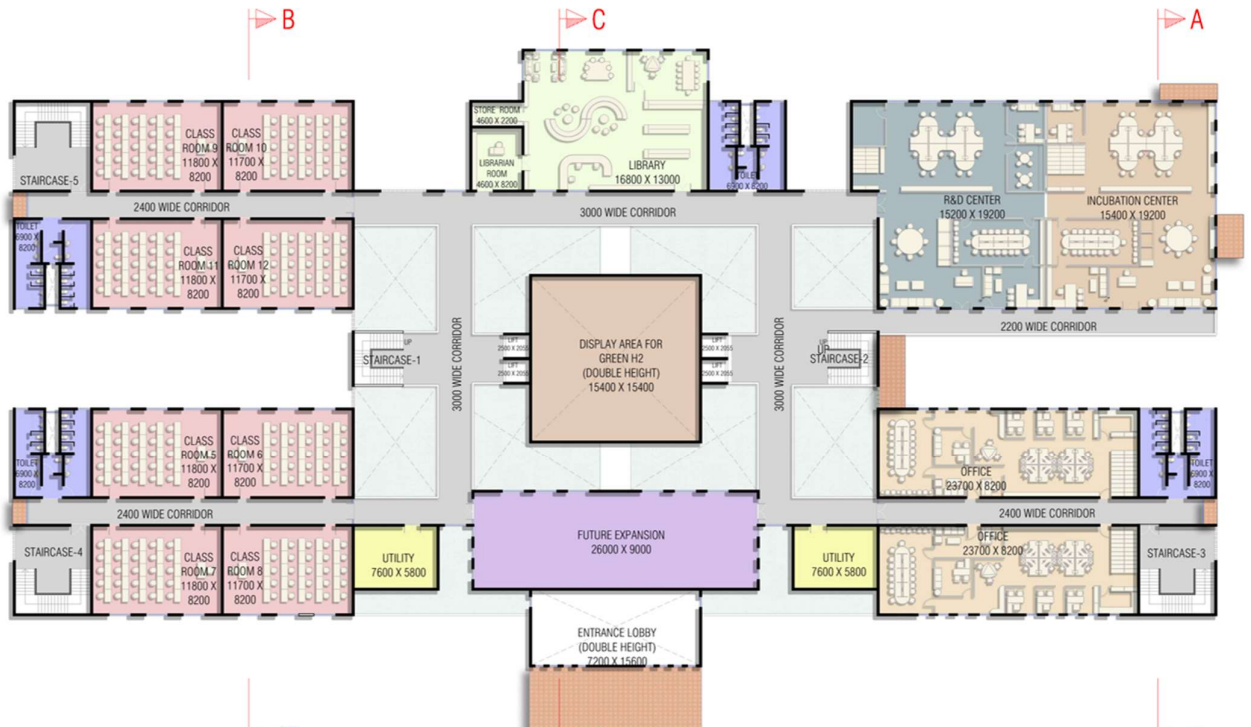


FLOOR PLANS

GROUND FLOOR PLAN



FIRST FLOOR PLAN



VIEWS

EXTERIOR VIEWS



INTERIOR VIEWS



Note: All the drawings are provided above are for reference purpose Only.

SECTION 9

BILL OF QUANTITIES

SECTION 10

FORMS OF SECURITIES AND OTHER FORMATS

FORMS OF SECURITIES AND OTHER FORMATS

Acceptable forms of securities are annexed. Bidders should not complete the performance and advance payment security forms at this time. Only the successful bidder will be required to provide performance and advance payment securities in accordance with one of the forms, or in a similar form acceptable to the employer

Specimen EMD (Bank Guarantee Format)

[The Bank shall fill in this Bank Guarantee Form in association with the instructions indicated. To be executed on Rs. 300/- non Judicial Stamp Paper]

(Bank's name and address of Issuing Branch or Office)

Beneficiary:____(Name and Address of Employer/Board)

Date: _____

Tender Guarantee No.: _____

We have been informed that [name of the Bidders] (hereinafter called "the Bidders") has submitted to you its Tender dated (hereinafter called "the Bidders") for the execution of [name of contract] under Invitation for Tenders No.[Number]. Furthermore, we understand that, according to your conditions, Tenders must be supported by an EMD.

At the request of the Bidders, we [name of Bank] hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of [amount in figures] ([amount in words]) upon receipt by us your first demand in writing accompanied by a written statement stating that the Bidders is in breach of its obligation(s) under the Tender conditions, because the Bidders:

- (a) Has withdrawn its Tender during the period of tender validity specified by the Bidders in the Form of Tender; or
- (b) Having been notified of the acceptance of its Tender by the Employer/Board during the period of Tender validity, (i) fails or refuses to execute the Form of Agreement, if required, or (ii) fails or refuses to furnish the performance guarantee, in accordance with the Instructions to Bidders.

This guarantee will expire unless otherwise extended or informed by the Employer/ Board:

- (a) If the Bidders is the successful Bidders, upon our receipt of copies of the contract signed by the Bidders and the performance guarantee issued to you upon the instruction of the Bidders; or
- (b) If the Bidders is not the successful Bidders, upon the earlier of
 - (i) Our receipt of a copy of your notification to the Bidders of the name of the successful Bidders; or
 - (ii) Twenty-eight days after the expiration of the Bidder's tender or any extended period thereof;

Consequently, any demand for payment under this guarantee must be received by us at the office on or before that date.

[Signature(s)] _____

[Authorization letter from the issuing bank that the signatory of this BG is authorized to do so should also be enclosed]

SPECIMEN BANK GUARANTEE PERFORMANCE
GUARANTEE / SECURITY DEPOSIT

(To be executed on Rs.300/- non-judicial Stamp Paper)

[The bank, as requested by the successful Bidders, shall fill in this form in accordance with the instruction indicated]

In consideration of the Board of Deendayal Port Authority of incorporated by the Major Port Authority Act, 2021 (hereinafter called "The Board" which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include the Board of Deendayal Port Authority of , its successors and assigns) having agreed to release Performance Guarantee / Security Deposit to (hereinafter called the "Contractor")

(Name of the Contractor/s)

from the demand under the terms and condition of the contract, vide from the demand under the condition of the contract, vide_'s letter No

(Name of the Department)

Date_____made between the Contractors and the Board for execution of _____covered under Tender No._____

_____dated (hereinafter called "the said contract") for the payment of Security Deposit in cash or Lodgment of Government Promissory Loan Notes for the due fulfillment by the said Contractors of the terms and condition of the said contract, on production of a bank Guarantee for Rs._____

_____ (Rupees_____) only we, the (Name of the _____ Bank _____ and _____ Address) _____

_____ (herein after referred toas "the Bank") at the request of the Contractors do hereby undertake to pay _____ to the Board an _____ amount not exceeding _____ Rs.

_____ (Rupees_____) only against any loss or damage caused to or suffered by the Board by reason of any breach by the Contractors of any of the terms and conditions of the said contract.

2. We, _____, do hereby (Name of Bank) (Name of Branch) Undertake to pay the amount due and payable under this guarantee without any demur merely on a demand from the Board starting that the amount claimed is due by way of loss or damage caused to or which would be caused to or suffered by the Board by reason of the Contractors failure to perform the said contract. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this guarantee shall be restricted to any amount not exceeding Rs. _____ (Rupees _____) only.

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

4. We, _____ further agree with the Board that the (Name of Bank and Branch) guarantee herein contained shall remain in full force and effect during the period that would be taken for performance of the said contract and that it shall continue to be enforceable till all the dues of the Board under or by virtue of the said contract have been fully paid and its claims satisfied or discharged or till the _____
(Name of the user department)

of the said certifies that the terms and conditions of the said contract have been fully and properly carried out by the said Contractors and accordingly discharge this guarantee. PROVIDED HOWEVER that the Bank shall be the request of the Board but at the cost of the Contractors, renew or extend this guarantee for such further period or periods as the Board may require from time to time.

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

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

7. It is also hereby agreed that the Courts in **Gandhidham** would have exclusive jurisdiction in respect of claims, if any, under this Guarantee.

8. We, _____ Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Board in writing.

9. Notwithstanding anything contained herein:

(a) Our liability under this Bank Guarantee shall not exceed Rs. _____
(Rupees _____ only);

- (b) This Bank Guarantee shall be valid up to____; and
- (c) We are liable to pay the guarantee amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before (date of expiry of Guarantee).”

Date_____day of_____ 20

For (Name of Bank)

(Name)

Signature

SPECIMEN BANK GUARANTEE FOR ADVANCE PAYMENT

(To be executed on Rs.300/- non-judicial Stamp Paper)

[The bank, as requested by the successful Tenderer, shall fill in this form in accordance with the instruction indicated]

In consideration of the Board of Deendayal Port Authority incorporated by the Major Port AUTHORITIES Act, 2021 (hereinafter called "The Board" which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include the Board of Deendayal Port Authority, its successors and assigns) having agreed to release advance payment to (hereinafter called the "contractor")

(Name of the contractor/s)

from the demand under the terms and condition of the contract, vide from the demand under the condition of the contract, vide ___'s letter No _____

(Name of the Department)

Date _____ made between the contractors and the Board for execution of

_____ covered under Tender No. _____

_____ dated _____ (hereinafter called "the said contract") for the payment of Advance Payment in cash or Lodgement of Government Promissory Loan Notes for the due fulfillment by the said contractors of the terms and condition of the said contract, on production of a _____ bank Guarantee for Rs. (Rupees _____)

_____ only we, the (Name of the Bank and Address) _____

_____ (hereinafter

Referred to as "the Bank") a the request of the contractors do hereby undertake to pay to

the Board an amount not exceeding Rs. _____

(Rupees _____) only against any loss or damage caused to or suffered by the Board by reason of any breach by the contractors of any of the terms and conditions of the said contract.

2. We, _____, do hereby (Name of Bank) (Name of Branch)

Undertake to pay the amount due and payable under this guarantee without any demur merely on a demand from the Board stating that the amount claimed is due by way of loss or damage caused to or which would be caused to or suffered by the Board by reason of the contractors failure to perform the said contract. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this guarantee shall be restricted to any amount not exceeding Rs. _____

(Rupees _____) only.

3. We, _____, undertake to pay to the (Name of Bank and Branch)

Board any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such payment.

4. We, _____ further agree with the Board that the (Name of Bank and Branch)
guarantee herein contained shall remain in full force and effect during the period that would be taken for performance of the said contract and that it shall continue to be enforceable till all the dues of the Board under or by virtue of the said contract have been fully paid and its claims satisfied or discharged or till the _____
(Name of the user department)
of the said certifies that the terms and conditions of the said contract have been fully and properly carried out by the said Contractors and accordingly discharge this guarantee. PROVIDED HOWEVER that the Bank shall be the request of the Board but at the cost of the Contractors, renew or extend this guarantee for such further period or periods as the Board may require from time to time.
5. We, _____ further agree with the Board that the (Name of Bank and Branch)
Board shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said contract or to extend the time of performance by the said contract or to extend the time of performance by the said Contractors from time to time or to postpone for any time or from time to time any of the powers exercisable by the board against the said Contractors and to forebear or enforce any of the terms and conditions relating to the said contract and we shall not be relieved from our liability by reason of any such variation or extensions being granted to the contractors or for any forbearance, act or omission on the part of the Board or any indulgence shown by the board to the Contractors or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.
6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).
7. It is also hereby agreed that the Courts in [**Gandhidham**] would have exclusive jurisdiction in respect of claims, if any, under this Guarantee.
8. We, _____ Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Board in writing.
9. Notwithstanding anything contained herein:
 - (a) Our liability under this Bank Guarantee shall not exceed Rs. _____ (Rupees _____ only);
 - (b) This Bank Guarantee shall be valid up to _____; and

(c) We are liable to pay the guarantee amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before_(date of expiry of Guarantee).”

Date_____day_____ of 20

For (Name of Bank)

(Name)

Signature

DISPUTES REVIEW BOARD AGREEMENT

(To be executed on Rs300/- non-judicial Stamp Paper)

THIS AGREEMENT, made and entered into this.....Day of 20

..... Between..... (“the Employer/ Board”) and.....(“the contractor”), and the Disputes Review Board (“the DR Board”) consisting of one/three DR Board Members, (Members from either party, i.e. contractor and Employer/Board)

(1)

.....(2)

.....(3)

.....

..... [Note: Delete whatever is (Not applicable)]

WITNESSETH, that

WHEREAS, the Employer/Board and the contractor have contracted for the execution of Project name).....(the “contract”) and WHEREAS, the contract provides for the establishment and operation of the DR Board NOW THEREFORE, the parties hereto agree as follows:

1. The parties agree to the establishment and operation of the DR Board in accordance with this DR Board Agreement.
2. Expect for providing the services required hereunder, the DR Board Members should not give any advice to either party or to the Nodal Officer or his nominee concerning conduct of the works.

The DR Board Members:

- (a) Shall have no financial interest in any party to the contract or the Nodal Officer or his nominee, or a financial interest in the contract,

except for payment for services on the DRBoard.

- (b) Shall have had no previous employment by, or financial ties to, any party to the contract, or the Nodal Officer or his nominee, expect for fee based consulting services on other projects, all of which must be disclosed prior to appointment to the DRBoard.
 - (c) Shall have disclosed in writing to the parties prior to signature of this Agreement any all recent or close professional or personal relationships with any director, officer, or employee of any party to the Nodal Officer or his nominee, and any and all prior involvement in the project to which the contract relates;
 - (d) Shall not, while a DR Board Member be employed whether as a consultant or otherwise by either party to the contract, or the Nodal Officer or his nominee, expect as a DR Board Member.
 - (e) Shall not, while a DR Board Member, engage in discussion or make any agreement with any party to the contract, or with the Nodal Officer or his nominee, regarding employment whether as a consultant or otherwise either after the contract is completed or after services as a DRBoard Members.
 - (f) Shall be and remain impartial and independent of the parties and shall disclose in writing to the Employer/Board, the contractor, the Nodal Officer or his nominee, and one another any fact or circumstances which might be such to cause either the Port or the contractor to question the continued existing of the impartiality and independence required of DR Board Members.
3. Except for its participation in the DR Board activities as provided in the contract and in this Agreement none of the Employer / Board, the contractor, the Nodal Officer or his nominee, and one another any fact or circumstances which might be such to cause either the Employer/Board or the contractor to question the continued existence of the impartiality and independence required of DR Board

Members.

4. The contractor shall:
 - a) Furnish to each DR Board Member one copy of all document which the DR Board may request including contract document, progress report, variation orders, and other document, pertinent to the performance of the contract.
 - b) In co-operation with the Employer/Board, co-ordinate the site visits of the DR Board, including conference facilities and secretarial and copying services.
5. The DR Board shall serve throughout the operation of the contract. It shall begin operation following execution of this Agreement, and shall terminate its activities after issuance of the taking over certificate and the DR Board's issuance of its Recommendation on all disputes referred to it.
6. DR Board Member, shall not assign or subcontract any of their work under this Agreement.
7. The DR Board Members are independent and not employees or agents of either the Employer/Board or the Contractor.
8. The DR Board Members are absolved of any personal or professional liability arising from the activities and the Recommendations of the DR Board.
9. Fees and expenses of the DR Bard Member[s] shall be agreed to and shared equally by the Employer/Board and the Contractor. If the DR Board requires special services, such as accounting, data research and the like, both the parties must agree and cost shall be shared by them as mutual agreed.
10. DR Board's site visit:
 - a. The DR Board shall visit the site and meet with representative of the Employer/Both and the contractor and the nodal officer are his nominee at regular intervals, at times of critical construction events, and at the return request of either party. The timing of site filing agreement shall be fixed by the DRBoard.

- b. Site meeting shall consist of an informal discussion of the status construction of the works followed by an inspection of the work, both attended by personal from the employer/Board, the contractor and the nodal officer or his nominee
- c. If request by either parties or the DR Board, the employer/Board will prepare minutes of the meeting and circulate them for comments of the parties and the nodal officer or his nominee.

11. Procedure for disputes referred to the DRBoard:

- a) If either party objects to any action or inaction of the other party or the Nodal Officer or his nominee, the objecting party may file a written Notice of Dispute to the other party with a copy to the Nodal Officer or his nominee stating that it is given pursuant to clause [number] and starting clearly and in detail the basis of the dispute.
- b) The party receiving the Notice of Dispute will consider it and respond in writing within 7 days after receipt.
- c) This response shall be final and conclusive on the subject, unless a written appeal to the response is filed with the responding party within 7 days of receiving the response. Both parties are encouraged to pursue the matter further to attempt to settle the dispute. When it appears that the dispute cannot be resolved without the assistance of the DR Board either party may refer the dispute to the DR Board by written Request for Recommendation to the Board, the other party & the Nodal Officer or his nominee stating that it is made pursuant to [insert relevant clause no.]
- d) The Request for recommendation shall state clearly and detail the specific issues of the dispute to be considered by the DRBoard.
- e) When a dispute is referred to the DR Board, and the DR Board is satisfied that the dispute requires the DR Board's assistance, the DR Board shall decide when to conduct a hearing on dispute. The DR Board may request that written documentation and arguments from both parties be submitted to each DRBoard Members before the

hearing begins. The parties shall submit insofar as possible agreed statements of the relevant facts.

- f) During the hearing, the contractor, the Employer/ Board, the Nodal Officer or his nominee shall each have ample opportunity to be heard and to offer evidence.

The DR Board's Recommendation for resolution of the dispute will be given in writing, to the Employer/ Board, the contractor and the Nodal Officer or his nominee as soon as possible, and in any event not more than 28 days after the DR Board's final hearing on the dispute.

12. Conduct of Hearing:

- a) Normally hearing will be conducted at the sites, but any location that would be more convenient and still provide all required facilities and access to necessary documentation may be utilized by the DR Board. Private sessions of the DR Board may be held at any location convenient to the DR Board.
- b) The Employer/ Board, the Nodal Officer or his nominee and contractor shall have representatives at all hearing.
- c) During the hearing, no DR Board Member shall express any opinion concerning the merit of any facet of the case.
- d) After the hearing are concluded, the DR Board shall meet privately to formulate its Recommendation. All DR Board deliberation shall be conducted in private, with all individual views kept strictly confidential. The DR Board's Recommendations, together with an explanation of its reasoning shall be submitted in writing to both parties and to the Nodal Officer or his nominee. The pertinent contract provision, applicable laws and regulations, and the facts and circumstances involved in the dispute.

The DR Board shall make every effort to reach a unanimous Recommendation. If this proves impossible, the majority shall decide, and the dissenting member may prepare a written minority report for submission to both parties.

[Notes: Delete if it is one member DR Board]

13. If during the contract period, the Employer/ Board and the contractor are of the opinion that the Disputes Review Board is not performing its function properly, the Employer/ Board and the contractor may together disband the Disputes Review Board. In such an event, the disputes shall have referred to Arbitration straightaway.

The Employer/Board and the contractor shall jointly sign a notice specifying that the DR Board shall stand disbanded with effect from the date specified in the notice. The notice shall be posted by a registered letter with AD or delivery of the letter, even if he refuses to do so.-

SPECIMEN FORMAT FOR DECLARATION

(To be executed on bidder's letter head)

To

(Project Title)

Ref: _____

The undersigned, having studied the pre-qualification submission for the above mentioned project, hereby states:

- (a) The information furnished in our bid is true and accurate to the best of my knowledge.
- (b) That in case of being pre-qualified, we acknowledge that the Employer may invite us to participate in due time for the submission of tender on the basis of provisions made in the tender documents to follow.
- (c) When the call for tenders is issued, if the legal, technical or financial conditions, or the contractual capacity of the firm or joint venture changes, we commit ourselves to inform you and acknowledge your sole right to review the pre-qualification made.
- (d) We enclose the entire required pre-qualification data format and all other evaluation.
- (e) We also state that no changes have been made by us in the downloaded tender document and also understand that in the event of any discrepancies observed, the printed tender document No. _____ is full and final for all legal/contractual obligations [delete if not required].

Date:

Place:

Name of the Applicant:

Represented by (Name & Capacity) _____

**SPECIMEN LETTER OF AUTHORITY FROM BANK
FOR ALL BGs**

(To be executed on Bank's Letter Head)

Date:

To,

The Board of Deendayal of Port Authority

Dear Sir,

dated_ _____ Sub: Our Bank Guarantee No. _____
For Rs. _____ favouring yourselves issued
on a/c of M/s. _____
(Name of contractor)

.....

We confirm having issued the above mentioned guarantee favouring
yourselves, issued on account of M/s. _____ validity for
expiry up to date _____ and claim expiry date up to _____

We also confirm 1) _____ 2) _____ is/are
empowered to sign such Bank Guarantee on behalf of the Bank and his/their signatures
is/are binding on the Bank.

Name of signature of Bank Officer

**SPECIMEN LETTER OF AUTHORITY FOR
SUBMISSION OF BID**
(To be executed on Rs.300/- non Judicial Stamp Paper)

To
The (PORT Address)

Dear Sir,

We-----

----- do hereby confirm that Shri.....(Name, designation and Address) is/are authorized to represent us to bid, negotiate and conclude the agreement on our behalf with you against tender no ----- and his specimen signature is appended hereto.

We confirm that we shall be bound by all and whatsoever our said signatory shall commit.

We understand that the communication made with him by the Employer/Board shall be deemed to have been done with us in respect of this Tender.

[specimen signature]

Yours faithfully,

Signature:

Name &

Designation:

For & on

behalf of:

PROFORMA OF JOINT VENTURE/CONSORTIUM AGREEMENT

(To be submitted on Non-judicial Stamp Paper of appropriate value)

This Joint Venture /Consortium Agreement is made and entered into on this day of2025 by and between (i) M/s. **(Name of the firm to be filled-in)**.....(ii) M/s.....**(Name of the firm to be filled-in)** , , primarily for the work under the Deendayal Port Authority.

All the partners of the Joint Venture /Consortium hereinafter individually referred to as the parties and collectively as the Joint Venture/Consortium‘.

1. Formation of Joint Venture/Consortium

(i) M/s. **(Name of the firm to be filled in)** is engaged in(Details of the works undertaken by the party)

(ii) M/s. **(Name of the firm to be filled in)** is engaged in..... (Details of the works undertaken by the party)

(iii)

1.1. On behalf of Board of Authority of Deendayal Port (here in after referred to as—Employer[]), the Chief Engineer, Deendayal Port Authority has invited bids from the experienced, resourceful and bonafide Developers with proven technical and financial capabilities of executing the work **Construction of Center of Excellence (CoE) for Grēen Hydrogen at Gandhidham.**

1.2. The parties have been exploring together the ways and means of collaboration for the purpose of an offer to be made for the said project of the Deendayal Port Authority and have mutually agreed to enter into a Joint Venture/Consortium Agreement to submit a common bid for the project and to carry out the project works in the event of award of the contract, in association with each other and **(.....Name of Partner to be filled in.....)** shall be the Lead Partner and (i) **(.....Name of Partner to be filled in)**, (ii) **(.....Name of Partner to be filled in.....)**, shall be the other partner(s).

NOW THEREFORE IT HAS BEEN AGREED TO BETWEEN THE PARTIES AS FOLLOWS

1.3. The Joint Venture/Consortium will be known as...(.....**Name of JV to be filled in.....**)and shall consist of (i) **(.....Name of the firm to be filled in.....)**, (ii) **(.....Name of the firm to be filled-in.....)**, , parties to the present agreement.

1.4. The recitals are true and correct and form an integral part of this agreement and are representations of the parties to which they relate and have been relied upon by the parties to enter into the present agreement.

- 1.5. Notwithstanding the date of signature of this agreement, its effective date will be the date of submission of bid.
- 1.6. All costs incurred by the parties before the date of award of contract will be borne by the parties concerned. All costs in implementation of this Joint Venture/Consortium Agreement after award of contract till the expiry of this agreement will be borne by the parties as here in after provided.
- 1.7. The Joint Venture/Consortium will be dissolved and this agreement will cease to have effect on completion of this project, maintenance and fulfilment of all other conditions under the contract, upon receipt of payment of all amounts from the Employer and on settlement of accounts between the parties as hereinafter provided.
- 1.8. The contract, if awarded by the Employer, Letter of Acceptance shall be issued in the name of (**....Name of JV/Consortium to be filled in....**) and the Contract shall be signed by legally authorized signatories of all the parties.
- 1.9. All the parties of the JV/Consortium shall be jointly and severally liable during the bidding process and the bid document shall be signed by legally authorized signatory of all the parties.
- 1.10. The financial contribution of each partner to the JV/Consortium operation shall be:
- (i) **M/s..... (Name of the partner to be filled-in) -**
- (ii) **M/s..... (Name of the partner to be filled-in) -**
- (iii) **.....**
- 1.11. All the parties of the JV/Consortium shall be jointly and severally liable for the execution of the project in accordance with the Contract terms, in the event of award of contract. The delineation of duties, responsibilities and scope of work shall be:
- a) The Lead Partner shall provide suitable experienced personnel at site, for general planning, site management and equipment operations, during entire period of contract execution.
- b) (**.....Name of Partner to be filled-in**) shall carry out the following works-

- c) (**.....Name of Partner to be filled-in**) shall carry out the following works
- d)
- 1.12. The parties hereto agreed that each of them shall duly and properly perform all the functions and all costs related to their respective works.
- 1.13. The parties hereto shall be at liberty to enter into liaison work/correspondence with statutory and local authorities as the circumstances warrant individually or collectively.
- 1.14. It is hereby agreed and undertaken that, all the parties are jointly and severally

liable to the —Board of Port of Deendayal for the performance of the contract.

- 1.15. Notwithstanding demarcation or allotment of work between JV/Consortium partners, JV/Consortium each partner shall be liable for non performance of the whole contract irrespective of their demarcation or share of work.
- 1.16. The Lead Partner shall be authorized to act on behalf of the JV/Consortium.
- 1.17. All the correspondences between the Employer and the JV /Consortium shall be routed through the Lead Partner.
- 1.18. The Lead Partner is authorized: (a) to submit bid, negotiate and conclude contract and incur all liabilities therewith on behalf of the partner(s) of the JV /Consortium during the bidding process; and (b) in the event of a successful bid, to incur liabilities and receive instructions for and on behalf of the partner(s) of the JV/Consortium and to carry out the entire execution of the contract including payment, exclusively through Lead Partner.
- 1.19. In the event of default of the Lead Partner, it shall be construed as default of the Developer/Contractor; and Employer shall be entitled to take action under relevant clause(s) of the Department Bid Document and/or Conditions of Contract.
- 1.20. All the parties of the JV/Consortium shall be jointly and severally liable for due performance, recourse/sanctions within the joint venture in the event of default of any partner and arrangements for providing the required indemnities.
- 1.21. The JV/ Consortium shall have a separate JV/Consortium Bank account (distinct from the Bank account of the individual partners) to which individual partners shall contribute their share capital / or working capital. The financial obligation of the consortium shall be discharged through the said JV/ Consortium Bank account only and also all payment received by consortium from the Deendayal Port Authority shall be through that account only.

The parties hereto have mutually agreed to the terms and conditions set forth herein above and have assured each other to duly perform the reciprocal promises and obligations on either side for effective implementation of the JV/Consortium for proper and due completion of the works envisaged, in the event of award of contract to the JV/Consortium and have affixed their signature in this indenture on this theday of.....20...

(i) Signature Name Designation seal & Common seal of the firm

(ii) Signature Name Designation seal & Common seal of the firm

Witness 1

Witness 2

**PROFORMA OF POWER- OF-ATTORNEY FOR LEAD
MEMBER OF JV/ CONSORTIUM**

((To be submitted on Non-judicial Stamp Paper of appropriate value))

By this Power-of-Attorney **executed** on **this**day of(month) of 2025, we,

(i) (.....*Name of legally authorized signatory of first partner to be filled in*.....), (ii) (.....*Name of legally authorized signatory of second partner to be filled in*.....),

..... hereby jointly authorize and

agree the Lead Partner, M/s (... *Name of the lead partner to be filled in*.....), (a) to submit bid, negotiate and conclude contract and incur all liabilities therewith on behalf of the partner(s) of the JV /Consortium during the bidding process; and (b) in the event of a successful bid, to incur liabilities and receive instructions for and on behalf of the partner(s) of the JV /Consortium and to carry out the entire execution of the contract including payment for the work of **Construction of Center of Excellence (CoE) for Green Hydrogen at Gandhidham** exclusively through Lead Partner.

(i) Signature Name
Designation seal & Common seal
of the firm

(ii) Signature Name
Designation seal & Common seal
of the firm

.....

.....

Signature, name and seal of the certifying authority/Notary Public

JOINT VENTURE PARTNER INFORMATION FORM

[The Tenderer shall fill in this Form in accordance with the instructions indicated below].

Date: [insert date (as day, month and year) of Tender Submission]

Tender No.: [insert number of Tendering process]

Page _____ of _____ pages

1. Tender's Legal Name: [insert Tenderer's legal name]
2. JV's Party legal name: [insert JV's Party legal name] JV's Legal Lead Partner {insert name and address}
3. JV's Party Country of Registration: [insert JV's Party country of registration and details of registration]
4. JV's Party year of Registration: [insert JV's Party year of registration]
5. JV's Party Legal Address in Country of Registration: [insert JV's Party legal address in country of registration]
6. JV's Party Authorized Representative information Name: [insert name of JV's Party authorized representative] Address:[insert address of JV's Party authorized representative] Telephone/Fax numbers:[insert telephone/fax numbers of JV's Party authorized representative] Email Address: :[insert email address of JV's Party authorized representative]
7. Attached are copies of original documents of [check the box(es) of the attached original documents] <input type="checkbox"/> Articles of incorporation or registration of firm named in 2, above, in accordance with tender document. <input type="checkbox"/> In case of government owned entity from India, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with Tender Documents <input type="checkbox"/> <u>PAN Number</u> <input type="checkbox"/> <u>Sales Tax / VAT registration number</u> <input type="checkbox"/> <u>Service Tax Registration Number</u> <input type="checkbox"/> Any other documents required for statutory compliance

Duly authorized to sign this Authorization on behalf of: [insert complete name of Tenderer]

Date on _____ day of _____, _____ [insert date of signing]

EXCEPTIONS AND DEVIATIONS

As pointed out in the Tender Call Notice, Bidder may stipulate here exceptions and deviations to the bid conditions, if considered unavoidable.

Sr. No.	Page No. of Bid Document	Clause No. of Bid Document	Subject Deviation

Note: however, the Bidders to note that unacceptable deviations, if any, the bid shall be liable for rejection. Bidder is discouraged to deviate from bid conditions, specifications, delivery schedules, and commercial terms as per the tender document.

Duly authorized to sign this authorization on behalf of: [insert complete name of Tenderer]

Date on_____day of_____,_____ [insert date of signing]

INTEGRITY PACT

Between

Deendayal Port Authority (DPA) hereinafter referred to as "**The Principal**"

and

.....(Name of The bidders and consortium members) hereinafter referred to as "**The Bidder / Contractor**"

Preamble

The Principal intends to award, under laid down organizational procedures, contract(s) / concession(s) for Tender No. C-I: 03/2025). The Principal values full compliance with all relevant laws of the land rules, regulations, economic use of resources and of fairness / transparency in its relations with its Bidder(s) and/ or Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitors (IEMs), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

1. The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -
 - (a) No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - (b) The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
 - (c) The Principal will exclude from the process all known prejudicial persons.
2. If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the IPC / PC Act, or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder(s) / Contractor(s)

1. The Bidder(s) / Contractor(s) commits themselves to take all measures necessary to prevent corruption. The Bidder(s) / Contractor(s) commits themselves to observe the following principles during participation in the tender process and during the contract execution.
 - (a) The Bidder(s) / Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in tender process or the execution of the contract or to any third person any material or other benefit, which he / she is not legally entitled to, in order to obtain in exchange of advantage of any kind whatsoever during the tender process or during the execution of the contract.
 - (b) The Bidder(s) / Contractor(s) will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids, or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
 - (c) The Bidder(s) / Contractor(s) will not commit any offence, under the relevant Prevention of Corruption Act / Indian Penal Code / PC Act; further the Bidder(s) / Contractor(s) will not use improperly, for purposes of competition, or personal gain, or pass on to others, any information or document provided by the Principal, as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
 - (d) The Bidder(s) / Contractor(s) of foreign origin shall disclose the name and address of the Agents / Representatives in India, if any. Similarly, the Bidder(s) / Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any. Further details as mentioned in the "Guidelines on Indian Agents of Foreign Suppliers" shall be disclosed by the Bidder(s) / Contractor(s). Further, as mentioned in the Guidelines all the payments made to Indian agent / representative have to be in Indian Rupees only. Copy of the "Guidelines on Indian Agents of Foreign Suppliers" is placed at Section 11.
 - (e) The Bidder(s) / Contractor(s) will, when presenting their bid, disclose any and all payments made, is committed to or intends to make to agents, brokers or any other intermediaries, in connection with the award of the contract.
 - (f) Bidder(s) / Contractor(s) who have signed the Integrity Pact shall not approach the Courts while representing the matter to IEMs and shall wait for their decision in the matter.

2. The Bidder(s) / Contractor(s) will not instigate third persons to commit offence outlined above or be an accessory to such offences.

Section 3 - Disqualification from tender process and exclusion from future contracts.

If the Bidder(s) / Contractor(s), before award or during execution has committed a transgression through a violation of Section-2 above, or in any other form, such as to put their reliability or credibility in question, the Principal is entitled to disqualify the Bidder (s) / Contractor(s), from the tender process, or take action as per the procedure mentioned in the "Guidelines on Banning of business dealings". Copy of the "Guidelines on Banning of business dealings" is placed at Section 11.

Section 4 – Compensation for Damages

1. If the Principal has disqualified the Bidder(s), from the tender process prior to the award, according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit / Bid Security.
2. If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Contractor, liquidated damages of the Contract Value or the amount equivalent to Security Deposit / Performance Bank Guarantee, whichever is higher.
3. The Bidder(s) agrees and undertakes to pay the said amounts, without protest or demur, subject only to condition that, if the Bidder(s) / Contractor(s) can prove and establish that the termination of the contract, after the contract award has caused no damage or less damage than the amount of the liquidated damages, the Bidder/Contractor shall compensate the principal, only to the extent of the damage in the amount proved.

Section 5 – Previous transgression

1. The Bidder declares that, no previous transgressions occurred in the last three years with any other company in any country confirming to the anti-corruption approach or with any other Public Sector Enterprises in India, that could justify his exclusion from the tender process.
2. If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or action can be taken as per the procedure mentioned in "Guidelines on Banning of Business dealing".

Section 6 – Equal treatment of all Bidders / Contractors

1. In case of a Joint Venture, all the partners of the Joint Venture will enter into agreement with identical conditions as this on which all Bidders.

2. There is no provision of sub-contract in the tender, any violation of the same, Contractor shall be held solely responsible for the same.

Section 7 - Criminal charges against violating Bidders / Contractors

If the principal obtains knowledge of conduct of a Bidder or Contractor or of an employee, or a representative, or an associate of a Bidder or Contractor, which constitutes corruption, or if the Principal has substantive suspicion, in this regard, the Principal will inform the same to the Chief Vigilance Officer (CVO) and the CVO will take further necessary action as deemed fit in accordance with the CVC Manual.

Section 8 – External Independent Monitor

1. The Principal appoints competent and credible Independent External Monitor for this Pact after approval by Central Vigilance Commission. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
2. The Monitor is not subject to instructions by the representative of the parties and performs his/ her functions neutrally and independently. The Monitor would have access to all Contact documents, whenever required. It will be obligatory for him / her to treat the information and documents of the Bidders / Contractors as confidential. He / she reports to the Chairperson of the Board of the Principal.
3. The Bidder(s) / Contractor(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the Contractor. The Bidder / Contractor will also grant the Monitor, upon his / her request and demonstration of a valid interest, unrestricted and unconditional access to the project documentation. The Monitor is under contractual obligation, to treat the information and documents of the Bidder / Contractor with confidentiality.
4. The Monitor is under contractual obligation to treat the information and documents of the Bidder(s) / Contractor(s) with confidentiality. The Monitor has also signed declaration on "Non-Disclosure of Confidential Information" and of "Absence of Conflict of Interest". In case of any conflict of interest arising at a later date, the IEM shall inform Chairman, DPA and recuses himself / herself from that case.
5. The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the Principal and the Bidder / Contractor. The parties offer to the Monitor the option to participate in such meetings.

6. As soon as the Monitor notices, or believes to notice, a violation of this agreement, he / she will so inform the Management of the Principal and request the management to discontinue, or take corrective action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.
7. The Monitor will submit a written report to the Chairperson of the Board of the Principal, within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise, submit proposals for correcting problematic situations.
8. If the Monitor has reported to the Chairperson of the Board of the Principal, a substantiated suspicion of an offence under relevant IPC / PC Act and the Chairperson of the Board of the Principal has not, within reasonable time taken visible action to proceed against such offence or reported it to the Chief Vigilance Officer, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
9. The word “**Monitor**” would include both singular and plural.

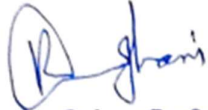
Section 9 - Pact Duration

- 9.1. This Pact shall be operative from the date of signing of IP by both the parties till the final completion of contract of successful bidder and for all other bidders six months after the contract has been awarded. Issues like warranty, guarantee, etc. should be outside the purview of IEMs.
- 9.2. If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this Pact, as specified above unless it is discharged / determined by the Chairperson, DPA.

Section 10 - Other Provisions

1. This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal, i.e. Gandhidham, Gujarat.
2. Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.
3. If the Bidder / Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.
4. Should one or several provisions of this agreement, turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
5. Issues like Warranty / Guarantee etc. shall be outside the purview of IEMs.

6. In the event of any contradiction between the Integrity Pact and its Annexure, the Clause in the Integrity Pact will prevail.

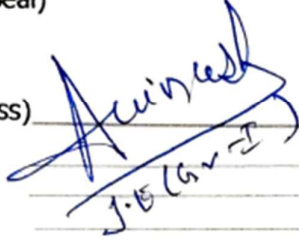


ଅଧିକାରୀ ଅଭିଯୋଗ (ନିର୍ମାଣ-1)
(For & on behalf of the Principal)
Executive Engineer (C...)
Deendayal Port Trust
(Office Seal)

(For & on behalf of the Bidder / Contractor)

(Office Seal)

Witness-1:
(Name & Address)



J.E. (G-1)

Witness-1:
(Name & Address)

Place : Gandhidham Date : ____/____/20____

Note: The bidder has to execute Integrity Pact Agreement with Deendayal Port Authority (as per Bid Response Sheet No. 10 and Shri Amiya Kumar Mohapatra, IFoS (Retd.) and Dr. Gopal Dhawan, Ex-CMD, MECL have been appointed by DPA as independent External Monitors and whose address are as under: -

1. **Shri Amiya Kumar Mohapatra, IFoS (Retd.)**

Qrs. No. 5/9, Unit-9, Bhoi Nagar,

Bhubaneswar-751 022

Mobile no. 9437002530

Email: amiyaifs@gmail.com

2. **Dr. Gopal Dhawan, Ex-CMD, MECL,**

House no. 120, Jal Shakti Vihar

(NHPC Society) P4, Builders area,

Greater Noida Gautam Budh Nagar,

Utter Pradesh - 201 315

Mobile no. - 8007771467

Email: gdhawangeologist@gmail.com

Annexure-II

FORMAT OF BID SECURITY DECLARATION FROM BIDDERS

(Applicable for MSME Bidders)

(On Bidders Letter head)

Date: _____

Tender No. _____

To (insert complete name and address of the Employer/Purchaser)

I/We. The undersigned, declare that:

I/We understand that, according to your conditions, bids must be supported by a Bid Securing Declaration.

I/We accept that I/We may be disqualified from bidding for any contract with you for a period of three years from the date of notification if I am /We are in a breach of any obligation under the bid conditions, because I/We

- a. have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or
- b. having been notified of the acceptance of our Bid by the employer/purchaser during the period of bid validity (i) fail or refuse to execute the contract, if required, or (ii) fail or refuse to furnish the Performance Security, in accordance with the Instructions to Bidders.

I/We understand this Bid Securing Declaration shall cease to be valid if I am/we are not the successful Bidder, upon the earlier of (i) the receipt of your notification of the name of the successful Bidder; or (ii) thirty days after the expiration of the validity of my/our Bid.

Signed: (insert signature of person whose name and capacity are shown)

in the capacity of _____ (insert legal capacity of person signing the Bid Securing Declaration)

Name: (insert complete name of person signing the Bid Securing Declaration)

Duly authorized to sign the bid for and on behalf of (insert complete name of Bidder)

Dated on _____ day of _____ (insert date of signing)

Corporate Seal (where appropriate)

(Note: In case of a Joint Venture, the Bid Securing Declaration must be in the name of all partners to the Joint Venture that submits the bid)

SECTION 11

GUIDELINES ON BANNING OF BUSINESS DEALINGS (Effective from 01/01/2023)



DEENDAYAL PORT AUTHORITY
(Formerly known as Kandla Port Trust)
GANDHIDHAM - KUTCH - GUJARAT - 370 201.

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1. Introduction

- 1.1 "Board" of Deendayal Port Authority (DPA) constituted by the Central Government in accordance with sub-section (1) of section 3 of the Major Port Authorities Act, 2021, has to ensure preservation of rights enshrined under the above Act. DPA has also to safeguard its commercial interests. DPA is committed to deal with Agencies, who have a very high degree of integrity, commitment and sincerity towards the work undertaken. It is not in the interest of DPA to deal with Agencies who commit deception, fraud or other misconduct while participating in tenders/in the execution of contracts awarded/orders issued to them. In order to ensure compliance with the constitutional mandate, it is incumbent on DPA to observe principles of natural justice before banning the business dealings with any Agency.
- 1.2 Since banning of business dealings involves civil consequences for an Agency concerned, it is incumbent that adequate opportunity for hearing is provided and the explanation, if tendered, is considered before passing any order in this regard keeping in view the facts and circumstances of the case.
- 1.3 The objective of these guidelines is to have a common procedure for Banning of Business Dealings with Agencies across the Company.

2. Scope

- 2.1 These guidelines are applicable to the sale and procurement of goods & services including contracts / projects across all the Departments and Divisions of DPA.
- 2.2 The General Conditions of Contract (GCC) of DPA provide that DPA reserves the rights to keep on hold participation in tenders or to ban business dealings if any Agency has been found to have committed misconduct and also to suspend business dealings pending investigation. If such provision does not exist in any GCC, the same may be incorporated.
- 2.3 Similarly, in the case of sale of material, there is a clause in Sale Order to deal with the Agencies / customers / buyers, who indulge in lifting of material in unauthorized manner. This should also include all activities including unauthorized selling of the material. If such a stipulation does not exist in any Sale Order, the same may be incorporated.
- 2.4 However, absence of such a clause as mentioned at para 2.2 & 2.3 above does not in any way restrict the right of the Board (DPA) to take action / decision under these guidelines in appropriate cases.
- 2.5 The procedure for (i) Board wide Hold on participation of the Agency in Tenders (ii) Suspension and (iii) Banning of Business Dealings with Agencies, has been laid down in these guidelines.
- 2.6 It is clarified that these guidelines do not deal with the decision of the Management not to entertain any particular Agency due to its poor / inadequate performance or for any other reason.
- 2.7 The banning shall be with prospective effect, i.e., future business dealings.

3. Definitions

In these Guidelines, unless the context otherwise requires:

- i) 'Party / Contractor / Supplier / Purchaser / Customer / Bidder / Tenderer' shall mean and include a public limited company or a private limited company, a firm whether registered or not, an individual, partnership firm, Limited Liability Partnership, a cooperative society or an association or a group of persons engaged in any commerce, trade, industry, etc. Party / Contractor / Supplier / Purchaser / Customer / Bidder / Tenderer' in the context of these guidelines is termed as 'Agency.'
- ii) 'Inter-connected Agency' shall mean two or more companies having any of the following features:
 - a) If one is a subsidiary of the other;
 - b) If the Functional Director(s), Partner(s), Manager(s) or Representative(s) are common;
 - c) If management is common;
 - d) If one owns or controls the other in any manner;
 - e) If the agencies have same authorized signatory (ies)

- f) If they have the same address/same Permanent Account Number / same Bank Account Number / common email ID.

Note: This list is only illustrative in nature.

- iii) 'Competent Authority' and 'Appellate Authority' shall mean the following:

Area of Banning/ Suspension	Competent Authority	1st Appellate Authority	2nd Appellate Authority
Board-wide banning	HoD of the Board	Chairman, DPA	--
Banning / Suspension of business dealings with Foreign supplier of imported coal & coke	HoD's Committee	Chairman, DPA	DPA Board**
Board wide Suspension of business dealings with Agency	Officer nominated by Chairman of Board. For Department headed by HoDs, the respective HoDs will nominate the officer for this purpose.*	Chairman of the Board. For Departments headed by HoDs, the respective HoDs will be the Appellate Authority.	--
Board wide Hold on participation of the Agency in Tenders #	Officer nominated by Chairman of Board. For Departments headed by HoDs, the respective HoDs will nominate the officer for this purpose.*	Chairman of the Board. For Departments headed by HoDs, the respective HoDs will be the Appellate Authority.	--

* For Board – The nominated officer shall be a Direct Reporting Officer (DRO) not below the rank of Head of the Department for "Competent Authority" for the purpose of suspension of business dealings with the Agency as well as for Board wide Hold on participation of the Agency in tenders under these guidelines. For Corporate Office, in case of procurement of items / award of contracts to meet the requirement of Corporate Office only, Head of Department shall be the Competent Authority and HoD concerned shall be the Appellate Authority. The Management of Subsidiary shall define / appoint the "Competent Authority", Appellate Authority & Standing Banning Committee in their respective cases.

This provision for Hold on participation of the Agency in tenders shall be applicable only in such case where Standing Banning Committee recommends for keeping on Hold the participation in tenders and which shall be limited to particular Department / Division.

** This would be applicable only in cases of banning of business dealings with Foreign Suppliers of imported coal and coke.

- iv) 'Investigating Department' shall mean any Department or Division investigating into the conduct of the Agency and shall include the Vigilance Department, Central Bureau of Investigation, the State Police or any other department set up by the Central or State Government having powers to investigate.

4. Initiation of Banning/Suspension

Action for banning/suspension of business dealings with any Agency should be initiated by the Concerned Department such as Indenting / Contracting / Executing Departments, etc. having business dealings with

Agency or by the department which floated the tender (in case where the tenderer has committed deception, fraud or other misconduct) subsequent to noticing the irregularities or misconduct on their part.

5. Suspension of Business Dealings

- 5.1 If the conduct of any Agency (except Foreign Suppliers of imported coal and coke) dealing with DPA is under investigation by any department of any Department, the Concerned Department may consider whether the allegations under investigations are of serious nature and whether pending investigations, it would be advisable to suspend (temporarily discontinue) business dealings with the Agency. Recommendation in the matter shall be submitted to the Competent Authority for this purpose.
- 5.2 If the Competent Authority, after consideration of the matter including the recommendation of the Investigating Department, decides that it would not be in the interest of Department of DPA to continue business dealings pending investigation, it may suspend business dealings with the Agency. The Suspension Order to this effect shall be issued by the Head of Concerned Department or by his representative / concerned executive with the approval of the Head of the Concerned Department, indicating a brief of the charges under investigation and the period of suspension. If it is decided that inter-connected Agencies would also come within the ambit of the order of suspension, the same should be specifically stated in the order. Ordinarily, the order of suspension would operate for a period not more than six months and may be communicated to the Agency and also to the Investigating Department.

Further to the suspension, the investigation, recommendation by the Standing Banning Committee (SBC) and final decision by the Competent Authority to be completed within six months from order of suspension.

- 5.3 The order of suspension of business dealings with the Agency under investigation shall be communicated to all Departmental Heads within the Board. During the period of suspension, no fresh contract will be entered into with the Agency. Suspension would be valid only for the concerned Board.
- 5.4 As far as possible, the Agency under suspension should be allowed to complete the job of existing contracts, unless the Competent Authority, having regard to the circumstances of the case, decides otherwise. Once the order for suspension is issued, existing offers against ongoing tenders (prior to issuance of contract)/ new offers of the Agency shall not be entertained during the period of suspension.
- 5.5 For suspension of business dealings with Foreign Suppliers of imported coal & coke, following shall be the procedure:-

- i) Suspension of the foreign suppliers shall apply throughout the Board including Subsidiaries.
- ii) The complaint against any foreign supplier shall be investigated by Board or by any other Investigating Department. If the gravity of the misconduct under investigation is found serious and it is felt that it would not be in the interest of DPA to continue to deal with such Foreign Supplier, pending investigation, the recommendation on such matter by Investigating Department (including Board) may be sent to Chairman, DPA to place it before a Committee consisting of the following:

1. Head of Finance Department,
2. Head of Department
3. Head of Law / Legal Division

The committee shall expeditiously examine the report; give its comments / recommendations within twenty one days of receipt of the reference by DPA.

- iii) The comments / recommendations of the Committee shall then be placed before DPA Board's

Committee. If DPA Board's Committee decides that it is a fit case for suspension, Board's Committee shall pass necessary orders which shall be communicated to the foreign supplier by Head of Department.

- 5.6 If the Agency concerned asks for detailed reasons of suspension, the Agency may be informed that its conduct is under investigation. It is not necessary to enter into correspondence or argument with the Agency at this stage.
- 5.7 It is not necessary to give any show-cause notice or personal hearing to the Agency before issuing the order of suspension. However, if investigations are not complete in six months' time, the Competent Authority with approval of Head of the Department may extend the period of suspension by another three months, during which period the investigation must be completed.

6. Grounds on which Banning of Business Dealings can be initiated

- 6.1 If the security consideration, including questions of loyalty of the Agency to the State, so warrants;
- 6.2 If the Director / Owner of the Agency, proprietor or partner of the firm, is convicted by a Court of Law for offences involving moral turpitude in relation to its business dealings with the Government or any other public sector enterprises or DPA, during the last five years preceding date of tender opening or during execution of contract, provided such information is known to DPA;
- 6.3 If there is strong justification for believing that the Directors, Proprietors, Partners, owner of the Agency have been guilty of malpractices such as bribery, corruption, fraud, substitution of tenders, interpolations, etc. during the last five years preceding date of tender opening or during execution of contract, provided such information is known to DPA;
- 6.4 If the Agency continuously refuses to return / refund the dues of DPA without showing adequate reason and this is not due to any reasonable dispute which would attract proceedings in Arbitration or Court of Law;
- 6.5 If the Agency employs a public servant dismissed / removed or employs a person convicted for an offence involving corruption or abetment of such offence, provided such information is known to DPA;
- 6.6 If business dealings with the Agency have been banned by the Central or State Govt. or any other public sector enterprise at the time of submitting his bid or on the date of tender opening or at the time of placement of order, provided such information is known to DPA;
- 6.7 If the Agency has resorted to Corrupt, fraudulent practices including misrepresentation of facts and / or fudging / forging / tampering of documents; **Ω**
- 6.8 If the Agency uses intimidation / threatening / misbehaves with DPA Official or brings undue outside pressure or influence on the Board (DPA) or its official in acceptance / performances of the job under the contract;
- 6.9 If the Agency indulges in repeated and / or deliberate use of delay tactics in complying with contractual stipulations / delayed the tendering process;
- 6.10 Wilful indulgence by the Agency in supplying sub-standard material irrespective of whether pre-dispatch inspection was carried out by Board (DPA) or not;
- 6.11 Based on the findings of the investigation report of Investigating Department against the Agency for mala-fide / unlawful acts or improper conduct on its part in matters relating to the Board (DPA) or even otherwise;
- 6.12 Established litigant nature of the Agency to derive undue benefit;
- 6.13 Continued poor performance of the Agency in several contracts;
- 6.14 If the Agency misuses the premises or facilities of the Board (DPA), forcefully occupies tampers or damages the Board's properties including land, water resources, forests / trees, etc.
- 6.15 If the Agency resorts to unauthorized sale of materials purchased from the Board.
- 6.16 If the Agency has committed a transgression through violation of any of its commitments under the Integrity Pact entered with DPA.

(Note: The examples given above are only illustrative and not exhaustive. The Competent Authority may decide to ban business dealings for any good and sufficient reason).

- Ω *No experience certificate shall be issued by Engineer in Charge / Executing Authority against the contract to the Agency found to have submitted forged / fabricated documents / indulged in corrupt / fraudulent practices.*

7. Banning of Business Dealings.

- 7.1 A decision to ban business dealings with any Agency by any one of the Departments of DPA will apply throughout the Board including Divisions, i.e., Board-wide banning.
- 7.2 There will be a Standing Banning Committee (SBC) in each Department to be appointed by Competent Authority for processing the cases of "Banning of Business Dealings". However, for procurement of items / award of contracts, to meet the requirement of Board only, the Committee shall be HoD each from Operations, Finance & Law Departments. The proposal of the Concerned Department for initiating action under the Guidelines for Banning of Business Dealings based on their own findings and / or upon receipt of advice of the Investigating Department shall be forwarded through respective Head of Department to the Standing Banning Committee for consideration.
- 7.3 The functions of the Standing Banning Committee shall, inter-alia include:
- i) To examine in detail the allegations / irregularities / misconduct mentioned in the proposal for banning forwarded by the Department, hold preliminary meeting and decide if a prima-facie case for banning under the guidelines exists. If during preliminary meeting, SBC is of opinion that prima facie no case is made out, it shall return the case to the Concerned Department.
 - ii) If it is decided to proceed for banning action, to recommend for issue of show-cause notice (as per para 9) to the Agency by the Concerned Department, as to why action should not be taken against the Agency, including its interconnected agencies, under the Guidelines for Banning of Business Dealings with them. Agency should be asked to submit its reply within 15 days of the show-cause notice.
 - iii) To examine the reply given by the Agency to show-cause notice and call the Agency for personal hearing, if required.
 - iv) To submit final recommendation to the Concerned Department for banning of business dealings with the Agency or Board wide Hold on participation of the Agency in tenders or exoneration.
- 7.4 If banning is recommended by the Standing Banning Committee of any Department / Division, the proposal containing the facts of the case, proper justification of the action proposed, relevant supporting documents along with the recommendation of the SBC and proposed banning period should be sent by the Concerned Department and duly forwarded by the Head of the Department / Division, to the Competent Authority. Based on this proposal, a decision for banning or otherwise shall be taken by the Competent Authority. At this stage if it is felt by the Competent Authority that there is no sufficient ground for banning, then the case with detailed reasons shall be sent back to the respective Department / Division for necessary action at their end. The Competent Authority may consider and pass an appropriate Speaking Order:
- a) For exonerating the Agency if the charges / allegations are not established;
 - b) For banning the business dealings with the Agency or
 - c) For putting on Hold the participation of the Agency in tenders in the concerned Department / Division.
- 7.5 If the Competent Authority decides that it is a fit case for banning of business dealings with the Agency, the Competent Authority shall pass necessary orders which shall be routed back to the Department concerned for issuance of banning orders to the Agency. However, in cases where there is a shortage of suppliers and banning may hurt the overall interest of DPA, endeavor should be to pragmatically analyze the circumstances, try to reform the Supplier and to get a written commitment from them that their performance will improve.

- 7.6 If the Competent Authority decides to ban business dealings, the period for which the ban would be operative shall be mentioned. If applicable, the order may also mention that the ban would extend to the interconnected agencies of the Agency. The Speaking Order for banning would be conveyed by the Concerned Department to the Agency concerned and copy circulated to all Departments of DPA.
- 7.7 The Banning period may range from 1 year to 3 years depending on the gravity of the case as decided by the Competent Authority. Ordinarily, the period of banning shall be in the range of 1-2 years from the date of issuance of order depending on the severity of the irregularities / lapses committed / termination of contract due to poor performance, etc. However, in case of fraud / forgery / corrupt / fraudulent practice or tampering of documents by the Agency as given in para 6.7 above, the period of banning to be imposed on the Agency would be three years. The period of suspension, if any, shall be accounted for up to a maximum of 6 months in the period of banning provided the banning order is issued within the period of suspension.
- 7.8 As far as possible, the Agency under banning should be allowed to complete the job of existing contracts, unless the Competent Authority, having regard to the circumstances of the case, decides otherwise. Once the order for banning is issued, existing offers against ongoing tenders (prior to issuance of contract) / new offers of the Agency shall not be entertained during the period of banning. In addition, if the Agency has been banned under provisions of Para 6.7, then the particular contract in which the irregularity has been proved will be terminated with immediate effect. In exceptional cases, where it would not be prudent to terminate the said contract with immediate effect, the contract may be allowed to continue for such minimum period during which alternate arrangement(s) can be made. The same shall however require the approval of the Chairman / HoD where the exigency to continue the contract has been clearly brought out.
- 7.9 In case the Competent Authority has decided to exonerate the Agency, the Concerned Department will issue the exoneration letter to the Agency concerned as well as communicate to all Departmental Heads within the Department / Division. If the Agency has been suspended in the case under consideration, in the same letter to the Agency it must be clarified that the Suspension has also been revoked.
- 7.10 Procedure for Banning of Business Dealings with Foreign Suppliers.
- i) Banning of the Agencies shall apply throughout the Company including Subsidiaries.
 - ii) The complaint against any Foreign Supplier shall be investigated by Head of Department of DPA or any other Investigating Department. After investigation, depending upon the gravity of the misconduct, Investigating Department may send their report to Head of Department of DPA to place it before a Committee referred at 5.5 (ii) above. The Committee shall examine the report and give its comments / recommendations within 21 days of receipt of the reference by Head of Department, DPA.
 - iii) The comments / recommendations of the Committee shall be placed by Head of Department before DPA Board's Committee constituted for the above purpose. If DPA Board's Committee decides that it is a fit case for initiating banning action, it will direct Chairman of DPA to issue show-cause notice to the Agency for replying within a period of 15 days of receipt of the show-cause notice or reasonable time.
 - iv) On receipt of the reply or on expiry of the stipulated period, the case shall be submitted by DPA Board's Committee to Chairman of DPA for consideration & decision.
 - v) The decision of the Chairman of DPA shall be communicated to the Agency by DPA.

8. Department / Division wide Hold on participation of the Agency in Tenders

- 8.1 If the SBC recommends for Board wide Hold on participation of the Agency in Tenders on coming to a conclusion that the charge against the Agency is minor in nature, the Concerned Department shall put up a proposal to the Competent Authority containing facts of the case, proper justification of action proposed, relevant documents alongwith the recommendations of the Committee and proposed period for Hold from participation in tenders. If the Competent Authority decides that it is a fit case for Board wide Hold on participation of the Agency in tenders, the Competent Authority may pass necessary orders which shall be communicated to the Agency by the Concerned Department. The period of Hold

may range from 6 months to 1 year.

- 8.2 The effect of Board wide Hold on participation of the Agency in tenders would be that the Agency would not be considered for any type of Tenders for such period as mentioned in the order at any stage before issuance of contract. Other existing contracts with the Agency would continue unless otherwise decided by the Competent Authority. However, no repeat orders would be placed on the party for the period as mentioned in the order.
- 8.3 The modalities for effecting Hold on participation of the Agency in tenders and re-entry after completion of period of Hold shall be worked out by the concerned Department / Division as the Hold is Department / Division specific.

9. Show-cause Notice

- 9.1 In case where the Competent Authority decides that action against an Agency is called for, a show-cause notice shall be issued to the Agency by the Concerned Department. Statement containing the imputation of misconduct should be appended to the show-cause notice and the Agency should be asked to submit within 15 days a written statement in its defence. It must be clearly mentioned in the Show-Cause Notice that DPA hereby proposes to initiate action against the Agency in terms of the Guidelines on Banning of Business Dealings. Generally, all communication with the Agency shall be through email mentioned by Agency in contract or last known email and postal address.
- 9.2 If the Agency requests for inspection of any relevant document in possession of DPA, necessary facility only for inspection of documents may be provided.

10. Appeal against the Decision of the Competent Authority

- 10.1 The Agency may file an appeal against the order of Board-wide banning of business dealings / suspension / Board wide Hold on participation of the Agency in tenders. The appeal shall lie to the respective Appellate Authority only. Such an appeal shall be preferred within 30 days of receipt of the order.
- 10.2 Appellate Authority would consider the appeal and pass appropriate Speaking Order which shall be communicated by the Concerned Department to the Agency as well as the Competent Authority whose Order has been appealed.

11. Circulation of the names of Agencies with whom Business Dealings have been banned

- 11.1 The Board shall upload/update the list of banned agencies alongwith the period of banning immediately on issue of the banning order on the Board's website as well as DPA Tenders website for wider circulation. Other Boards would check the list of banned Agencies before proceeding on tenders at their respective Boards. Boards having SAP/SRM system shall disable the banned vendors in SAP/SRM from issuance of further Enquiry/Purchase Order till the expiry of the banning period.
- 11.2 Depending upon the gravity of misconduct established, the Competent Authority may advise Head of Vigilance Department / HoD for circulating the names of Agency with whom business dealings have been banned, to the Government Departments, other Boards, Public Sector Enterprises, etc., for such action as they deem appropriate. The updated list of banned Agencies must be uploaded by Board on DPA Tenders website for wider circulation.
- 11.3 If Government Departments or a Public Sector Enterprise request for more information about the Agency with whom business dealings have been banned, a copy of the report of Investigating Department / Standing Banning Committee / DPA Board's Committee together with a copy of the order of the Competent Authority / Appellate Authority may be provided.

- 11.4 If business dealings with any Agency have been banned by the Central or State Government or any other Public Sector Enterprise, DPA may, on receipt of such information, without any further enquiry or investigation, issue an order banning business dealings with the Agency and its interconnected Agencies. In event of receipt of information, the procedure for banning in DPA will still have to be followed though no investigation will be called for, and the banning period proposed should be co-terminus with the period of banning in the organization which has issued the banning order but limited to the maximum period of banning as per the extant banning guidelines of DPA. On completion of the banning period as per DPA banning order, the Agency will be eligible for participating in any tenders in DPA irrespective of banning status in the other organization.
- 11.5 Based on the above, Departments / Divisions may take necessary action for implementation of the Guidelines for Banning of Business Dealings and same be made a part of the tender documents.

12. Saving

Any amendment to the guidelines shall require the approval of Chairman, DPA.

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