

Tender No.: BHU/P&E/09/2024-25/25 DATED 25.09.2024



STATE BANK OF INDIA

LOCAL HEAD OFFICE,
III/1, Pt. J. N. MARG
BHUBANESWAR

TENDER NO. BHU/P&E/09/2024-25/25

DATE: 25.09.2024

Part – I (Technical Bid)

NOTICE INVITING e-TENDER

TENDER DOCUMENT FOR CONSTRUCTION OF G+2 STORIED BUILDING FOR ADMINISTRATIVE OFFICE & REGIONAL OFFICE AT AMBAPUA, BERHAMPUR, ODISHA. (COMPOSITE WORK COMPRISES CIVIL, PH, EXTERNAL ELCTRICAL(HT), DG & LIFT INSTALLATION AND FIRE FIGHTING WORKS, AUTOMATIC FIRE DETECTION & ALARM SYSTEM, PUBLIC ADDRESS AND VOICE EVACUATION SYSTEM).

Name of the Tenderer : _____

Address : _____

Date & Time of Opening of Tender: 09.10.2024 at 4:00 pm.

M/s Vastukar

2845, Nageswar Tangi,
Bhubaneswar-751002, Ph-0674-2435060,
9438077543

E- mail :- vastukar_architect@rediffmail.com

Web :-www.vastukar.in

Eligibility Criteria: ENLISTED COMPOSITE contractors found eligible vide our previous tender no. **BHU/P&E/08/2024-25/18 dated 23.08.2024.** Vendor/Contractor should possess valid digital signature for this e-tender.

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Notice Inviting Tender (e-NIT)

WORK: Construction Of G+2 Storied Building for Administrative Office & Regional Business Office at Ambapua, Berhampur, Odisha.

Tender reference No: **BHU/P&E/09/2024-24/25**

SBI, LHO invites two bid percentage based e-Tenders from eligible enlisted COMPOSITE contractors vide our previous tender no. **BHU/P&E/08/2024-25/18 dated 23.08.2024** for 'Pre-qualification of composite Contractor for Construction of G+2 storied building for Administrative Office & Regional office at Ambapua, Berhampur, Odisha. (Composite work comprises Civil, PH, external electrical (HT/LT), lift installation & DG and firefighting works, automatic fire detection & alarm system, public address and voice evacuation system).' The other details of the tender are as under:

1.	Name of Work	Construction of G+2 Storied Building for Administrative Office & Regional Business Office at Ambapua, Berhampur, Odisha.
2	Eligibility criteria	Contractors found eligible vide our previous Pre-qualification tender no. <u>BHU/P&E/08/2024-25/18 dated 23.08.2024</u>
3	Estimated cost put to tender	Rs 7,26,60,679.00 (Rupees Seven Crores Twenty Six Lakhs Sixty Thousand Six Hundred Seventy Nine Only) plus GST
4	Time of Completion	18 (Eighteen) Calendar Months from the date of handover of site to the Contractor.
5	Earnest Money Deposit (EMD)	Rs.7,26,700.00 (Rupees Seven Lakh Twenty Six Thousand Seven Hundred Only) in the form of Demand Draft/Banker's Cheque issued by any Nationalised /Scheduled Bank Drawn in favour of " State Bank of India. " Payable at Bhubaneswar ". The EMD shall be submitted to SBI, LHO, III/1, Pt. J. N. Marg, Bhubaneswar, in a separate envelope super scribing "EMD." <u>Vendors having NSIC/ MSME certificates are not required to submit the EMD. Scan copy of Registration Certificate shall be submitted. However, no exemption shall be entertained towards Initial security deposit (ISD) as per T&C of the contract.</u>
6	Security Deposit	5% of the final bill value.
7	Availability of Tender document.	Contractor should download Tender documents from e-tendering portal from 26.09.2024 up to 3:00 PM on 09.10.2024 from e-Tender portal <u>https://etender.sbi</u> or

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		Bank's website www.sbi.co.in <link> SBI in the News>Show More>Procurement . But the bidder need to submit digitally signed copy on-line only in the e-tendering portal only.
8	Pre-bid Meeting	Online pre-bid meeting At 11:00 AM on 30.09.2024. Click here to join the meeting, through MS Teams application.
9	Last date, time, and place for submission of Online Technical Bid.	<p>The eligible agencies/ companies are required to submit the scan copies of following documents on-line on service provider portal i.e https://etender.sbi, on or before</p> <p>Dt. 09.10.2024 up to 03:00 PM.:</p> <ul style="list-style-type: none"> i) Payment receipt of the Tender processing fee, if any. ii) Earnest Money Deposit (EMD). iii) Process Compliance form (Annexure-I) in company letterhead duly signed and stamped by authorized representative. iv) Letter of Undertaking in company letterhead duly signed and stamped by authorized representative. <p><u>The scan copy of the EMD and technical bid digitally signed are to be submitted online on or before 09.10.2024 up to 03:00 PM. However, the aforesaid documents (original) need to be submitted physically at the aforesaid address on or before due date.</u></p> <p><u>The SBI shall not entertain EMD received late due to any delay on account of delivery by the courier agency/speed post or any other mode for the reasons whatsoever. Tenders received without any one or more documents mentioned above shall be rejected.</u></p> <p>The technical bid and price bid shall be submitted online only. Price bid of technically qualified vendors will be opened online.</p>
10	Last date, time and Mode of submission of <u>Online Price Bid</u>	<p>The Price Bids is to be submitted by enlisted vendors online on the service provider portal i.e https://etender.sbi on or before the 3:00 PM of 09.10.2024 as notified in the e-tendering portal. Enlisted vendors shall also be informed by mail for participating in the e-tendering process.</p> <p>The bidder (Company/Authorized person) should have a val-</p>

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		<p>id digital signature for this e-tender. E-tendering guidelines may be obtained from:</p> <p>Service provider: Sujith Nair Dy. Manager – Client Service e-Procurement Technologies Limited Address: B-704, Wall Street – II, Opp. Orient Club, Ellisbridge, Ahmedabad – 380006, Gujarat, India Contact: sujith@eptl.in Phone: 9904407199 Mubassera@eptl.in Phone: 7859800621 Office Hours: (Monday – Friday: 10:00 AM – 7:00 PM (IST), Saturday: 10:00 AM – 6:00 PM (IST)) (Exclusion: Sunday, Holidays and 2nd & 4th Saturday)</p>
11	Date, Time, and Place of opening of online Technical Bid.	Technical bid (Part-I): After 4.00 PM on 09.10.2024 at the Office of AGM(P&E), 2 nd Floor, LHO building, Kharvelnagar, Bhubaneswar. Click here to participate in the bid opening process, through MS Teams application.
12	Date, Time, and Place of the opening of Online Price Bid.	Price bid (Part-II): After 4.30 PM on 09.10.2024 , at the Office of AGM(P&E), 2 nd Floor, LHO building, Kharvelnagar, Bhubaneswar
13	Defect Liability Period	1 year from the date of issue of virtual completion certificate
14	Validity of Offer	90 days from the date of opening of the Price-Bid
15	Commencement of work.	As advised in the Work Order.
16	Liquidated Damages (LD)	LD shall be imposed at the rate 0.5 % Per week for delay subject to maximum amount of 5% of the accepted Contract/ final work Value.
17	Terms and Mode of payment	<p>i) No advance/mobilization payment will be entertained.</p> <p>ii) The interim/running payment of Rs. 50.00 Lakhs will be entertained subject to execution of works.</p> <p>iii) After successful completion of entire work balance or 100% payment will be released against submission of tax invoice and work completion certificates.</p> <p>iv) Payment shall be made by way of Electronic fund transfer and the bill will be paid by the SBI. Firm should furnish details of the bank, A/c no, IFSC code.</p> <p>v) Any Tax invoice raised to the Bank, should bear the GST Number 21AAACS8577K1Z1 of State Bank of India for Bhubaneswar LHO.</p>

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18	Contact Person for sending any kind of correspondence regarding this tender	For any Technical queries: Architect's side: Namrata Prasad-9438077543 Vastukar, Bhubaneswar Bank's side Sri Sujoy Roy, AGM (Civil)-9674710327, Sri Kuldeep Srivastav, Fire Officer-7600035062, Sri Prakash Chandra Sethi, Manager (Civil)-9491041610, Sri B V Pratap Dy. Manager (Elect)-9937337964 P & E Dept., SBI, LHO, Bhubaneswar, Email: agmpre.lhobhu@sbi.co.in
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- In case the date of opening of tenders is declared as a holiday, the tenders will be opened on the next working day at the same time. The bidder, who is the authorized representative and participating on behalf of the company/ Dealer/vendor, should have a valid digital signature certificate (DSC) for this e-tender or in firm's name.
- SBI reserves the right to increase or decrease the quantum of services, and manpower to be provided and also reserves the right to reject, cancel or revise or accept any or all the tenders or part of tenders without giving any reasons thereto.
- SBI reserves its rights to accept/reject any/all tender without assigning any reasons whatsoever and to increase or decrease the quantities of any item and the contractor has to execute the same at the rate quoted and no correspondence shall be entertained in this regard. The successful bidder shall sign and stamp each page of the tender document thereby ensuring the number and sequence of all pages after the completion of the tendering procedures. Conditional tenders are liable for rejection.

Vastukar
(For and behalf of Assistant General Manager)
SBI, LHO, Bhubaneswar

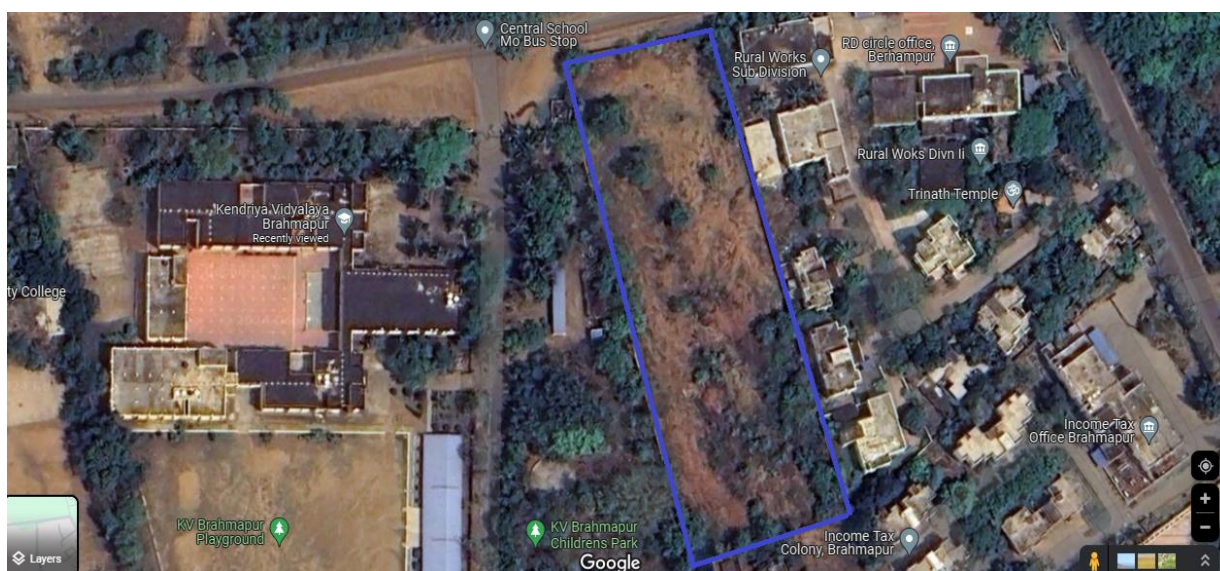
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INSTRUCTIONS TO THE TENDERERS

1.0 Scope of Work

Sealed Tenders are invited by M/s.Vastukar, project architect for and behalf of State Bank of India for the work of **Construction Of G+2 Storied Building For Administrative Office & Regional Office at Ambapua, Berhampur, Odisha.**

1.1 Site and Its Location



Bank intends to construct G+2 storied building having total built up area of 2322 Sqm having 735 Sqmt in each floor and around 50 Sqmt for Guard room, Gen set etc. The adjacent buildings are Kendriya Vidyalaya in right side & Office of Executive Engineer (RWSS) at left side to this existing plot at Ambapua, Berhampur, Odisha.

2.0 Tender Documents

2.1 The work has to be carried out strictly according to the conditions stipulated in tender consisting the following documents and the most workman like manner,

- Instructions to tenderers
- General Conditions of Contract
- Special Conditions of Contract
- Additional Conditions for Electrical Installation
- Additional conditions for firefighting Systems
- Technical Specifications
- Drawings
- Priced Bid

2.2 The above documents shall be taken as complementary and mutually explanatory of one another but in case of ambiguities or discrepancies, shall take precedence in the order given below:

- Price Bid
- Technical Specifications
- Additional Conditions for Electrical Installation
- Special Conditions of Contract
- General Conditions of Contract

Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

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➤ Instructions to Tenderers

2.3 Complete set of tender documents including relative drawings can be downloaded from the Bank's website for the drawings, if required may be obtained in person from the Architects Office at 2845, Nageswartangi, Bhubaneswar between 10.00 to 15.00 hrs on any day except holidays during the period mentioned in the NIT.

2.4 The tender documents are not transferable.

3.0 Site Visit

3.1 The tenderer must obtain himself on his own responsibility and his own expenses all information and data which may be required for the purpose of filling this tender document and enter into a contract for the satisfactory performance of the work. The Tenderer is requested satisfy himself regarding the availability of water, power, transport and communication facilities, the character quality and quantity of the materials, labour, the law & order situation, climatic conditions local authorities requirement, traffic regulations etc. The tenderer will be fully responsible for considering the financial effect of any or all the factors while submitting his/her tender.

4.0 Earnest Money

The tenderers are requested to submit the Earnest Money of aforesaid amount in the form of Demand

4.1 Draft or Banker's Cheque in favour of State Bank of India drawn on any Bank India.

4.2 EMD in any other form other than as specified above will not be accepted. Tender not accompanied by the EMD in accordance with clause 4.1 above shall be rejected.

4.3 No interest will be paid on the EMD.

4.4 EMD of unsuccessful tenderers will be refunded within 30 days of award of Contract.

4.5 EMD of successful tenderer will be retained as a part of security deposit.

5.0 Initial Security Deposit

The successful tenderer will have to submit a sum equivalent to 2% of contract value less EMD by means of D/D drawn in favour of State Bank of India within a period of 15 days of acceptance of tender.

6.0 Security Deposit

6.1 Total security deposit shall be 5% of contract value. Out of this 2% of contract value is in the form of initial security deposit which includes the EMD. Balance 3% shall be deducted from the running account bill of the work at the rate of 10% of the respective running account bill i.e. deduction from each running bill account will be 10% till total 3% of contract value is reached. 50% of the total security shall be paid to the contractors on the basis of architect's certifying the virtual completion. The balance 50% would be paid to the contractors after the defects liability period as specified in the contract.

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6.2 No interest shall be paid to the amount retained by the Bank as Security Deposit.

6.3 Additional Security Deposit:- Additional Security deposit (ASD)/Additional performance Guarantee (APG) shall be applicable if the bid price is below 7.5 % of the estimated cost put to tender. The amount of such ASD/ APG shall be the difference between 92.5 % of estimated cost put to tender and the quoted price.

7.0 Signing of Contract Documents

The successful tenderer shall be bound to implement the contract by signing an agreement and conditions of contract attached herewith within 15 days from the receipt of intimation of acceptance of his tender by the Bank. However, the written acceptance of the tender by the Bank will constitute a binding agreement between the Bank and successful tenderer whether such formal agreement is subsequently entered into or not.

8.0 Completion Period: The time period allowed for completion of the project shall be **Eighteen (18) months** from the date of commencement of work or 15 days from the date of issuance of work order, whichever is earlier.

9.0 Validity of Tender

Tenders shall remain valid and open for acceptance for a period of 3 (Three) months from the date of opening price bid. If the tenderer withdraws his/her offer during the validity period or makes modifications in his/her original offer which are not acceptance to the Bank without prejudice to any other right or remedy the Bank shall be at liberty to forfeit the EMD.

10.0 Liquidated Damages

The liquidated damages shall be 0.5% per week subject to a maximum of 5% of contract value.

11.0 Rates and Prices : Percentage rate based tender

11.1 The bidders should submit their price bid in the online tendering portal within the stipulated timeline, failing which tender shall be summarily rejected. As the case is of Percentage Rate Tender, contractor has to quote rate in percentage below/above against Bank's total estimated cost (in figures as well as in words) given in Schedule of Quantities, to execute the work.

(a) The tender submitted shall be treated as invalid if:

1. The contractor does not quote percentage above/ below on the total amount of tender or any section/ sub head of the tender.
2. The percentage above/below is not quoted in figures & words both on the total amount of tender or any section/ sub head of the tender.

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3. The percentage quoted above/below is different in figures & words on the total amount of tender or any section/ sub head of the tender.

4. Tenderers, whoever propose any alteration in the work specified in the said form of invitation to tender, or in the time allowed for carrying out the work, or which contain any other conditions of any sort including conditional rebates, will be summarily rejected.

(b) The intending bidders shall be asked to quote their offers in terms of "specific Percentage numerical value" (only up to two decimal places) above (+) / below (-) / at par (=) with the total Estimated Cost published for the project.

(c) After taking into account the Percentage Rebate/ Addition Offered by all the bidders on the Estimate Cost, "Net Tender Value" of each bidder shall be evaluated (Mostly by the online system itself) and the bidder offering Lowest Tender Amount for projects pertaining to Procurement Purchase Contract and Highest Tender Amount for Sales Contracts shall be declared as "Successful Bidder".

(d). The "Percentage Offer" shall be uniformly applicable to each and every item including all sections/ sub sections/sub heads of the Tender.

(e). In case, the Lowest Tendered Amount (i.e. Estimated cost +/- Percentage Bid quoted) of two or more contractors is same, such lowest contractors will again be asked to submit sealed /online "Revised +/- Percentage (%) offers" on the original Estimated cost of tender including all sub sections/sub heads excluding fixed rate items as the case may be, but the revised percentage quoted shall, in no case, be higher than the percentage quoted during their initial offer for the project. The lowest tender shall be decided on the basis of revised offers.

(f). The process of online re-bidding amongst two or more contractors offering same percentage rates tendering process shall continue till L-1 bidder is discovered, which may be conducted in same or next working day. However, revised offer cannot be more than initial/previous offer.

(g). In case, any of such contractor(s) (quoted same tender amount during initial bidding or subsequent re-bidding) refuses to submit revised offer, it shall be treated as **"withdrawal of tender"** by the Contractor before acceptance and the EMD of such contractors shall be forfeited.

(h) In case all the lowest contractors who have quoted same tendered amount, refuse to participate in online revised bidding process for the project, the EMD of all such Contractors shall be forfeited and the tenders for the project shall be invited afresh.

(i). The Contractor(s), whose earnest money is forfeited because of non-submission of revised offer, shall not be allowed to participate in the re-tendering process for the said project.

- 11.1.1 The tenderers need not quote their rates for which no quantities have been given. In case the tenderers quote their rates for such items those rates will be ignored and will not be considered during execution.

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11.1.2 The tenderers should not change the units as specified in the tender. If any unit is changed the tenders would be evaluated as per the original unit and the contractor would be paid accordingly.

The tenderer should not change or modify or delete the description of the item. If any discrepancy is observed he/she should immediately bring to the knowledge of the Architect/ Bank.

11.1.3 The rate quoted shall be firm and shall include all costs, allowances, transportation, taxes, cess, royalties, levies, excluding GST etc.

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E-TENDERING INSTRUCTIONS TO BIDDERS

General:

State Bank of India hereby publishes the TENDER on the e-tendering Portal (Website) <https://etender.sbi> in Electronic mode hereinafter referred as “e Tendering” and TENDER will be hereunder called “e-Tender”. The e-tender published online through the above portal (website) consists standard tender conditions, specifications, schedule of quantities, drawings (if any) for above referred work. Please note that copy of the above e-tender can be downloaded from above portal (website) and should be mandatorily submitted in online Electronic Mode hereinafter referred as “Online Offer”. The submission of the online offer duly Encrypted & Digitally signed on above portal should be in prescribed Electronic Forms (Online) available on above portal for respective tender in Online Envelope(s) on or before as per the key Dates mentioned in the Tender Notice in this document and online portal for above tender.

Instructions:

1. Tender Bidding Methodology:

Electronically Sealed Bid System – Two - Stage – Technical Bid and Price Bid, in percentage rate tendering process on price bid. Firstly, a technical bid will be opened and after technical evaluation, suitable agencies will be shortlisted. The Price bid (Financial bid) will be opened to only those agencies who qualify in the technical bid.

2. Broad outline of activities from Bidders prospective:

- 1.0 Procure a Digital Signing Certificate (DSC)
- 2.0** Register on the e-Procurement portal <https://etender.sbi>
- 3.0 (The contractors need to upload scan copy of their valid empanelment letter in the portal otherwise their registration would be cancelled)
- 4.0 Create Users and assign roles on the above portal
- 5.0 View Notice Inviting Tender (NIT) on the above portal
- 6.0 Download Official Copy of Tender Documents from the above portal
- 7.0 Clarification to Tender Documents on the above portal
- 8.0 Bid-Submission on the above portal
- 9.0 Attend Public/Limited Online Tender Opening Event (TOE) on the above portal-Opening of Technical-Part
- 10.0 Post-TOE Clarification on the above portal (Optional) – Respond to SBI's Post-TOE queries
- 11.0 Attend Public/Limited Online Tender Opening Event (TOE) on the above portal – Opening of Financial-Part (Only for Technical Responsive Bidders)

3. Digital Certificates

For integrity of data and authenticity/ non-repudiation of electronic records, and to be complaint with IT Act 2021, it is necessary for each user to have a Digital Certificate (DC). also referred to as Digital Signature Certificate (DSC), of Class II or above, issued by a Certifying Authority (CA) licensed by Controller of Certifying Authorities (CCA) [refer <http://www.cca.gov.in>].

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4. Registration

To use the Electronic Tender portal <https://etender.sbi> vendors need to register on the portal. Registration of each organization is to be done by one of its senior persons vis-a-vis Authorised Signatory who will be the main person coordinating for the e-tendering activities. In the above portal terminology, this person will be referred to as the Super User (SU) of that organization. For further details, please visit the website/portal, and follow further instructions as given on the site.

Note: After successful submission of Registration details please contact to the Helpdesk of the portal to get your registration accepted/activated.

Help Desk:

**Sujith Nair | Dy. Manager – Client Service
e-Procurement Technologies Limited**

Address: B-704, Wall Street – II, Opp. Orient Club, Ellisbridge, Ahmedabad – 380006, Gujarat, India

Contact: sujith@eptl.in | Phone: 9904407199

mubassera@eptl.in | Phone: 7859800621

Office Hours: (Monday – Friday: 10:00 AM – 7:00 PM (IST), Saturday: 10:00 AM – 6:00 PM (IST))

(Exclusion: Sunday, Holidays and 2nd & 4th Saturday)

To Know eTender submission Process – Click Here : - [eTender Submission Guidance Video](#) . (Note : This is General Process of eTender, It may be Vary As per Tenderer Requirement).

5. Bidding related Information for this Tender (Sealed Bid)

The entire bid-submission would be online on the portal. Broad outline of submissions are as follows:

- Submission of Bid Security/ Earnest Money Deposit (EMD) & Cost of Bid Document
- Submission of digitally signed copy of Tender Documents/ Addendum
- Power of Attorney, • Two Envelopes, - Technical-Part, Each of the above electronic envelopes consists of Main bid and Electronic form (both mandatory) and bid Annexure (Optional).

NOTE: Please note that above e-Tendering system is an automatically time locked system which will be locked immediately as soon as due date and time is over and will not accept any offer after that. So, the tenderers are strictly advised to do their process well before the due date and time to avoid any such instances.

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6. Tender Opening Event (TOE):

The e-Procurement portal offers a unique facility for 'Public/Limited Online Tender Opening Event (TOE)'. Tender Opening Officers as well as authorized representatives of bidders can attend the Public/Limited Online Tender Opening Event (TOE) from the comfort of their offices. For this purpose, representatives of bidders (i.e. Supplier organization) duly authorized are requested to carry a Laptop and Wireless Connectivity to Internet. Every legal requirement for a transparent and secure 'Public/Limited Online Tender Opening Event (TOE)' has been implemented on the portal. As soon as a Bid is decrypted with the corresponding 'Pass-Phrase' as submitted online by the bidder himself (during the TOE itself), salient points of the Bids are simultaneously made available for downloading by all participating bidders. The tedium of taking notes during a manual 'Tender Opening Event' is therefore replaced with this superior and convenient form of 'Public/Limited Online Tender Opening Event (TOE)'. The portal has a unique facility of 'Online Comparison Chart' which is dynamically updated as each online bid is opened. The format of the chart is based on inputs provided by the Buyer for each Tender. The information in the Comparison Chart is based on the data submitted by the Bidders. A detailed Technical and/ or Financial Comparison Chart enhance Transparency. Detailed instructions are given on relevant screens. The portal has a unique facility of a detailed report titled 'Minutes of Online Tender Opening Event (TOE)' covering all important activities of 'Online Tender Opening Event (TOE)'. This is available to all participating bidders for 'Viewing/ Downloading'. There are many more facilities and features on the portal. For a particular tender, the screens viewed by a Supplier will depend upon the options selected by the concerned Buyer.

IMPORTANT NOTE: In case of internet related problem at a bidder's end, especially during 'critical events' such as – a short period before bid-submission deadline, during online public/limited tender opening event, during e-tender, it is the bidder's responsibility to have backup internet connections. In case there is a problem at the e-procurement/ e-tender service-provider's end (in the server, leased line, etc) due to which all the bidders face a problem during critical events, and this is brought to the notice of SBI by the bidders in time, then SBI/SBI will promptly re-schedule the affected event(s).

7. Minimum Requirements at Bidders end:

In order to operate on the electronic tender management system, the user's machine is required to be set up. The machine must have running XP service Pack 3 or higher version of Windows like Vista or Window 7. Also need to install Mozilla Fire fox web browser and latest Version of Java.

8. Please follow below steps to open Internet Explorer mode in Microsoft Edge.

- Open Microsoft Edge > click on "settings" > click on Default browser
- Let Internet Explorer open in Microsoft Edge change it from "**Always**" to "**Incompatible sites only (Recommended)**".
- Allow sites to be reloaded in Internet Explorer mode > "**Allow**"

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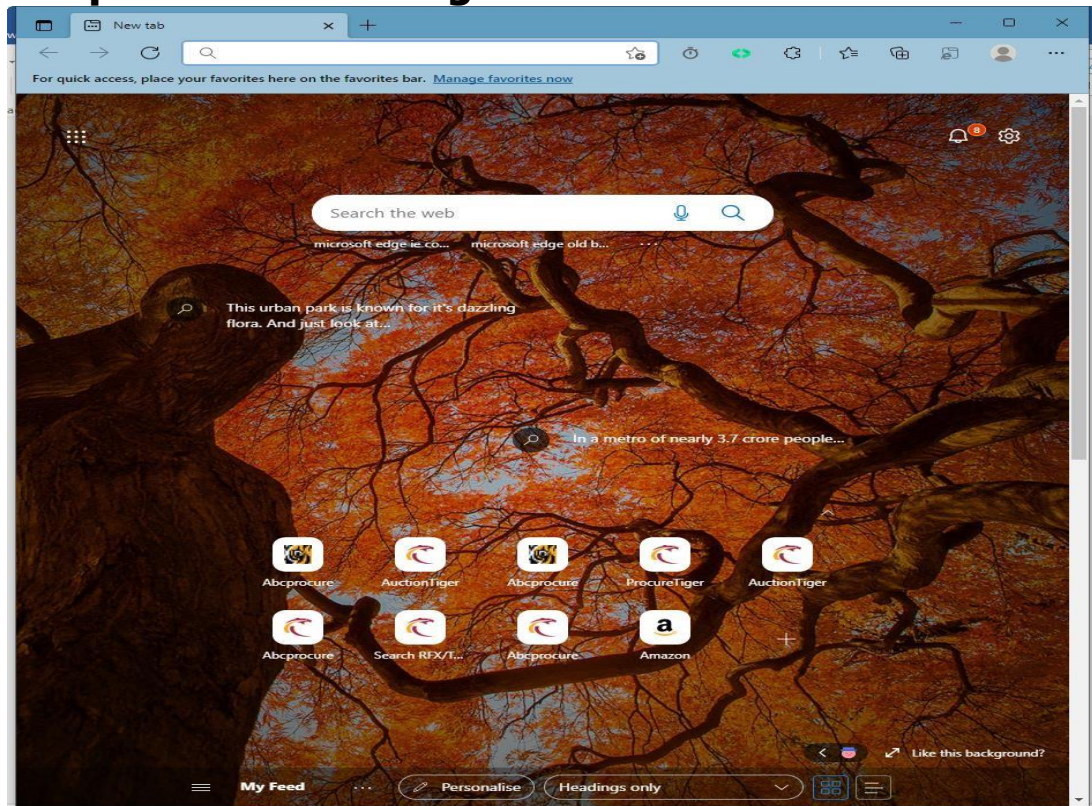
- Internet Explorer mode pages > click on “Add” > Enter a URL: <https://etender.sbi>
- After make changes reopen Microsoft Edge & log in.

**(For and behalf of Assistant General Manager)
SBI, LHO, Bhubaneswar**

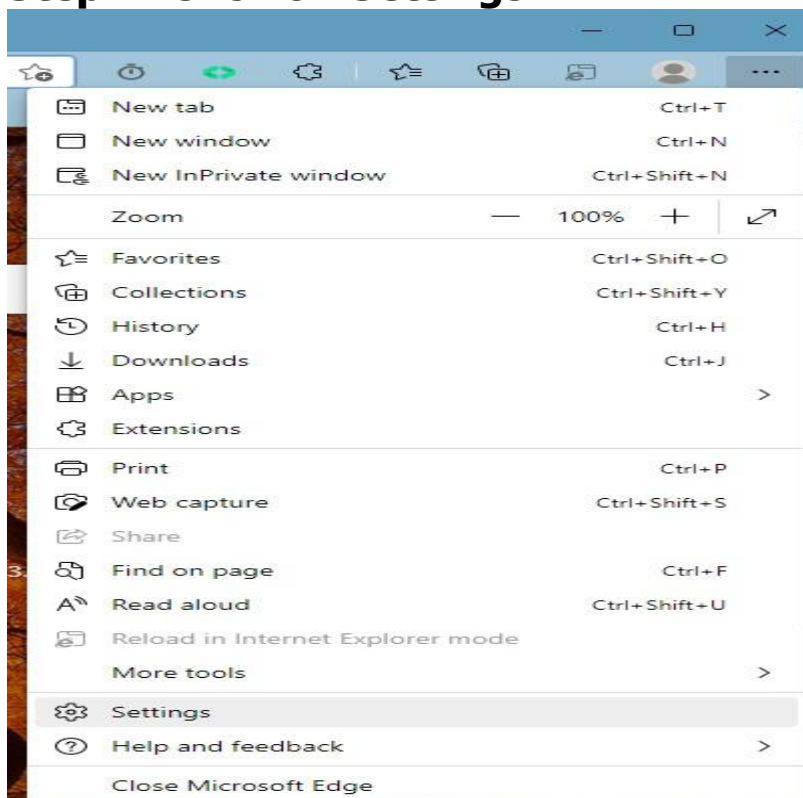
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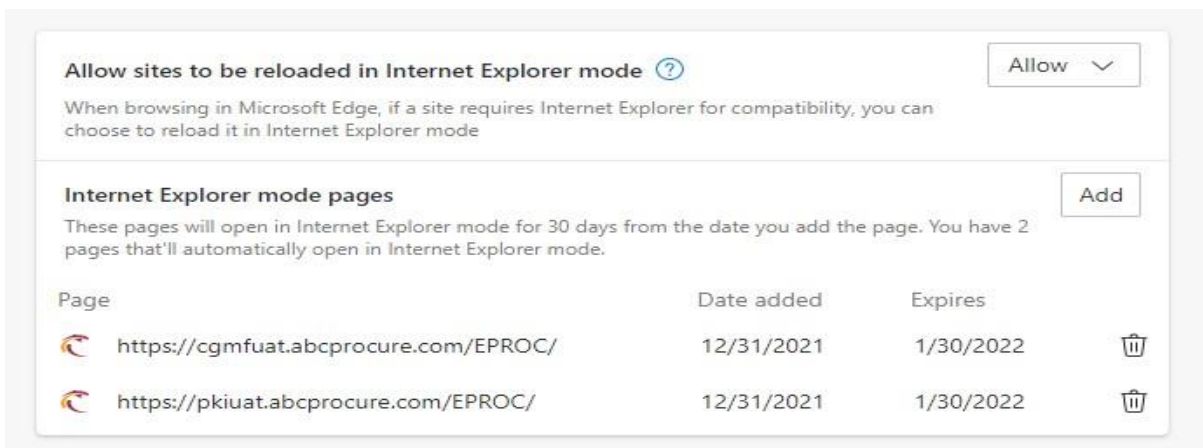
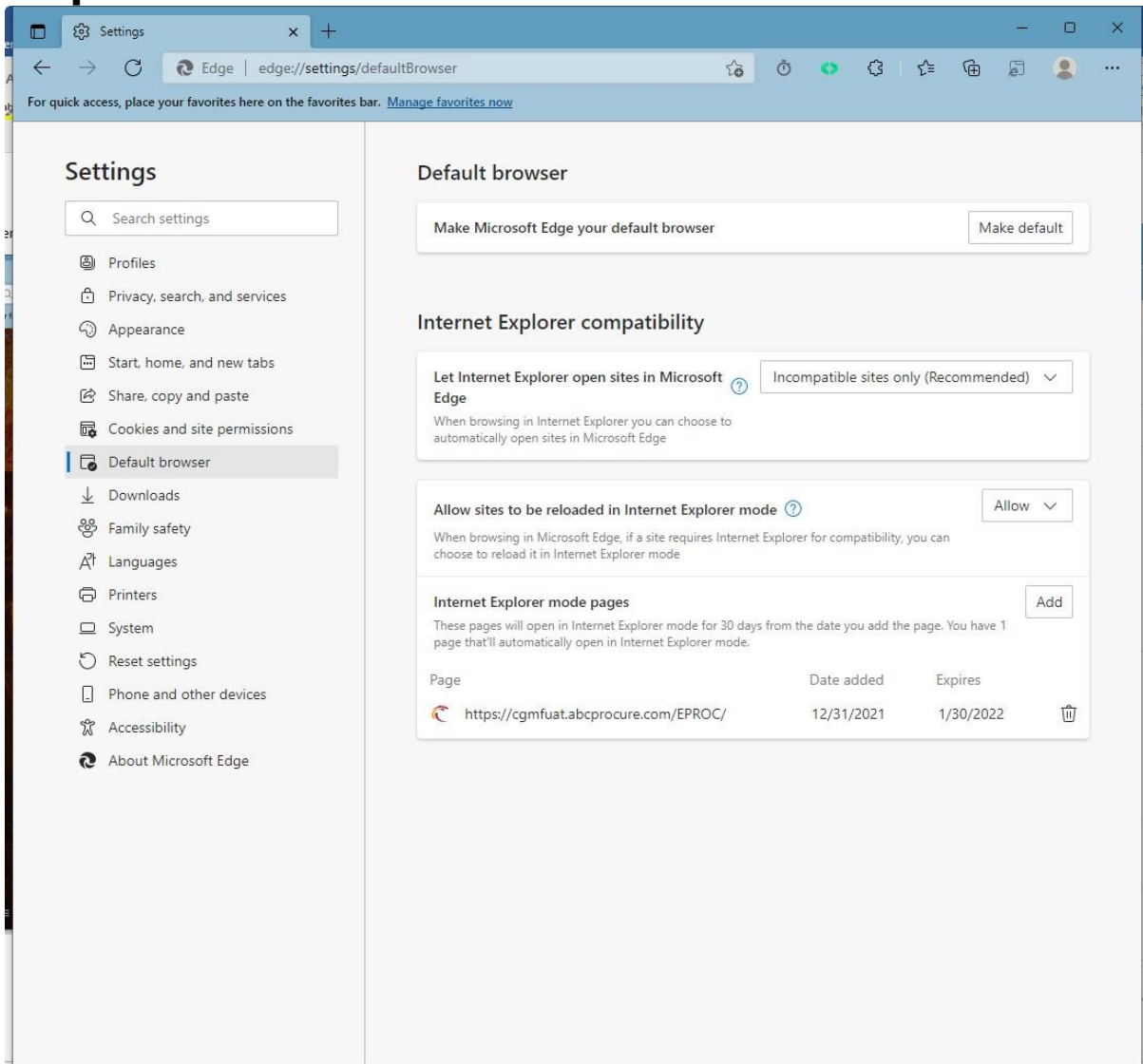
Step 1. Open Microsoft Edge browser



Step 2. Click on Settings

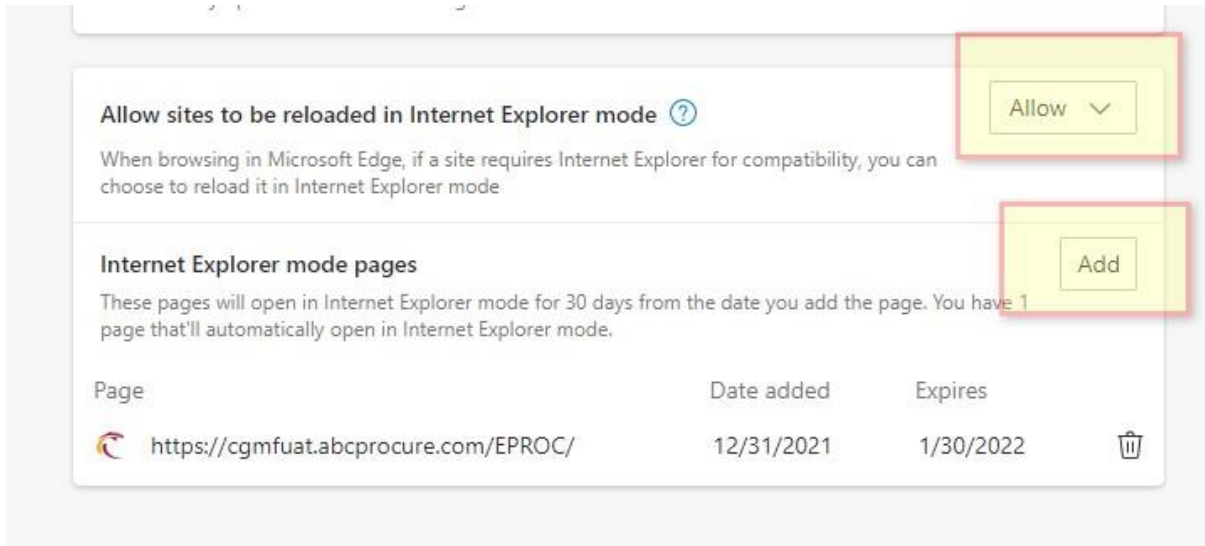


Step.3 Click on 'Default browser'

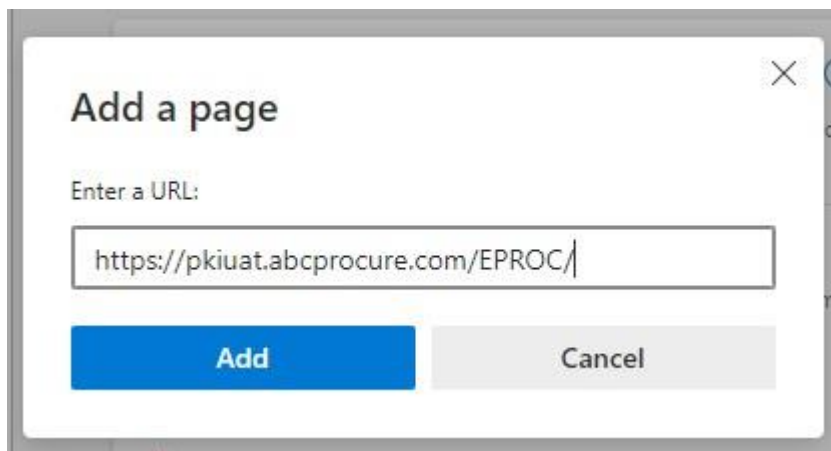


Step 4. Configure URL in Internet Explorer mode

- Allow sites to be reloaded in Internet Explorer mode = Allow
- Click on Add button



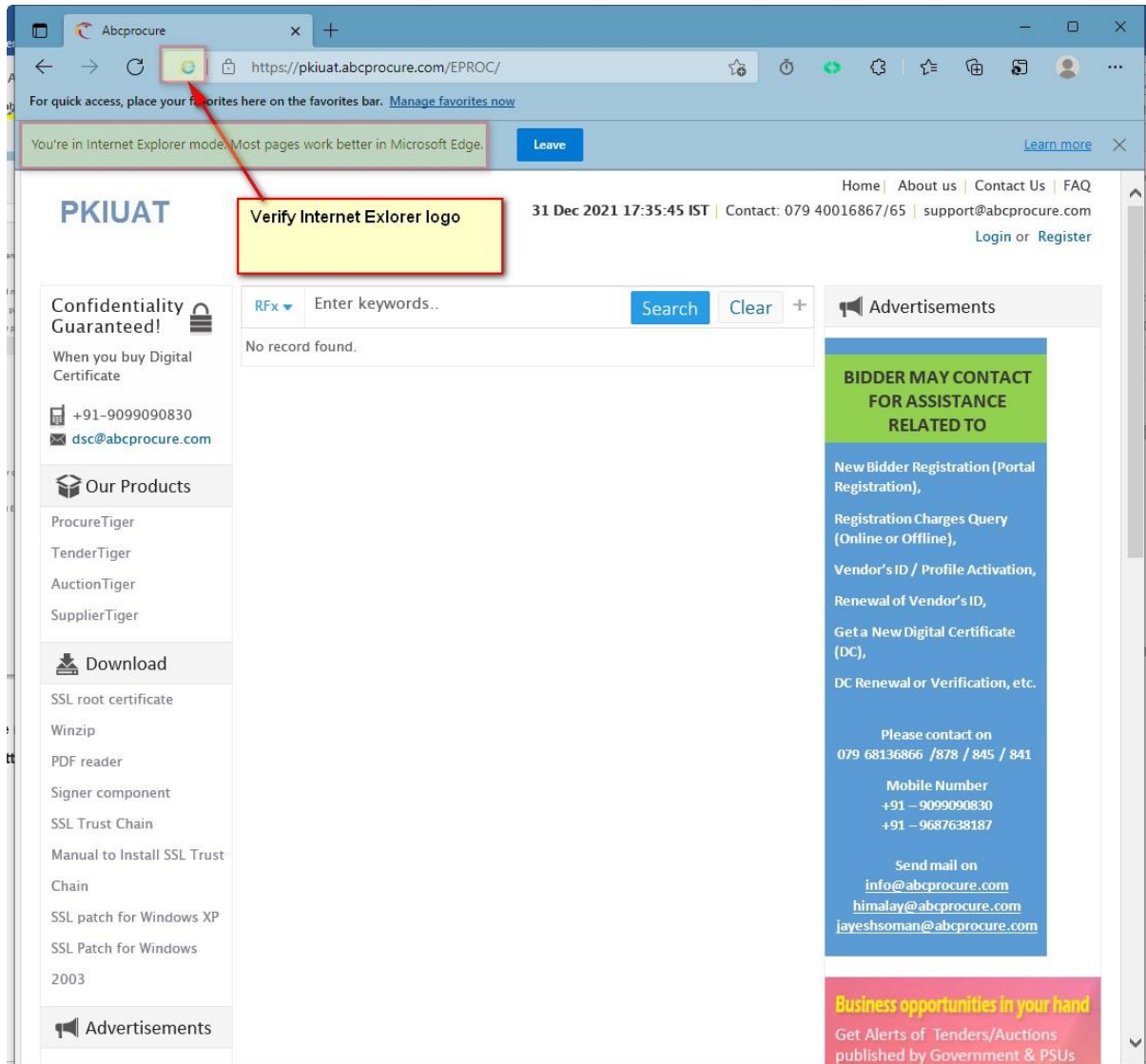
- Add URL



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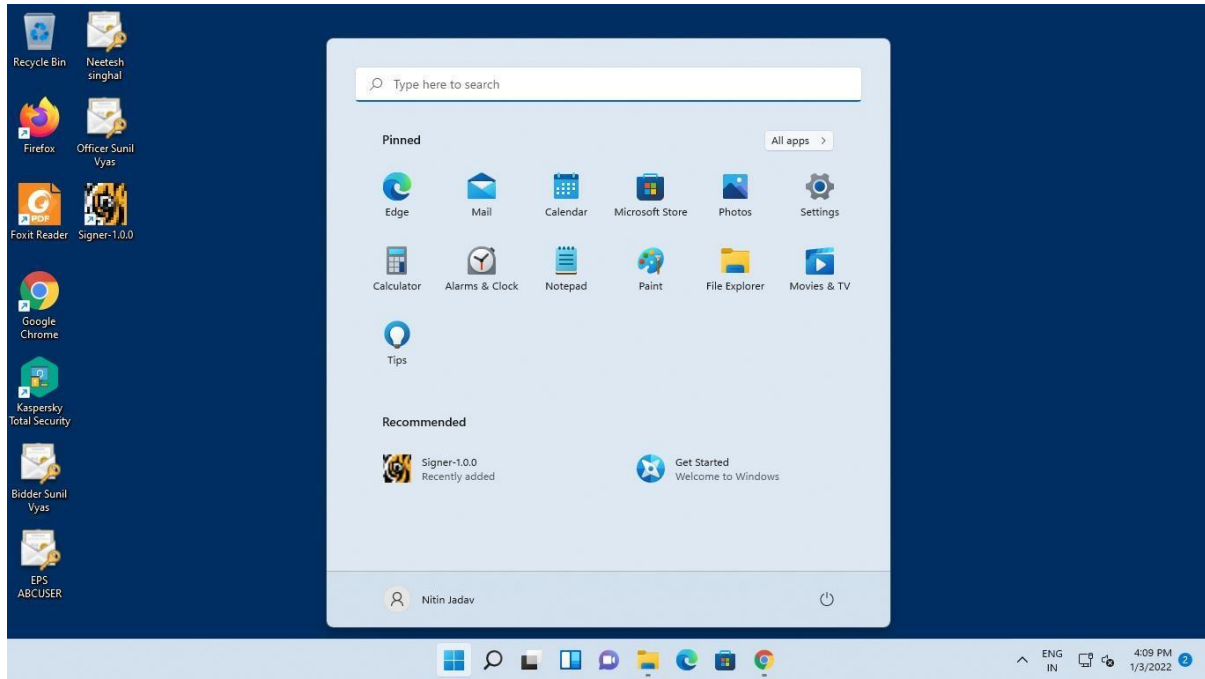
Step 5. Restart the browser and open URL.

Verify it is opened in Internet Explorer mode by logo and notification

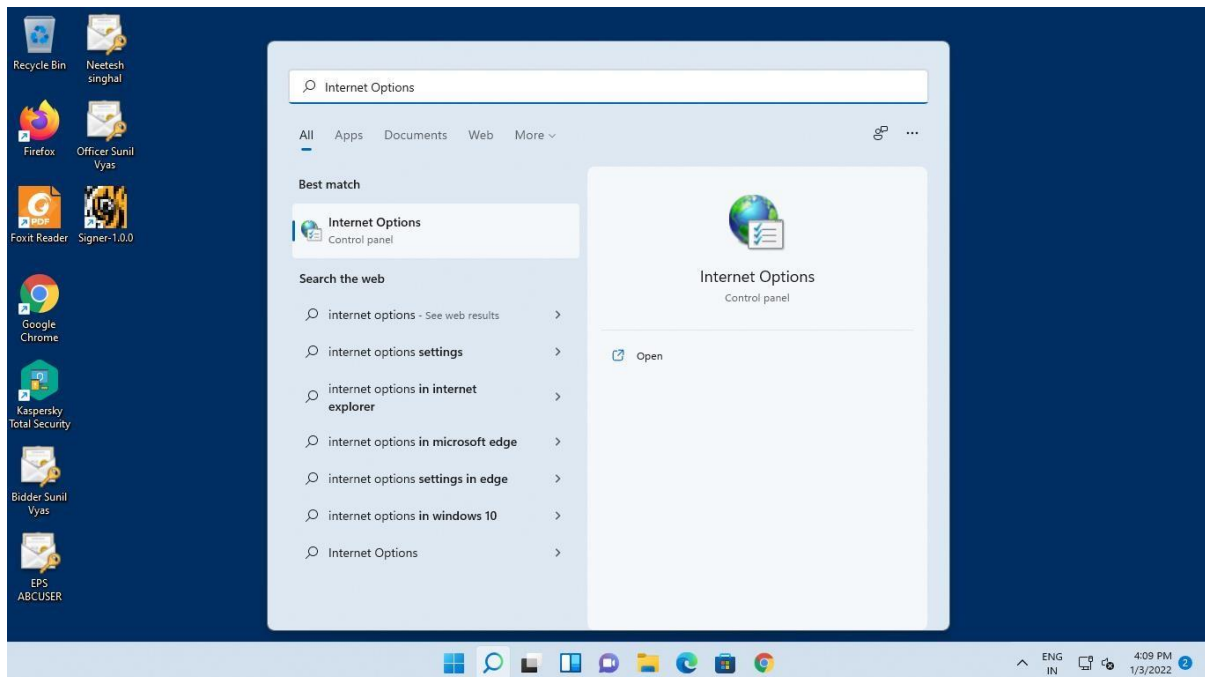


Step 6. Configure Internet Option:

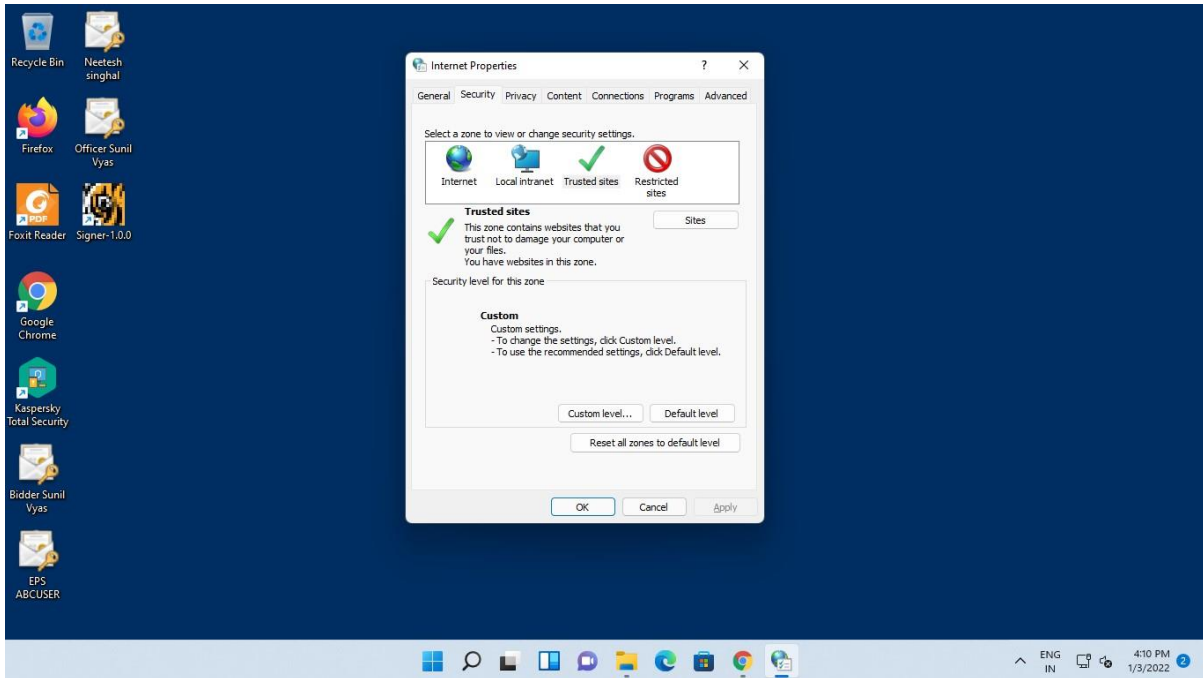
6.1 Click on Windows button / Start Menu



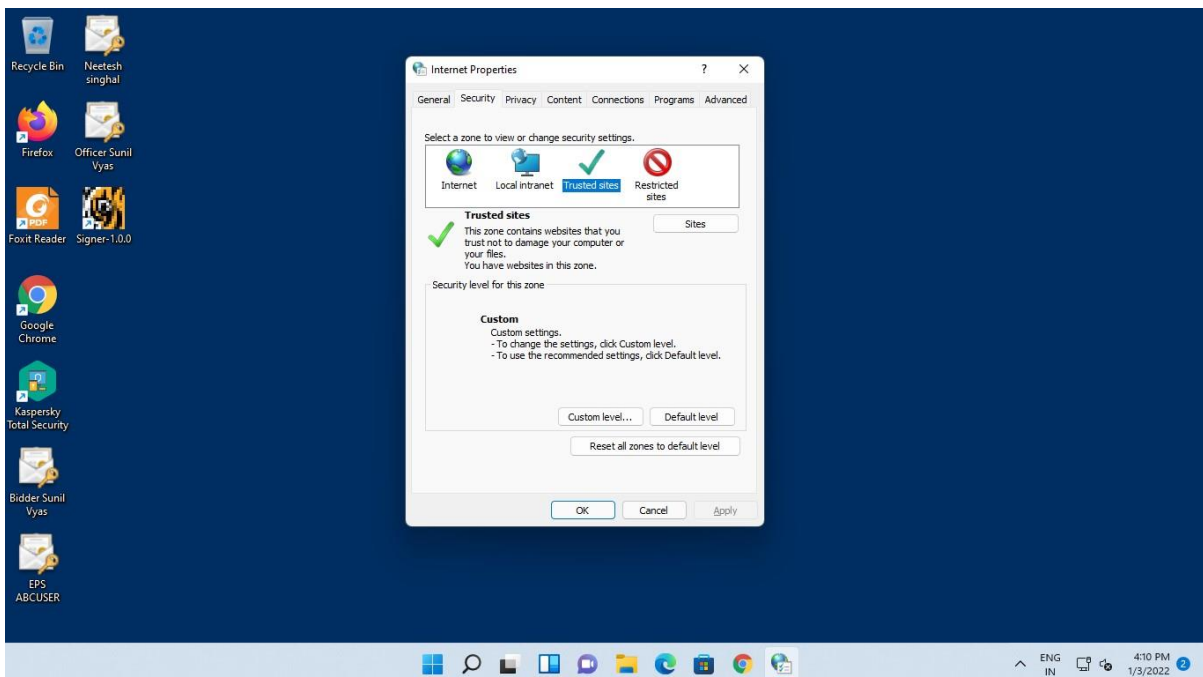
6.2 Search "Internet option" and Click on Open



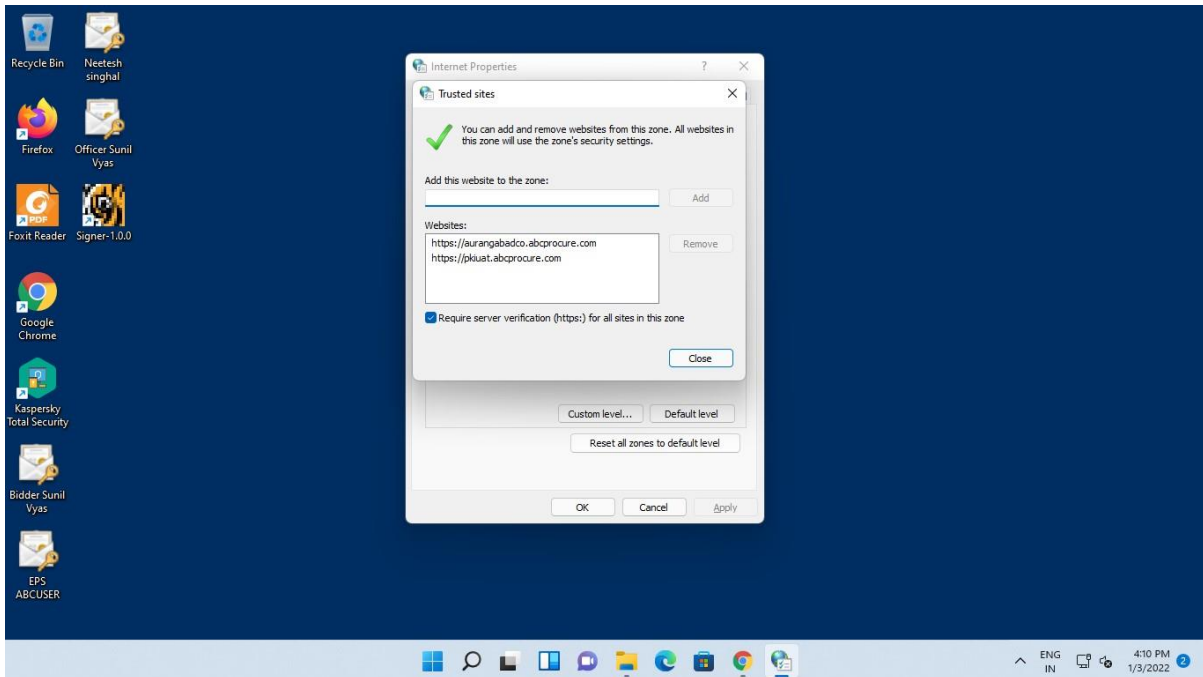
6.3 Click on "Security" Tab



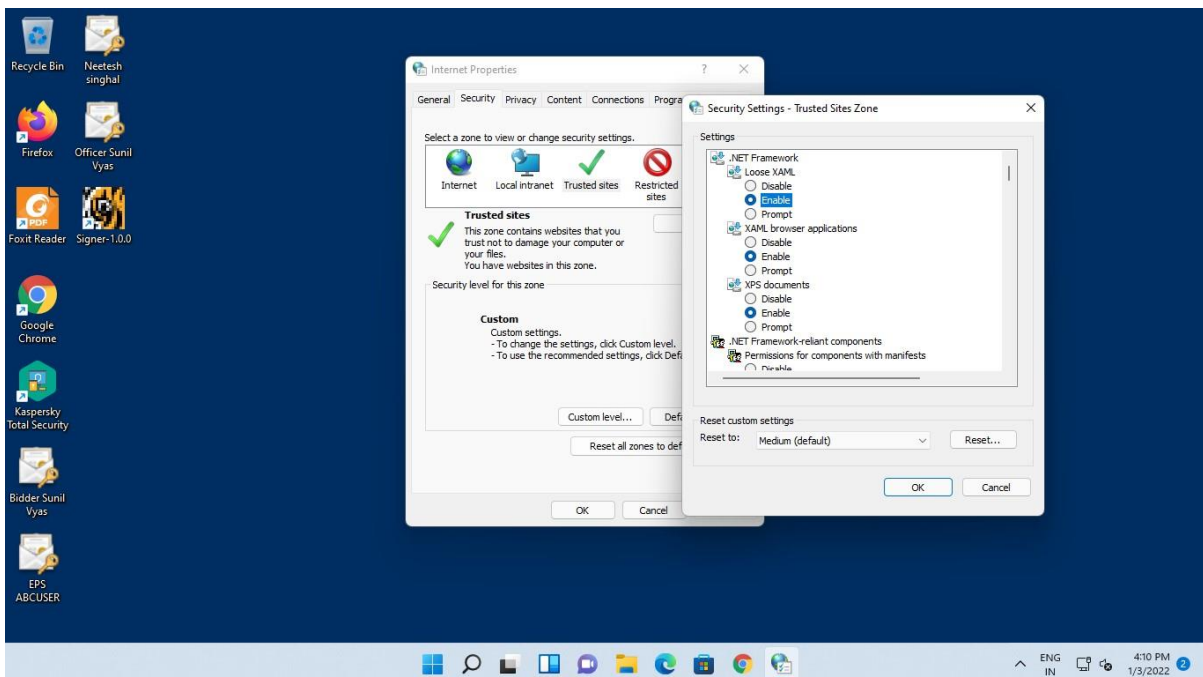
6.4 Select "Trusted site" Icon and Click on "Sites" Button



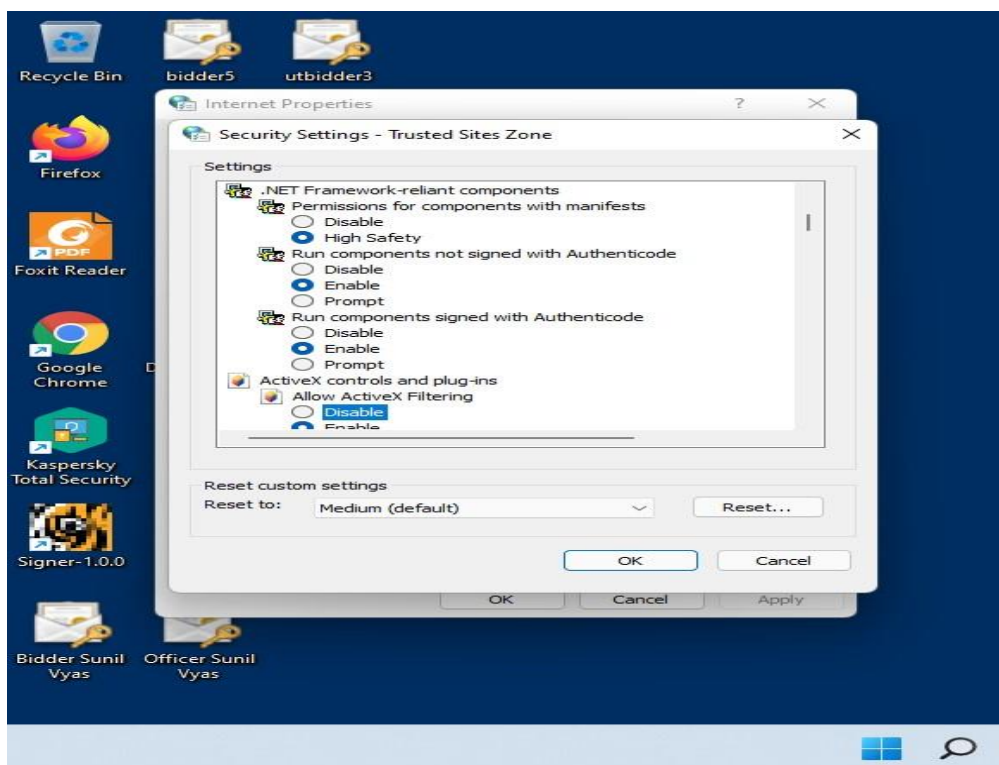
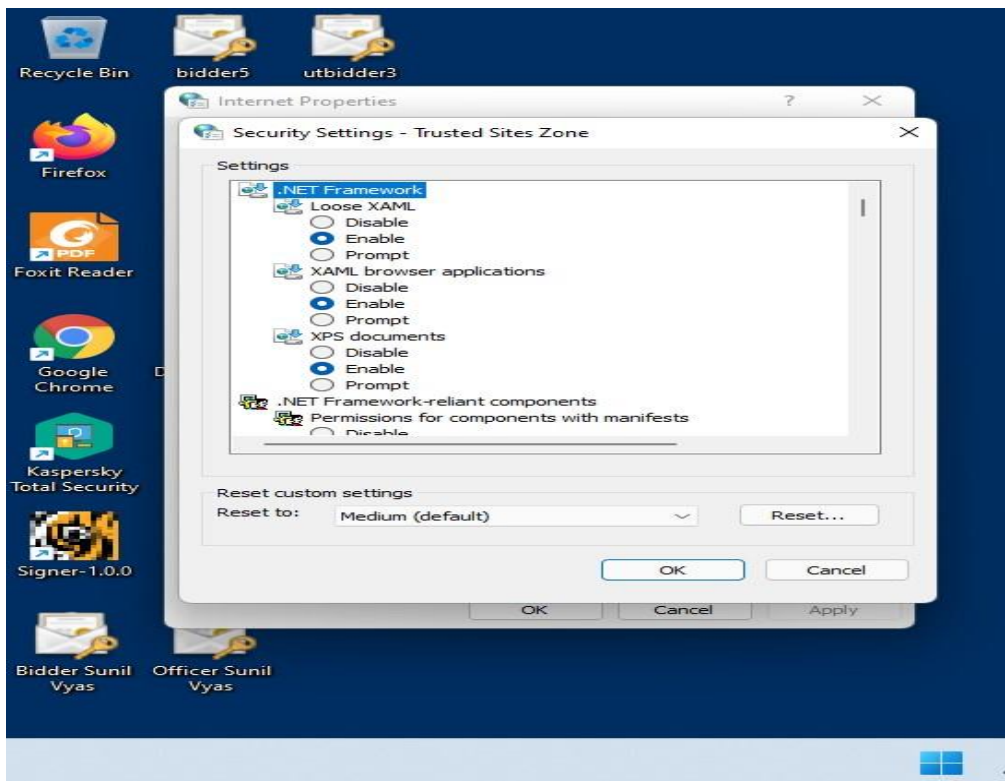
6.5 Click on "Add" button to Enter "Web URL" in Trusted List



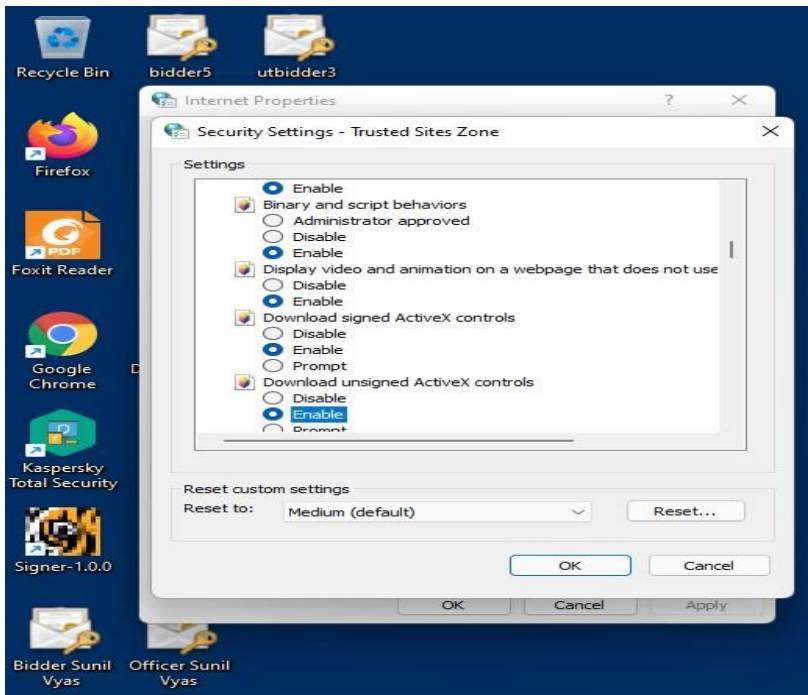
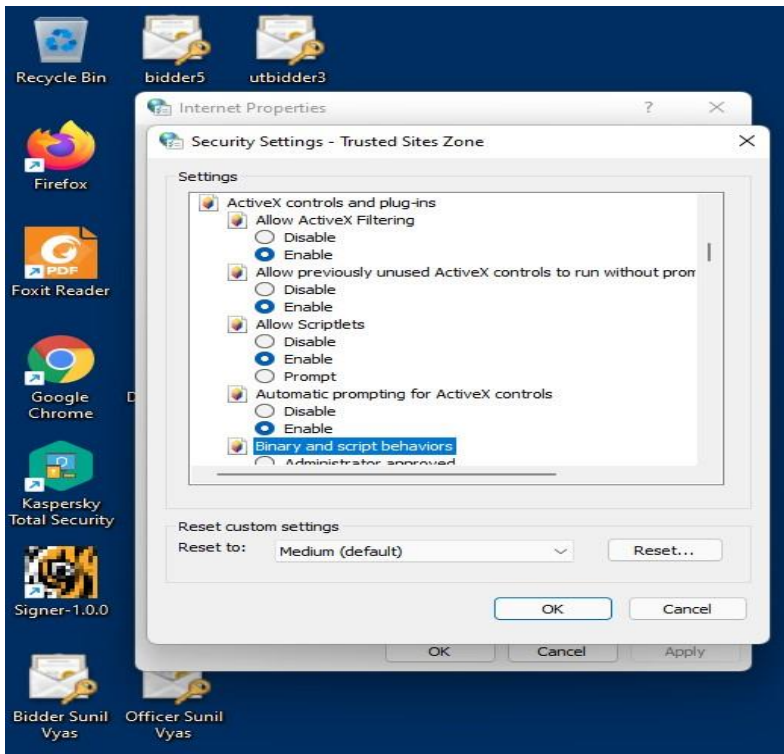
6.6 Click on "Custom Level" Button

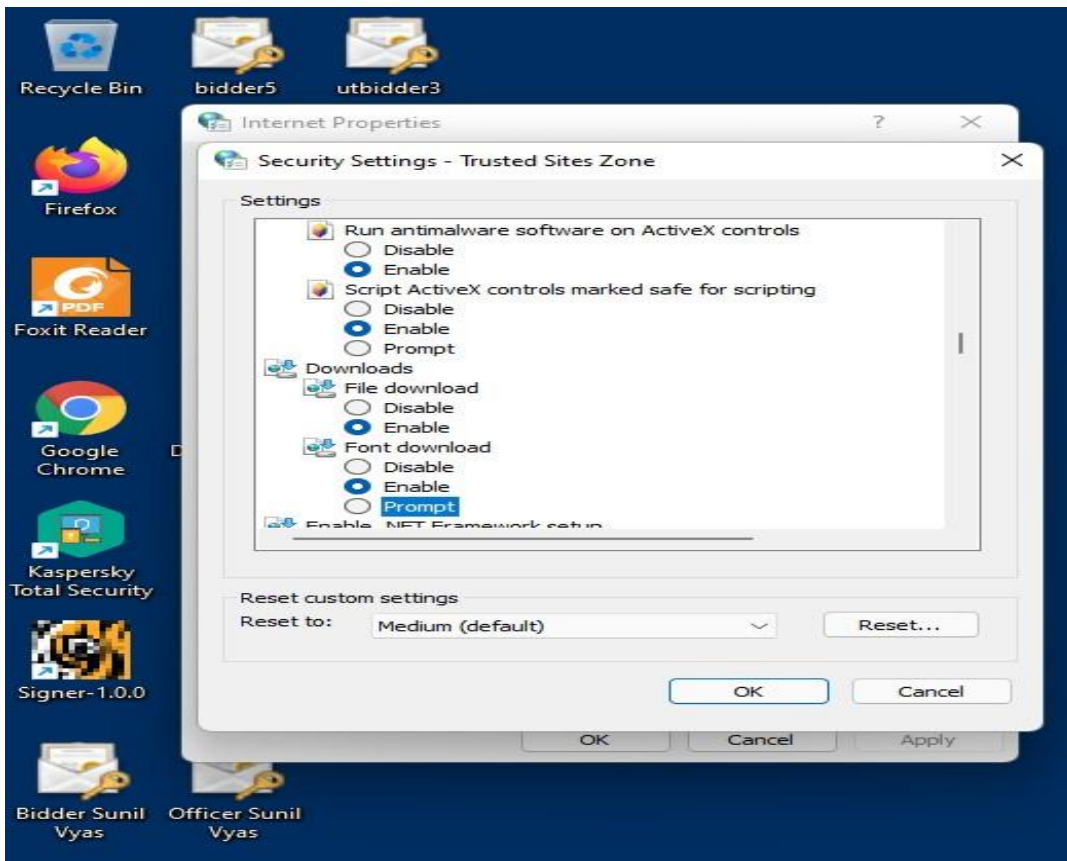
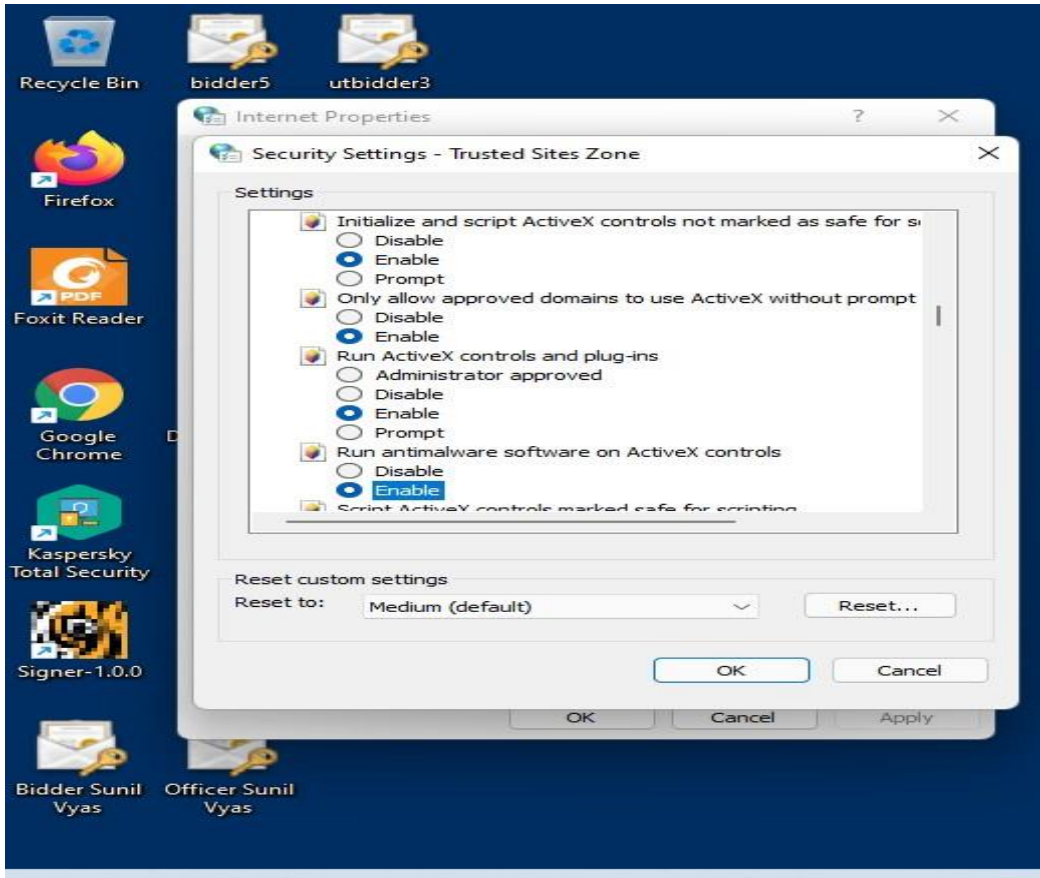


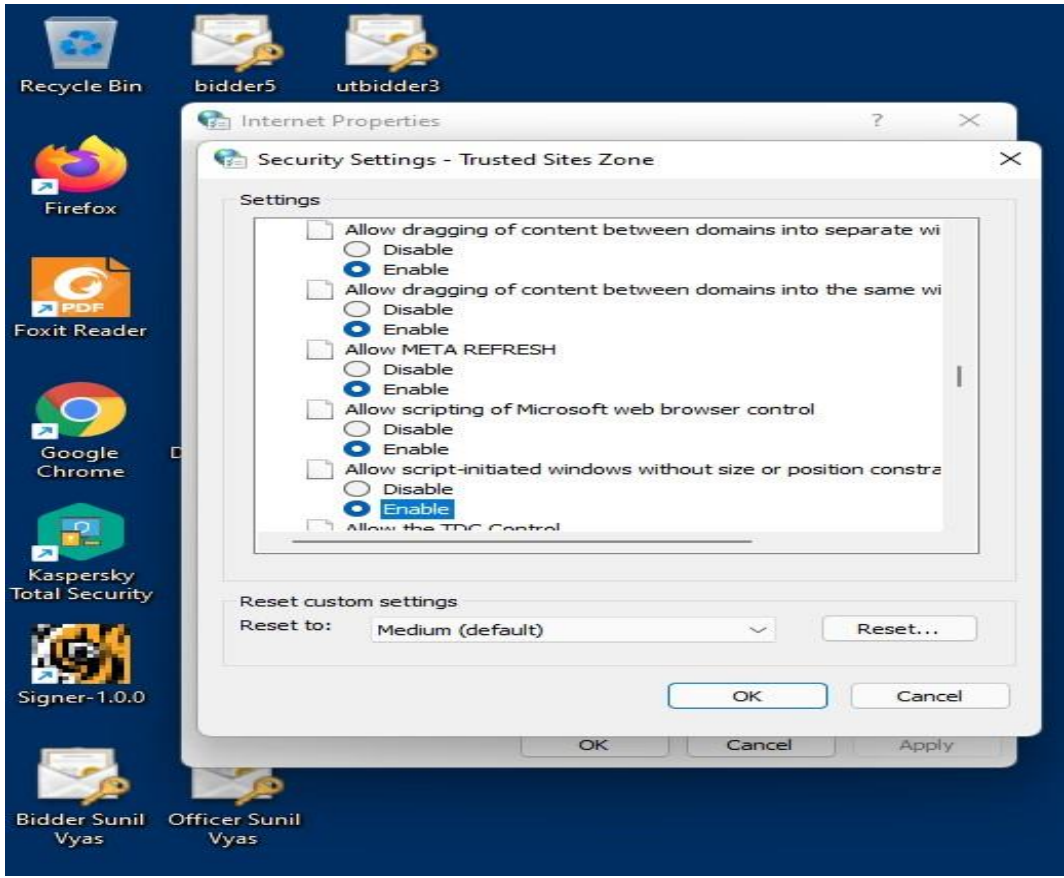
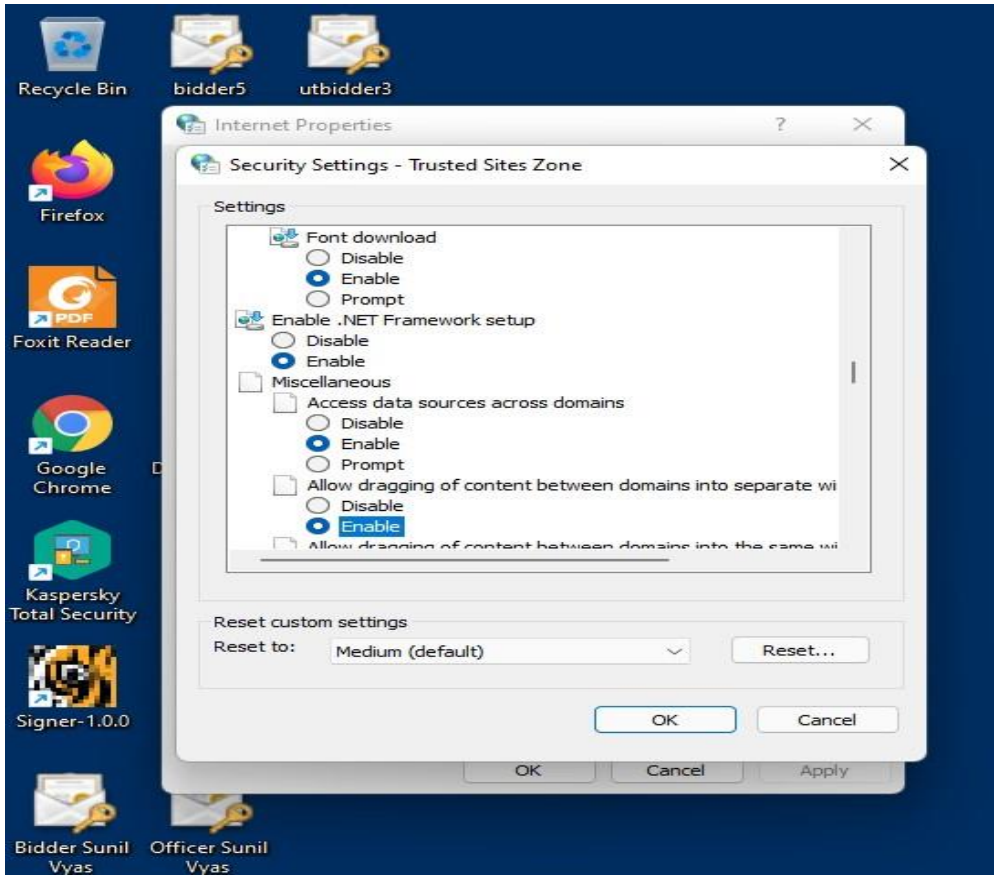
6.7 Configure settings of choice and Click on 'OK" button

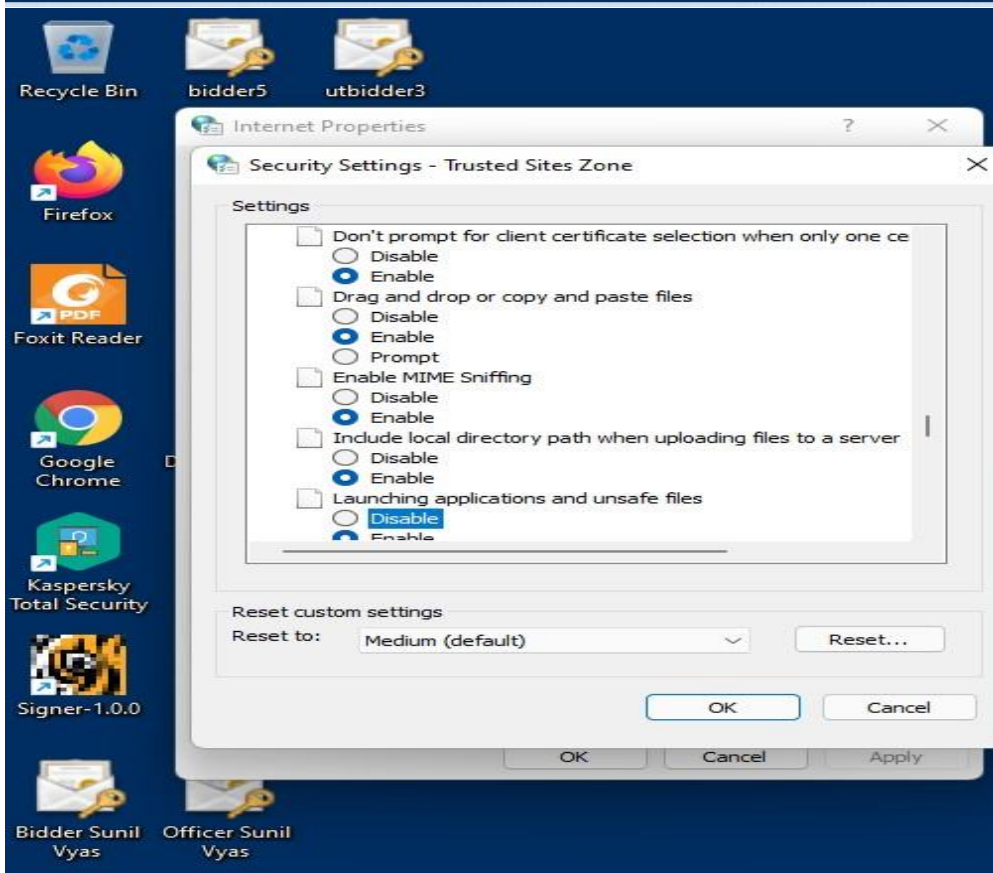
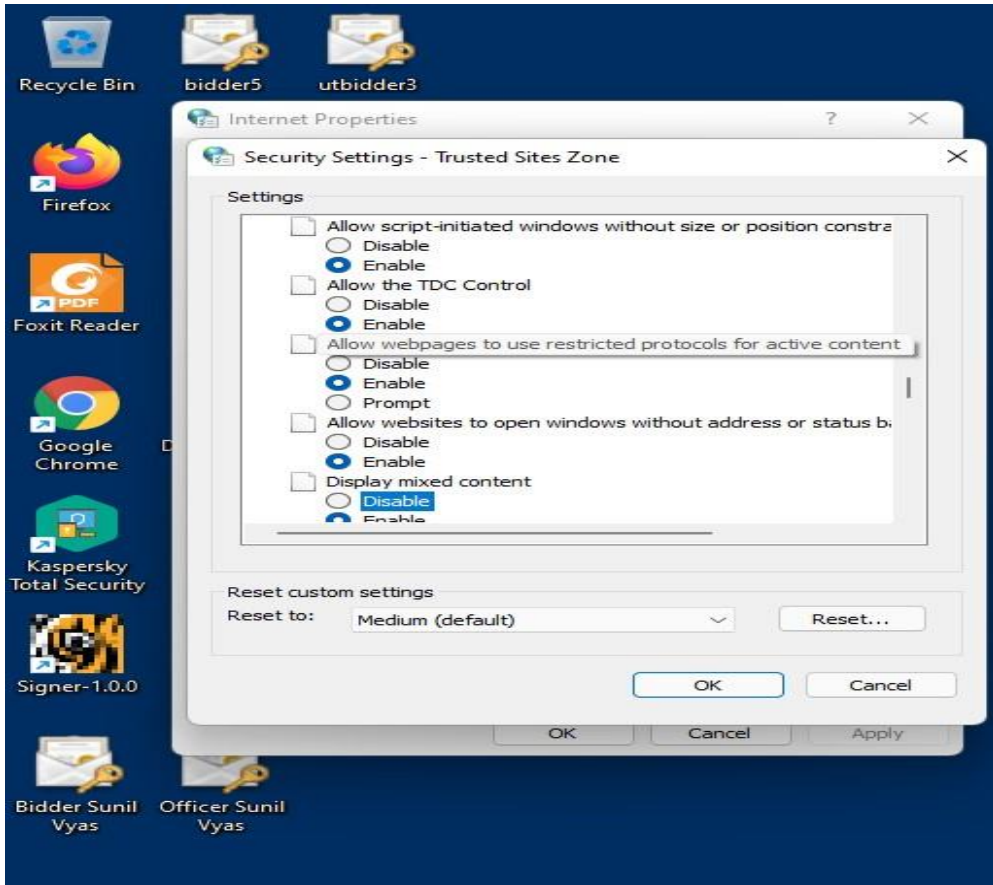


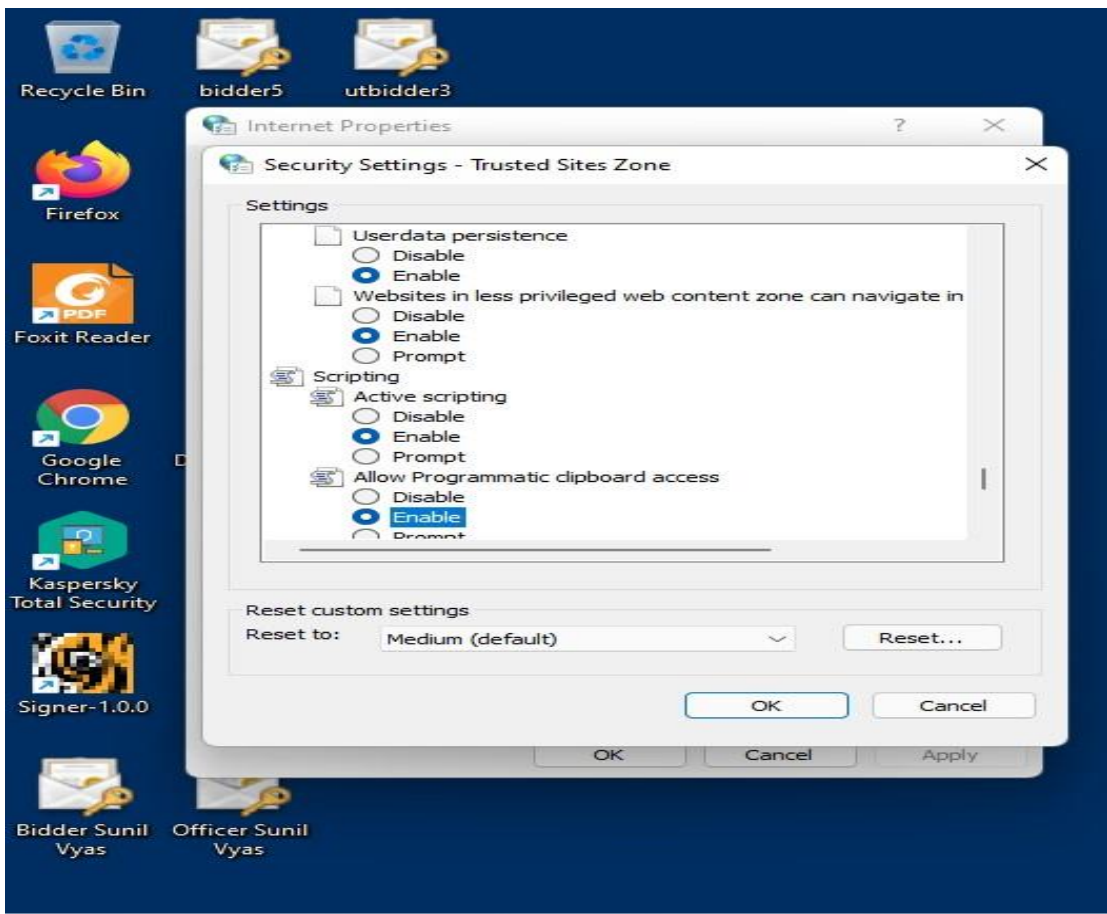
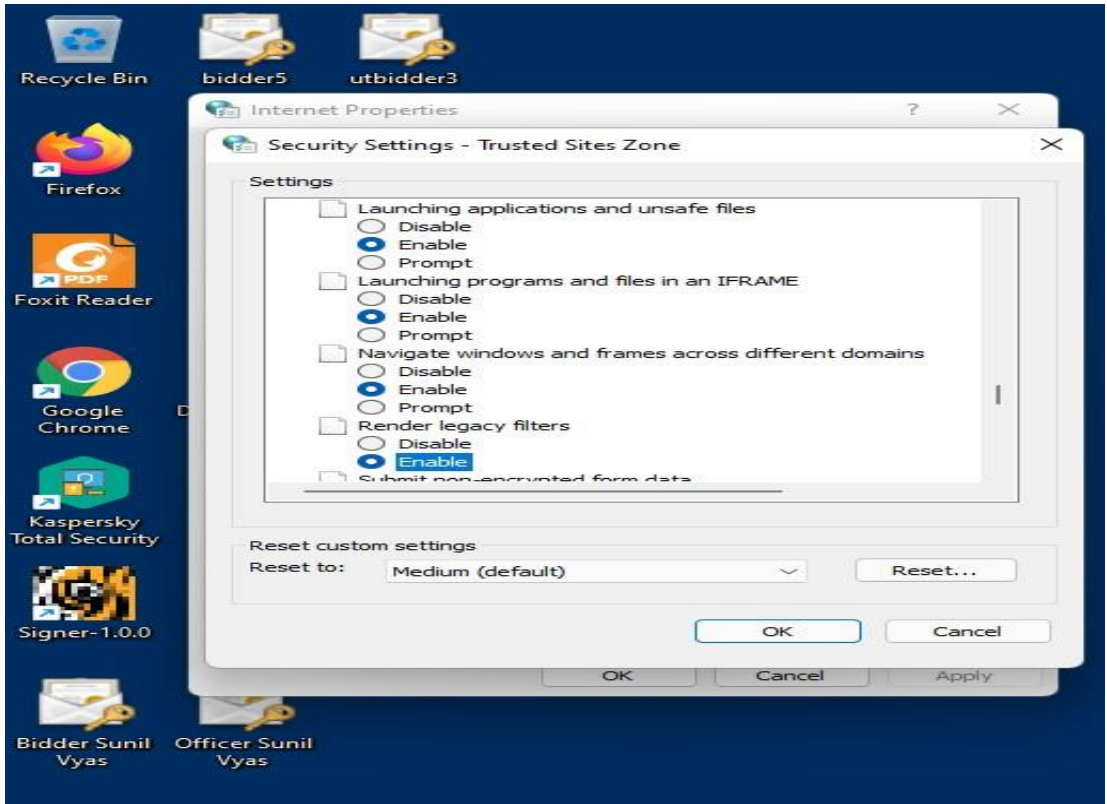
Tender No.: BHU/P&E/09/2024-25/25 DATED 25.09.2024











PROCESS COMPLIANCE STATEMENT

(Annexure- I)

(The bidders are required to print this on their company's letterhead and sign, stamp it before emailing/submission online.)

M/s e-Procurement Technologies Limited
B-704, Wall Street – II, Opp. Orient Club,
Ellisbridge, Ahmedabad – 380006, Gujarat, India
Email ID: sujith@eptl.in

Agreement to the Process Related Terms and Conditions for the on-line e – tendering for Construction Of G+2 Storied Building For Administrative Office & Regional Office at Ambapua, Berhampur, Odisha.

Dear Sir,

This has reference to the Terms & Conditions for the E-tendering mentioned in the Tender Document. This letter is to confirm that:

- 1) The undersigned is authorized representative of the company.
- 2) We have studied the Commercial Terms and the Business rules governing the E-tendering as mentioned in Tender of SBI as well as this document and confirm our agreement to them.
- 3) We also confirm that we have taken the training on the E-tendering tool and have understood the functionality of the same thoroughly.
- 4) We confirm that SBI and M/s. **e-Procurement Technologies Limited** shall not be liable & responsible in any manner whatsoever for my/our failure to access & bid on the e-E-tendering platform due to loss of internet connectivity, electricity failure, virus attack, problems with the PC, any other unforeseen circumstances etc. before or during the E-tendering event.
- 5) We confirm that we have a valid digital signature certificate issued by a valid Certifying Authority.
- 6) We, hereby confirm that we will honour the Bids placed by us during the E-tendering process.

With regards,

Date:

Name:

Company / Organization:

Designation within Company / Organization: Address of Company / Organization:

Scan it and send to this Document on -----

To,
AGM (P&E),
State Bank of India,
Local Head Office,
III/1, Pt. J.N.Marg,
Bhubaneswar.
Dear Sir,

CONSTRUCTION OF G+2 STORIED BUILDING FOR ADMINISTRATIVE OFFICE & REGIONAL OFFICE AT AMBAPUA, BERHAMPUR, ODISHA

I/We refer to the tender notice issued by you for **construction of G+2 storied building for Administrative Office & Regional Office at Ambapua, Berhampur, Odisha**, in connection with above subject.

1. I/we have satisfied myself/ourselves as to the site conditions examined the drawings and all aspects of the tender conditions subject to above, I/We do hereby agree should this tender be accepted in whole or part of:
 - a. Abide by and fulfil all the terms and provisions of the said conditions annexed hereto:
 - b. Complete the work within the timeline as stipulated in two or three shifts if considered necessary by the consultants/ architects at no extra cost to the bank,
2. I/we have deposited the earnest money of **Rs. 7,26,700.00** which we note will not bear any interest and is liable to forfeiture,
 - i. If the offer is withdrawn within the validity period of acceptance or
 - ii. If the contract is not executed within 15 days from award of contract, or
 - iii. The acceptance of this tender shall constitute a breach of contract by us & the tender accepting authority shall be entitled to have the work executed at our risk and cost and to claim extra cost/expenditure incurred by then from us
3. Unless and until a formal agreement is prepared and executed, this tender together with your written acceptance thereof shall constitute as a binding contract,
4. I/We understand that you are not bound to accept the lowest any tender received,
5. I/we have independently considered the amount of liquidated damages in the Appendix the General Conditions of contract and agree that it represents fair estimate of the loss likely to etc to be suffered by you in the event of the works not being completed in time,
6. Our _____ bankers are:_____

The name of partners/ directors of the firm authorized to sign or name of persons having power of attorney to sign the contract (certified true copy of the power of attorney should be attached).

Yours faithfully

Signature of contractor/ authorized representative

Signature and address of witness (Mobile No and e mail address if any)

- 1.
- 2.

Notes to schedule items

1. Tenderers shall include their rates quoted for preliminary and general items required for the execution of work such as tools, plants, workman's shed, temporary offices, cleaning site, scaffolding up to the required height etc. The description of each item shall unless otherwise stated be held to include conveyance, labour, finishing to required shape and size, setting, fitting and fixing in position, straight cutting and wastes, return of packings, overheads, profits and other unless otherwise stated, be held to include the consequent waste.
2. The rates quoted by the contractor should cover for work at any height for all items of work under this contract. List of all materials will not form a criterion for any extra payment unless other contractors used in the particular item.
In the event of arithmetical error/errors being discovered in the contract document, the rates mentioned in the words in tender copy marked original will only be taken as Bonafide.
3. Contractor should note that the tender **is strictly percentage rate based** and their attention is drawn to the fact that their rates for each and every item should be correct, workable and self-supporting. If called upon by architect/ Employer details analysis of any or all rates shall be bound to recognise contractors' analysis.
4. Contractor should note that their rates should be inclusive of all attendance on their sub-contractors and also for making good any holes and chases left by the sub-contractor before the building work is completed.
5. The Contractor shall be responsible for procuring all required materials sufficiently in advance and see that the work is never hindered for want of materials or due to any other reason or restriction.
6. The contractor shall have to carry out all connected work within the boundary of proposed work and inside the building if ordered to do so by the architect/ employer at the rate quoted in the schedule items.
7. The contractor is to study architectural drawings before commencing work. In case of discrepancy, the contractor must report to the architect/ employer immediately and shall get the same rectified before proceeding it.
8. The rate quoted for Electrical installation works shall include all necessary charges/requirements complying with Indian electricity act and rules in force for the work.
9. All works which shall be used in the work must be form the list of the approved materials as mentioned in the specification. Samples of materials proposed to be used shall be submitted to the Consultant/Bank for Approval.
10. General spirit of the technical specification and method of measurement shall be as laid down in the latest edition of I S code of practice. Rates quoted for all items shall include for the cost of supplying labour and materials fixing and erection complete with all the application necessary for proper execution and carrying out of the work to the truest sense of drawing and specification through this may not be mentioned in particular item of the schedule items.
11. The quoted rates shall include clearing site from all shrubs, vegetation, bushes, tress, before commencement of work even if not otherwise specified. Trees with girth of above 4500mm and measured 300mm above GL shall be cut with prior permission form Bank / consultant adhere to statutory norm/NOC from local Authority/Forest department, as applicable.
12. The quoted rate shall be deemed inclusive of costs, of all labour, materials, tools, plants

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Equipment, curing cost al lead and lift and all taxes, duties octroi even if these are not otherwise mentioned in items. GST shall be paid extra as applicable.

13. Products with ISI sample, if available shall be use with prior approval of the consultant/ employer reserves the right to select any particular brand between different state products of the same category.

ARTICLES OF AGREEMENT (DRAFT)

This agreement made theday of between Assistant General Manager (Premises & Estate), State Bank of India, Local Head Office, Bhubaneswar (hereinafter called the Bank or SBI) which expression shall include the successors and assigns) of the one part and M/s. company / partnership for registered under the Indian Companies Act/ Partnership Act having its registered office..... (hereinafter called 'the Contractors' which expression shall include the present directors / partners and also the directors / partners from time to time as also their respective heirs, legal representatives, administrators and assigns) of the other part.

WHEREAS the employer is desirous of execution of Construction Of G+2 Storied Building for Administrative Office & Regional Business Office at Ambapua, Berhampur, Odisha. (Name of work) and has caused drawings and specifications describing the works to be done prepared by Project Architects M/s Vastukar having their offices at Nageswartangi, Bhubaneswar (hereinafter called "the Architect")

AND WHEREAS THE SAID Drawings numbered as mentioned in the tender documents hereinafter mentioned and to be issued from time to time, the specifications and the Schedule of items and quantities have been signed by or on behalf of the parties hereto.

AND whereas the contractors have agreed to execute upon and subject to the condition set forth herein and Schedule of items and quantities, General & special Conditions of Contract, specification etc. contained in the tendered documents including all correspondences exchanged by or between the parties from the submission of tender till the award of work, both letters inclusive, (all of which are collectively hereinafter referred to as "the said conditions"). The works shown upon the said drawing and /or described in the said specification and included in the schedule of Items and Quantities at the respective rates therein set forth amounting to the sum of Rs._____ (Rupees _____ in words _____) as there in arrived at or such other sum as shall become payable there under (hereinafter referred to as "the said Contract Amount").

NOW IT IS HEREBY AGREED AS FOLLOWS:

1. In consideration of the said Contract amount to be paid at the times and the manner set forth in the said Conditions, the Contractors shall upon and subject to the said conditions execute and complete the work shown upon the said drawings and described in the said specifications and the schedule of items and quantities.
2. The employer shall pay the Contractors the amount or such other sum as shall become payable, at the times and in the manner specified in the said conditions.
3. The term "the Architect" in the said condition shall mean the said "M/s Vastukar" or in the event of their ceasing to be the Architect for the purpose of this contract for whatever reason, such other person or persons as shall be nominated for that purpose by the Employer, not being a person to whom the Contractor shall object for reasons considered to be sufficient by the Employer provided always that no person or persons subsequently appointed to be Architect under this contract shall be entitled to disregard or over rule any previous decisions or approval or direction given or expressed in writing by the architect for the time being.
4. The said conditions and appendix thereto shall be read and construed as forming part of this agreement, and the parties hereto shall respectively abide by / submit them-

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selves to the said conditions and perform the agreements on their part respectively in the said conditions contained.

5. The plans, agreement and documents mentioned herein shall form the basis of this contract.
6. This contract is neither a fixed Lump sum contract nor a piece work contract but is a contract to carry out the work in respect of the entire project on percentage rate basis to be paid for according to actual measured quantities at the rates contained in the schedule of quantities and rates or as provided in the said conditions.
7. The Bank / Employer reserves to itself the rights of altering the specifications and nature of work by adding to or omitting any item of work or having portions of the same carried out without prejudice to the contract.
8. Time shall be considered as the essence of this contract and the contractor here by agrees to commence the work soon after the site is handed over to him or from the 14th day after date of issue of formal work order as provided for in the said conditions of contractor whichever is later and to complete the entire work within ____ (period of contract) months subject never the less to the provisions for extension of time.
9. All payments by the Employer under this contract will be made only at Bhubaneswar.
10. Any dispute arising under this Agreement shall be referred to arbitration in accordance with the stipulations laid down in the tender.
11. That all the parts of this contract have been read by the contractor and fully understood by the contractor. They further agree to complete the said work to fullest satisfaction of architect / Employer.
12. IN WITNESS WHEREOF the Employer and the contractors have set their respective hands to these present through their duly authorized official and the said two duplicates hereof to be executed on its behalf of the day and year first herein above written.

Signed on behalf of the

Signed on behalf of the

STATE BANK OF INDIA

CONTRACTORS

In the presence of:

In the presence of:

1. Signature :

1. Signature :

Name :

Name :

Address :

Address :

In the presence of:

In the presence of:

2. Signature :

2. Signature :

Name :

Name :

Address :

Address :

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GENERAL CONDITIONS OF THE CONTRACT

1.0 Definitions

“**Contract**” means the documents forming the tender and the acceptance thereof and the formal agreement executed between SBI and the contractor, together with the documents referred therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Architects/SBII and all these, documents taken together shall be deemed to form one contract and shall be, complementary to one another.

1.1 In the contract the following expressions shall, unless the context otherwise requires, have the meaning hereby respectively assigned to them.

1.1.1 ‘**SBI / Bank**’ shall mean State Bank of India (client) a body Corporate created under SBI Act 1955, having one of its Circle Office at State Bank of India, III/1 Pandit Jawaharlal Nehru Marg, Bhubaneswar- 01 and includes the client’s representatives, successors and assigns.

1.1.2 ‘**Architects/Consultants**’ shall mean **M/s. Vastukar, Bhubaneswar**

1.1.3 ‘**Site Engineer**’ shall mean an Engineer appointed by the Bank/Architect as their representative to give instructions to the contractors.

1.1.4 ‘**The Contractor**’ shall mean the individual or firm or company whether incorporated or not, undertaking the works and shall include legal personal representative of such individual or the composing the firm or company and the permitted assignees of such individual or firms of company.

1.1.5 The expression ‘**works** or ‘work’ shall mean the permanent or temporary work described in the ‘Scope of Work’ and/or to be executed in accordance with the contract and includes materials, apparatus, equipment, temporary supports, fittings and things of all kinds to be provided, the obligations of the contractor hereunder and work to be done by the contractor under the contract.

1.1.6 ‘**Engineer**’ shall mean the representative of the Architect/consultant.

1.1.7 ‘**Drawings**’ shall mean the drawings prepared and issued by the Architects duly approved by the Bank and referred to in the specifications and any modifications of such drawings as may be issued from time to time ‘Contract value shall mean the value of the entire work as stipulated in the letter of acceptance of tender subject to such additions thereto or deductions there from as may be made under the provision hereinafter contained.

1.1.8 ‘**Specifications**’ shall mean the specifications referred to in the tender and any modifications thereof as maybe time to time be furnished or approved by the architect/ consultant
“Month” means calendar month.

1.1.9 “**Week**” means seven consecutive days.

1.1.10 “**Day**” means a calendar day beginning and ending at 00 Hrs and 24 hrs respectively.

1.1.11 “**SOQ/BOQ**” may read as Schedule or Bill of Quantities.

Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

1.1.12 The project/work as stated in the tender “CONSTRUCTION OF G+2 STORIED BUILDING FOR ADMINISTRATIVE OFFICE & REGIONAL OFFICE AT AMBAPUA, BERHAMPUR, ODISHA (COMPOSITE WORK COMPRISES CIVIL, PH, EXTERNAL ELECTRICAL (HT), LIFT INSTALLATION AND FIRE FIGHTING WORKS, AUTOMATIC FIRE DETECTION & ALARM SYSTEM, PUBLIC ADDRESS AND VOICE EVACUATION SYSTEM)”, may read and understood as “**Construction Of G+2 Storied Building For Administrative Office & Regional Business Office at Ambapua, Berhampur, Odisha**”.

CLAUSES:

1.0 Total Security Deposit: Total Security deposit comprises of:

- Earnest Money Deposit
- Initial Security Deposit
- Retention Money

c) Retention Money: Total security deposit shall be 5% of the final value of the work. Out of this 2% of tender value (i.e. tender amount) is in the form of initial security deposit (ISD) which includes the EMD. Balance security deposit (i.e. 5% of final value of work less 2% of tender value already deposited as ISD) towards the work shall be deducted from the running account bill of the work as Retention money at the rate of 10% of the respective running account bill i.e. deduction from each running bill account will be 10% till total 5% of final value of work as per final bill is reached. 50% of the total security i.e.2.5% of the final value of work shall be paid to the contractors on the basis of Project Engineer-in-Charge certifying the virtual completion and its approval by SBI. The balance 50% i.e. 2.5% of final value of work would be paid to the contractors after the defects liability period as specified in the contract and after satisfactory completion of CVC Audit. In case CVC Audit is not conducted, 1.25% of final value of work will be retained for a maximum period of further one year (w.e.f. completion of defect liability period).

2.0 Language Errors, Omissions and Discrepancies: In case of errors, omissions and/or disagreement between written and scaled dimensions on the drawings or between the drawings and specifications etc, the following order shall apply.

- i) Between scaled and written dimension (or description) on a drawing, the latter shall be adopted.
- ii) Between the written or shown description or dimensions in the drawings and the corresponding one in the specification the former shall be taken as correct.
- iii) Between written descriptions of the item in the specifications and descriptions in bills of quantities of the same item, the latter shall be adopted.
- iv) In case of a difference between rates written in figures and words, the rate in words shall prevail.

v) Between the duplicate/subsequent copies of the tender, the original tender shall be taken as correct.

3.0 Scope of Work: The contractor shall carry out, complete, and maintain the said work in every respect strictly in accordance with this contract and with the directions of and to the satisfaction of the SBI /architect/consultant. The architect/consultant at the directions of the Bank from time to time issue further drawings and/or written instructions, details directions and explanations which are hereafter collectively referred to as SBI/Architect's instructions in regard to : the variation or modification of the design, quality or quantity of work or the addition or omission or substitution of any work, any discrepancy in the drawings or between the BOQ and/or drawings and/or specifications, the removal from the site of any material brought thereon by the contractor and the substitution of any other materials thereof, the demolition, removal and/or re-execution of any work executed by him, the dismissal from the work of any person employed/engaged thereupon.

4.0 (i) Letter of Acceptance: Within the validity period of the tender the SBI shall issue a letter of acceptance either directly or through the architect by registered post/e-mail/speed post or otherwise depositing at the address of the contractor as given in the tender to enter into a Contract for the execution of the work as per the terms of the tender. The letter of acceptance shall constitute a binding contract between the SBI and the contractor.

ii) Contract Agreement: On receipt of intimation of the acceptance of tender from the SBI/Architect the successful tenderer shall be bound to implement the contract and within fifteen days thereof, he shall sign an agreement in a non-judicial stamp paper of appropriate value (as per the Article of Agreement format earlier given in this document) with SBI.

5.0 Ownership of drawings: All drawings, specifications and copies thereof furnished by the SBI, through its architect/ consultants are the properties of the SBI. They are not to be used on other work.

6.0 Detailed drawings and instructions: The SBI through its architects/consultants shall furnish with reasonable promptness additional instructions by means of drawings or otherwise necessary for the proper execution of the work. All such drawings and instructions shall be consistent with the contract documents, true developments thereof and reasonably inferable there from.

The work shall be executed in conformity therewith and the contractor shall prepare a detailed programme schedule (i.e. BAR/PERT Chart) indicating therein the date of start and completion of various activities on receipt of the work order and submit the same to the SBI through the Architect/Consultant.

7.0 Copies of Agreement: Out of Six copies, two copies of agreement/tender document duly signed by both the parties with the drawings shall be handed over to the contractors, two copies to SBI and one copy each shall be for the use of SBI and Architect.

8.0 Liquidated Damages: If the contractor fails to maintain the required progress in terms of contract or to complete the work and clear the site including vacating their office on or before the contracted or extended date or completion without justification in support of the cause of delay, he may be called upon without prejudice to any other right of remedy available under

Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

Tender No.: BHU/P&E/09/2024-25/25 DATED 25.09.2024

the law to the SBI on account of such breach to pay a liquidated damages at the rate of 0.5% of the final value of work per week subject to a maximum of 5% of the final value of work.

9.0 Materials, Appliances, and Employees: Unless or otherwise specified the contractor shall provide and pay for all materials, labour, water, power, tools, equipment transportation and any other facilities that are required for the satisfactory execution and completion of the work. Unless or otherwise specified all materials shall be new and both workmanship and materials shall be best quality. The contractor shall at all times enforce strict discipline and good order among his employees/workers and shall not employ on the work any unfit person/worker or anyone not skilled in the work assigned to him. Workman whose work or behaviour is found to be unsatisfactory by the SBI /Architect, he shall be removed from the site immediately.

10.0 Permits, Laws and Regulations: Permits and licences required for the execution of the work shall be obtained by the contractor at his own expenses. The contractor shall give notices and comply with the regulations, laws/ labour laws, and ordinances rules, applicable to the contractor. If the contractor observes any discrepancy between the drawings and specifications, he shall promptly notify the SBI in writing under intimation of the Architect/Consultant. If the contractor performs any act which is against the law, rules and regulations he shall meet all the costs arising there from and shall indemnify the SBI any legal actions arising there from.

11.0 Setting out Work: The contractor shall set out the work and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions, and alignment of all parts thereof and get it approved by the architect/consultant before proceeding with the work. If at any time any error in this respect shall appear during the progress of the works, irrespective of the fact that the layout had been approved by the architect/consultant the contractor shall be responsible for the same and shall at his own expenses rectify such error, if so, required to satisfaction of the SBI.

12.0 Protection of works and property: The contractor shall continuously maintain adequate protection, of all his work from damage and shall protect the SBI's properties from injury or loss arising in connection with contract. He shall make good any such damage, injury, loss due to his fault or negligence except which are due to causes beyond his control.

He shall take adequate care and steps for protection of the adjacent properties. The contractor shall take all precautions for safety and protection of his employees on the works and shall comply with all applicable provisions of Government and local bodies' safety laws and relevant building codes to prevent accidents, or injuries to persons or property of about or adjacent to his place of work. The contractor shall take insurance covers as per clause 25.0 at his own cost. The policy may be taken in joint names of the contractors and the SBI and the original policy may be lodged with the SBI.

13.0 Inspection of Work: SBI/Architect/Consultant or their representatives shall at all reasonable time have free access to the work site and/or to the workshop, factories or other places where materials are lying or from where they are obtained and the contractor shall give every facility to the /SBI/Architect/Consultant and their representatives necessary for

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inspection and examination and test of the materials and workmanship. No person unless authorized by the SBI/Architect/Consultant except the representative of Public authorities shall be allowed on the work at any time. The proposed work either during its construction stage or its completion can also be inspected by the Chief Technical Examiner's organization a wing of Central Vigilance Commission.

14.0 Assignment and subletting: The whole of work included in the contract shall be executed by the contractor and he shall not directly entrust and engage or indirectly transfer assign or underlet the contract or any part or share thereof or interest therein without the written consent of the SBI /SBI through the architect and no undertaking shall relieve the contractor from the responsibility of the contractor from active superintendence of the work during its progress.

15.0 Quality of Materials, Workmanship & Test: All materials and workmanship shall be best of the respective kinds described in the contract and in accordance with SBI/Architect's instructions and shall be subject from time to time to such tests as the SBI/Architect may direct at the place of manufacture or fabrication or on the site or an approved testing laboratory.

The quantity given in SOQ are intended to cover the entire new structure indicated in the drawing but the employer reserves the right to execute only a part or the whole or any excess thereof without assigning any reason thereof. Qty not mentioned in the item will also be executed that are necessary to complete the work. The rate shall be derived as per prevailing market rate including CPOH 15%. The contractor shall provide such assistance, instruments, machinery, labour and materials.

Contractor to made arrangement of laboratory on site, where weight of various materials like aluminium extrusions etc. can be done, Contractor should also make available 3.00 meters, 15.00 meters & a 50.00 meters tape, a Vernier Calliper & Micrometre so any measurements/ tests can be taken on sites itself.

(ii)Samples: All samples of adequate numbers, size, shades & pattern as per specifications shall be supplied by the contractor without any extra charges. If certain items proposed to be used are of such nature that samples cannot be presented or prepared at the site detailed literature/test certificate of the same shall be provided to the satisfaction of the SBI/Architect. Before submitting the sample/literature the contractor shall satisfy himself that the material/equipment for which he is submitting the samples/literature meet with the requirement of tender specification. Only when the samples are approved in writing by the SBI /Architect the contractor shall proceed with the procurement and installation of the particular material/equipment.

The approved samples shall be signed by the SBI /Architect for identification and shall be kept on record at site office until the completion of the work for inspection/comparison at any time. The SBI/Architect shall take reasonable time to approve the sample. Any delay that might occur in approving the samples for reasons of its not meeting the specifications or other discrepancies inadequacy in furnishing samples of best qualities from various manufacturers and such other aspects causing delay on the approval of the materials/equipment etc. shall be to the account of the contractor.

(iii) Cost of tests: The cost of making any test shall be borne by the contractor if such test is intended by or provided for in the specifications or BOQ.

(iv) Cost of test not provided for: If any test is ordered by the SBI/Architect which is either:

- (a) If so intended by or provided for or (in the cases above mentioned) is not so particularized or through so intended or provided for but ordered by the SBI/ Architect which is either to be carried out by an independent person at any place other than the site or the place of manufacture or fabrication of the materials tested or any Government/approved laboratory, then the cost of such test shall be borne by the contractor.

16.0 Obtaining Information related to execution of work: No claim by the contractor for additional payment shall be entertained which is consequent upon failure on his part to obtain correct information as to any matter affecting the execution of the work nor any misunderstanding or the obtaining incorrect information or the failure to obtain correct information relieve him from any risks or from the entire responsibility for the fulfilment of contract.

17.0 Contractor's superintendence: The contractor shall give necessary personal superintendence during the execution of the works and as long, thereafter, as the SBI/Architect may consider necessary until the expiry of the defect liability period, stated hereto.

18.0 Quantities: i) The bill of quantities (BOQ) unless or otherwise stated shall be deemed to have been prepared in accordance with the Indian Standard Method of Measurements

The rate quoted shall remain valid for variation of quantity against individual item to any extent subject to maximum variation of the contract value by 25%. The entire amount paid under Clause 20 hereof as well as amounts of prime cost and provisional sums, if any, shall be excluded.

ii) Variation exceeding 25%: The items of work executed in relation to variation exceeding 25% shall be paid on the basis of provisions of clause 21(e) hereof. Rate of this item will not exceed the tender rate.

19.0 Works to be measured: The SBI/Architect may from time to time intimate to the contractor that he required the work to be measured and the contractor shall forthwith attend or send a qualified representative to assist the SBI/Architect in taking such measurements and calculation and to furnish all particulars or to give all assistance required by any of them. Such measurements shall be taken in accordance with the Mode of measurements detailed in the specifications. The representative of the SBI/ Architect shall take joint measurements with the contractor's representative and the measurements shall be entered in the measurement book.

The contractor or his authorized representative shall sign all the pages of the measurement book in which the measurements have been recorded in token of his acceptance. All the corrections shall be duly attested by both representatives. No writings shall be made in the measurement book. Should the contractor not attend or neglect or omit to depute his representative to take measurements then the measurements recorded by the representative of the SBI/ Architect shall be final. All authorized extra work, omissions and all variations made shall be included in such measurements.

20.0 Variations: No alteration, omission or variation ordered in writing by the SBI/Architect shall vitiate the contract.

In case the SBI /SBI/Architect thinks proper at any time during the progress of works to make any alteration in, or additions to or omission from the works or any alteration in the kind or quality of the materials to be used therein, the Architect/Consultant shall give notice thereof in writing to the contractor or shall confirm in writing within seven days of giving such oral instructions the contractor shall alter to, add to, or omit from as the case may be in accordance with such notice but the contractor shall not do any work extra to or make any alteration or additions to or omissions from the works or any deviation from any of the provisions of the contract, stipulations, specifications or contract drawings without previous consent in writing of the Architect/Consultant and the value of such extras, alterations, additions or omissions shall in all cases be determined by the Architect/Consultant and the same shall be added to or deducted from the contract value, as the case may be.

21.0 Valuation of Variations: No claim for an extra shall be allowed unless it shall have been executed under the authority of the Architect with the concurrence of the SBI as herein mentioned. Any such extra is herein referred to as authorized extra and shall be made in accordance with the following provisions.

a. The net rates or prices in the contract shall determine the valuation of the extra work where such extra work is of similar character and executed under similar conditions as the work priced herein. Rates for all items, wherever possible should be derived out of the rates given in the priced BOQ.

b. The net prices of the original tender shall determine the value of the items omitted, provided if omissions do not vary the conditions under which any remaining items of works are carried out, otherwise the prices for the same shall be valued under sub clause (c) hereunder.

c. Where the extra works are not of similar character and/or executed under similar conditions as aforesaid or where the omissions vary the conditions under which any remaining items or works are carried out, then the contractor shall within 7 days of the receipt of the letter of acceptance inform the SBI/Architect of the rate which he intends to charge for such items of work, duly supported by analysis of the rate or rates claimed and the SBI/Architect shall fix such rate or prices as in the circumstances in his opinion are reasonable and proper, based on the market rate.

d. Where extra work cannot be properly measured or valued the contractor shall be allowed day work prices at the net rates stated in the tender of the BOQ or, if not, so stated then in accordance with the local day work rates and wages for the district; provided that in either case, vouchers specifying the daily time (and if required by the SBI /SBI/Architect) the workman's name and materials employed be delivered for verifications to the Architect/Consultant at or before the end of the week following that in which the work has been executed.

e. It is further clarified that for all such authorized extra items where rates cannot be derived from the tender, the contractor shall submit rates duly supported by rate analysis worked on

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the “market rate basis” for material, labour, hire/running charges of equipment and wastages etc. plus 15% towards establishment charges, contractor’s overheads and profit. Such items shall not be eligible for escalation.

22.0 Final Measurement: The measurement and valuation in respect of the contract shall be completed within **one month** of the virtual completion of the work.

23.0 Virtual Completion Certificate (VCC): On successful completion of entire works covered by the contract to the full satisfaction of the SBI, the contractor shall ensure that the following works have been completed to the satisfaction of the SBI-

- a) Clear the site of all scaffolding, wiring, pipes, surplus materials, contractor’s labour, equipment and machinery.
- b) Demolish, dismantle and remove the contractor’s site office, temporary works, structures including labour sheds/camps and constructions and other items and things whatsoever brought upon or erected at the site or any land allotted to the contractor by the SBI and not incorporated in the permanent works.
- c) Remove all rubbish, debris etc from the site and the land allotted to the contractor by the SBI and shall clear, level and dress, compact the site as required by the SBI.
- d) Shall put the SBI in undisputed custody and possession of the site and all land allotted by the SBI.
- e) Shall hand over the work in a peaceful manner to the SBI.
- f) All defects/imperfections have been attended and rectified as pointed out by the SBI to the full satisfaction of SBI.

Upon the satisfactory fulfilment by the contractor as stated above, the contractor shall be entitled to apply to the Architect/Consultant for the certificate. If the SBI/Architect/Consultant is satisfied of the completion of the work, relative to which the completion certificate has been sought, the SBI/Architect/Consultant shall within fourteen (14) days of the receipt of the application for virtual completion certificate, issue a VCC in respect of the work for which the VCC has been applied.

This issuance of a VCC shall be without prejudice to the /SBI’s rights and contractor’s liabilities under the contract including the contractor’s liability for defects liability period nor shall the issuance of VCC in respect of the works or work at any site be construed as a waiver of any right or claim of the SBI against the contractor in respect of works or work at the site and in respect of which the VCC has been issued.

23A. Defects after Completion:

The contractor shall make good at his own cost and to the satisfaction of the employer all defects, shrinkages, settlement or other faults which may appear **within 12 months** after virtual completion of work. In default, the employer may employ and pay other persons to amend and make such damages, loses and expenses consequent thereon or incidental thereto shall be made good and borne by the contractor and such damages, loss and ex-

penses shall be recoverable from him by the employer or may be deducted by the employer in lieu of such amending and making good by the contractor deduct from any money due to the contractor a sum of equivalent to the cost of amending such work and in the event of the amount retained being insufficient, recover that balance from the contractor from the amount retained under relevant clause together with any expenses the employer may have incurred in connection therewith

24.0 Work by other agencies: The SBI/Architect reserves the rights to use premises and any portion of the site for execution of any work not included in the scope of this contract which it may desire to have carried out by other persons simultaneously and the contractor shall not only allow but also extend reasonable facilities for the execution of such work. The contractor however shall not be required to provide any plant or material for the execution of such work except by special arrangement with the SBI. Such work shall be carried out in such manners not to impede the progress of the works included in the contract.

25.0 Insurance of Works

25.1 Without limiting his obligations and responsibilities under the contract the contractor shall ensure in the joint names of the SBI and the contractor against all loss or damages from whatever cause arising other than the excepted risks, for which he is responsible under the terms of the contract and in such a manner that the SBI and contractor are covered for the period stipulated in clause 28 of GCC and are also covered during the period of maintenance for loss or damage arising from a cause, occurring prior to the commencement of the period of maintenance and for any loss or damage occasioned by the contractor in the course of any operations carried out by him for the purpose of complying with his obligations under the clause.

- a) The works for the time being executed to the estimated current Contract value thereof, or such additional sum as may be specified together with the materials for incorporation in the works at their replacement value.
- b) The constructional plant and other things brought on to the site by the contractor to the replacement value of such constructional plant and other things.
- c) Such insurance shall be effected with an insurer and in terms approved by the SBI which approval shall not be unreasonably withheld and the contractor shall whenever required produce to the SBI/Architect the policy of insurance and the receipts for payment of the current premiums.

25.2 Damage to persons and property: The contractor shall, except if and so far as the contract provides otherwise indemnify the SBI against all losses and claims in respect of injuries or damages to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution and maintenance of the works and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation of damages for or with respect to :

- a) The permanent use or occupation of land by or any part thereof.

b) The right of SBI to execute the works or any part thereof, on, over, under, in, or through any lands.

c) Injuries or damages to persons or properties which are an unavoidable result of the execution or maintenance of the works in accordance with the contract.

d) Injuries or damage to persons or property resulting from any act or neglect of the SBI, their agents, employees or other contractors not being employed by the contractor or in respect of any claims, proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or where the injury or damage was contributed to by the contractor, his servants or agents such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the SBI, their employees, or agents or other employees, or agents or other contractors for the damage or injury.

25.3 Contractor to indemnify SBI: The contractor shall indemnify the SBI against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the provision sub-clause 25.2 of this clause.

25.4 Contractor's superintendence: The contractor shall fully indemnify and keep indemnified the SBI/SBI against any action, claim, or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claim made under or action brought against SBI in respect of such matters as aforesaid, the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expenses to settle any dispute or to conduct any litigation that may arise therefrom, provided that the contractor shall not be liable to indemnify the SBI if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the SBI/Architect in this behalf.

The contractor shall employ at least the following technical staff besides other personal: One graduate engineer / Sr Diploma holder having experience of 5yrs or more. The above technical staff should be available at site to take instructions whenever required by the architect/employer. In case the contractor fails to comply the technical staff as aforesaid he shall be liable to pay a sum of RS. 5000 each month or part thereof for default. The decision of architect/employer so as to the period will be final and binding on the contract.

25.5 Third-Party Insurance

25.5.1 Before commencing the execution of the work the contractor but without limiting his obligations and responsibilities under clause 25 of GCC shall insure against his liability for any material or physical damage, loss, or injury which may occur to any property including that of SBI, or to any person, including any employee of the SBI, by or arising out of the execution of the works or in the carrying out of the contract, otherwise than due to the matters referred to in the provision to clause 25 thereof.

25.5.2 Minimum Amount of Third-Party Insurance: Such insurance shall be affected with an insurer and in terms approved by the SBI which approval shall not be reasonably withheld and for at least the amount stated below. The contractor shall, whenever required, produce

to the SBI/Architect the policy or policies of insurance cover and receipts for payment of the current premiums.

The minimum insurance cover for physical property, injury, and death is Rs.5.0 lacs per occurrence with the number of occurrences limited to four. After each occurrence contractor will pay the additional premium necessary to make insurance valid for four occurrences always.

25.7 Accident or Injury to Workmen

25.7.1 The SBI shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workmen or other person in the employment of the contractor or any sub-contractor, save and except an accident or injury resulting from any act or default of the SBI or their agents, or employees. The contractor shall indemnify and keep indemnified SBI against all such damages and compensation, save and except as aforesaid and against all claims, proceedings, costs, charges, and expenses whatsoever in respect thereof or in relation thereto.

25.7.2 Insurance against accidents etc to workmen: The contractor shall insure against such liability with an insurer approved by the SBI during the whole of the time any person employed by him on the works and shall, when required, produce to the architect/consultant such policy of insurance and receipt for payment of the current premium. Provided always that, in respect of any persons employed by any sub-contractor the contractor's obligation to insure as aforesaid under this sub-clause shall be satisfied if the sub-contractor shall have insured against the liability in respect of such persons in such manner that SBI is indemnified under the policy but the contractor shall require such sub-contractor to produce to the SBI/Architect when required such policy of insurance and the receipt for the payment of the current premium.

25.7.3 Remedy on Contractor's failure to insure: If the contractor fails to effect and keep in force the insurance referred to above or any other insurance which he may be required to effect under the terms of contract, then and in any such case the SBI may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the SBI as aforesaid and also deduct 15% of contract value from any amount due or which may become due to the contractor, or recover the same as debt from the contractor.

Without prejudice to the other rights of the SBI against contractors, in respect of such default, the SBI shall be entitled to deduct from any sums payable to the contractor the amount of any damage costs, charges, and other expenses paid by the SBI and which are payable by the contractors under this clause. The contractor shall upon settlement by the insurer of any claim made against the insurer pursuant to a policy taken under this clause, proceed with due diligence to rebuild or repair the works destroyed or damaged. In this event all the monies received from the insurer in respect of such damage shall be paid to the contractor and the contractor shall not be entitled to any further payment in respect of the expenditure incurred for rebuilding or repairing of the materials or goods destroyed or damaged.

26.0 Commencement of Works: The date of commencement of the work will be reckoned as the recorded date of handing over site by the SBI/SBI or **14 days** from the date of receipt of Letter of Acceptance from SBI, whichever is later.

27.0 Time for completion: Time is the essence of the contract and shall be strictly observed by the contractor. The entire work shall be completed within a period of **Eighteen Calendar month from the date of commencement**. If required in the contract or as directed by the SBI/Architect, the contractor shall complete certain portions of work before completion of the entire work. However, the completion date shall be reckoned as the date by which the whole work is completed as per the terms of the contract.

28.0 Extension of Time: If, in the opinion of the Architect/Consultant, the work be delayed for reasons beyond the control of the contractor, the Architect/Consultant may submit a recommendation to the SBI to grant a fair and reasonable extension of time for completion of work as per the terms of contract. If the contractor needs an extension of time for the completion of work or if the completion of work is likely to be delayed for any reasons beyond the due date of completion as stipulated in the contract, the contractor shall apply to the SBI through the Architect/Consultant in writing at least 15 days before the expiry of the scheduled time and while applying for extension of time he shall furnish the reasons in detail and his justification if any, for the delays. The architect/consultant shall submit their recommendations to the SBI in the prescribed format for granting extension of time. While granting extension of time the contractor shall be informed the period extended time which will qualify for levy of liquidated damages. For the balance period in excess of original stipulated period and duly sanctioned extension of time by the SBI the provision of liquidated damages as stated under clause 8 of GCC shall become applicable. Further contract shall remain in force even for the period beyond the due date of completion irrespective whether the extension is granted or not.

29.0 Rate of progress: Whole of the materials, plant and labour to be provided by the contractor and the mode, manner and speed of execution and maintenance of the works are to be of a kind and conducted in a manner to the satisfaction of the SBI/Architect. Should the rate of progress of the work or any part thereof be at any time be in the opinion of the SBI /Architect too slow to ensure the completion of the whole of the work by the prescribed time or extended time for completion the SBI /Architect shall thereupon take such steps as considered necessary to expedite progress so as to complete the woks by the prescribed time or extended time. Such communications from the SBI /Architect neither shall relieve the contractor from fulfilling obligations under the contract nor he shall be entitled to raise any claims arising out of such directions.

30.0 Work during nights and holidays: Subject to any provision to the contrary contained in the contract no permanent work shall save as herein provided be carried on during the night or on holidays without the permission in writing of the SBI/Architect, save when the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the work in which case the contractor shall immediately advise the SBI/Architect. However, the provision of the clause shall not be applicable in the case of any work which becomes essential to carry by rotary or double shifts in order to achieve the progress and quality of the

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part of the works being technically required and continued with the prior approval of the SBI/Architect at no extra cost to the SBI.

All work at night after obtaining approval from competent authorities shall be carried out without unreasonable noise and disturbance so as to avoid disputes with the neighbours.

31.0 No compensation for restrictions of work: If at any time after acceptance of the tender SBI shall decide to abandon or reduce the scope of work for any reason whatsoever and hence not require the whole or any part of the work to be carried out, the SBI Architect shall give notice in writing to that effect to the contractor and the contractor shall act accordingly in the matter. The contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the work fully but which he did not derive in consequence of the foreclosure of the whole or part of the work. Provided that the contractor shall be paid the charges on the cartage only of materials actually and bona fide brought to the site of the work by the contractor and rendered surplus as a result of the abandonment, curtailment of the work or any portion thereof and then taken back by the contractor, provided however that the SBI /Architect shall have in such cases the option of taking over all or any such materials at their purchase price or a local current rate whichever is less. In case of such stores having been issued from SBI stores and returned by the contractor to stores, credit shall be given to him at the rates not exceeding those at which were originally issued to the contractor after taking into consideration and deduction for claims on account of any deterioration or damage while in the custody of the contractor and in this respect the decision of SBI /SBI/Architect shall be final.

32.0 Suspension of work: The contractor shall, on receipt of the order in writing of the SBI/Architect (whose decision shall be final and binding on the contractor) suspend the progress of works or any part thereof for such time and in such manner as SBI /Architect may consider necessary so as not cause any damage or injury to the work already done or endanger the safety thereof for any of following reasons.

- a) On account of any default on the part of the contractor, or
- b) For proper execution of the works or part thereof for reasons other than the default of the contractor, or
- c) For the safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the SBI /SBI/Architect.

i. If the suspension is ordered for reasons (b) and (c) in sub-Para (i) above:

The contractor shall be entitled to an extension of time equal to the period of every such suspension. No compensation whatsoever shall be paid on this account.

33.0 Action when the whole security deposit is forfeited: In any case in which under any clause or clauses of this contract, the Contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit the Architect/Consultant shall

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have the power to adopt any of the following course as they may deem best suited to the interest of the SBI.

a) To rescind the contract (of which rescission notice in writing to the contractor by the Architect/Consultant shall be conclusive evidence) and in which case the security deposit of the contractor shall be forfeited and be absolutely at the disposal of SBI.

b) To employ labour paid by the SBI and to supply materials to carry out the work, or any part of the work, debiting the contractor with the cost of the labour, materials (the cost of such labour and materials as worked out by the SBI/Architect shall be final and conclusive against the contractor) and crediting him with the value of the work done, in all respects in the same manner and at the same manner and at the same rates as if it had been carried out by the contractor under the terms of this contract the certificate of Architect/Consultant as to the value of work done shall be final and conclusive against the contractor.

c) To measure up the work of the contractor, and to take such part thereof as shall be unexecuted, out of his hands, and to give it to another contractor to complete in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor, if the whole work had been executed by him (of the amount of which excess the certificates in writing of the Architects/ Consultant shall be final and conclusive) shall be borne by original contractor and may be deducted from any money due to him by SBI under the contract or otherwise, or from his security deposit or the proceeds of sale thereof, or sufficient part thereof.

In the event of any of above courses being adopted by the SBI the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any material or entered into any engagements or make any advances on account of, or with a view to the execution of the work or the performance of the contract and in case the contract shall be rescinded under the provision aforesaid, the contractor shall not be entitled to recover or to be paid any sum or any work thereto for actually performed under this contract, unless, and until the Architect/Consultant/SBI will have certified in writing the performance of such work and the value payable in respect thereof, and he shall only be entitled to be paid the value so certified.

34.0 Owner's Right to Terminate the Contract: If the contractor being an individual or a firm commit any 'Act of Insolvency' or shall be adjusted an insolvent or being an incorporated company shall have an order for compulsory winding up voluntarily or subject to the supervision of Government and of the Official Assignee of the liquidator in such acts of insolvency or winding up shall be unable within seven days after notice to him to do so, to show to the reasonable satisfaction of the SBI /Architect that he is able to carry out and fulfil the contract, and to give security therefore if so required by the SBI.

Or if the contractor (whether an individual firm or incorporated Company) shall suffer execution to be issued or shall suffer any payment under this contract to be attached by or on behalf of any of the creditors of the contractor.

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Or shall assign or sublet this contract without the consent in writing of the SBI through the Architect/Consultant or shall charge or encumber this contract or any payment due to which may become due to the contractor there under.

a) Has abandoned the contract; or

b) Has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for 14 days after receiving from the SBI through the Architect/Consultant written notice to proceed, or

c) Has failed to proceed with the works with such diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or has failed to remove the materials from the site or to pull down and replace work within seven days after written notice from the SBI through the Architect/ Consultant that the said materials were condemned and rejected by the Architect/ Consultant under these conditions; or has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this contract to be observed and performed by the contractor for seven days after written notice shall have been given to the contractor to observe or perform the same or has to the detriment of good workmanship or in defiance of the SBI /SBI's or Architect's/Consultant's instructions to the contrary subject any part of the contract. Then and in any of said cases the SBI and or the Architect/Consultant, may not withstanding any previous waiver, after giving seven days' notice in writing to the contractor, determine the contract, but without thereby affecting the powers of the SBI or the Architect/Consultant or the obligation and liabilities of the contractor the whole of which shall continue in force as fully as if the contract had not been so determined and as if the works subsequently had been executed by or on behalf of the contractor. And, further the SBI through the Architect/Consultant, their agents or employees may enter upon and take possession of the work and all plants, tools, scaffoldings, materials, sheds, machineries lying upon the premises or on the adjoining lands or roads, use the same by means of their own employees or workmen in carrying on and completing the work or by engaging any other contractors or persons to complete the work and the contractor shall not in any way interrupt or do any act, matter or thing to prevent or hinder such other contractor or other persons employed for completing and finishing or using the materials and plant for the works. When the works shall be completed or as soon thereafter as convenient to the SBI or the Architect/Consultant shall give a notice in writing to the contractor to remove his surplus materials and plants and should the contractor fail to do so within 14 days after receipt thereof by him the SBI. /SBI sell the same by public auction after due publication and shall adjust the amount realized by such auction. The contractor shall have no right to question any of the acts of the SBI incidental to the sale of the materials etc.

35.0 Certificate of Payment:

The contractor shall be entitled under the certificates to be issued by the Architect/ Consultant to the contractor within 10 working days from the date of certificate to the payment from SBI from time to time. The SBI shall recover the statutory recoveries and other dues including the retention amount from the certificate of payment.

Provided always that the issue of any certificate by the Architect/Consultant during the progress of works or completion shall not have effect as certificate of satisfaction or relieve the contractor from his liability under clause.

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The Architect/Consultant shall have power to withhold the certificate if the work or any part thereof is not carried out to their satisfaction.

The Architect/Consultant may by any certificate make any corrections required in previous certificate.

The SBI shall modify the certificate of payment as issued by the Architect/Consultant from time to time while making the payment.

The contractor shall submit interim bills only after taking actual measurements and properly recorded in the Measurement book (M.B).

The contractor shall not submit interim bills when the approximate value of work done by him is less than Rs..... and the minimum interval between two such bills shall be one month.

The final bill may be submitted by contractor within a period of one month from the date of virtual completion and Architect/Consultant shall issue the certificate of payment within a period of two months. The SBI shall pay the amount within a period of three months from the date of issue of certificate provided there is no dispute in respect of rates and quantities.

The contractor shall submit the interim bills in the prescribed format with all details.

36.0 Settlement of Disputes and Arbitration:

Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design, drawings and instructions herein 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 thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the work or the execution or failure to execute the same, whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter :

- i) If the contractor considers that he is entitled to any extra payment or compensation in respect of the works over and above the amounts admitted as payable by the Architect or in case the contractor wants to dispute the validity of any deductions or recoveries made or proposed to be made from the contract or raise any dispute, the Contractor shall forthwith give notice in writing of his claim, or dispute to the Assistant General Manager (Premises& Estate)/Dy. General Manager (Premises)and endorse a copy of the same to the Architect, within 30 days from the date of disallowance thereof or the date of deduction or recovery. The said notice shall give full particulars of the claim, grounds on which it is based and detailed calculations of the amount claimed and the contractor shall not be entitled to raise any claim nor shall the Bank be in any way liable in respect of any claim by the contractor unless notice of such claim shall have been given by the contractor to the Assistant General Manager (Premises& Estate)/Dy. General Manager (premises) in the manner and within the time as aforesaid. The contractor shall be deemed to have waived and extinguished all his rights in respect of any claim not notified to the Assistant General Manager

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- (Premises & Estate) / Dy. General Manager (Premises) in writing in the manner and within the time aforesaid.
- ii) The Assistant General Manager (Premises & Estate) / Dy. General Manager (Premises) shall give his decision in writing on the claims notified by the contractor. The contractor may within 30 days of the receipt of the decision of the Assistant General Manager (Premises & Estate) / Dy. General Manager (Premises) submit his claims to the conciliating authority namely the Circle Development Officer/General Manager (Official Language & Corporate Services) for conciliation along with all details and copies of correspondence exchanged between him and the Assistant General Manager (Premises & Estate)/Dy. General Manager (Premises)
 - iii) If the conciliation proceedings are terminated without settlement of the disputes, the contractor shall, within a period of 30 days of termination thereof shall give a notice to the concerned Chief General Manager/Dy. Managing Director (HR) & Corporate Development Officer of the Bank for appointment of an arbitrator to adjudicate the notified claims failing which the claims of the contractor shall be deemed to have been considered absolutely barred and waived.
 - iv) Except where the decision has become final, binding and conclusive in terms of the contract, all disputes or differences arising out of the notified claims of the contractor as aforesaid and all claims of the Bank shall be referred for adjudication through arbitration by the Sole Arbitrator appointed by the Chief General Manager at LHO /Dy. Managing Director & Corporate Development Officer at CC/CCEs. It will also be no objection to any such appointment that the Arbitrator so appointed is a technically competent person not below the rank of Superintending Engineer or equivalent position in Public Sector Banks / CPSEs, CPWD, LIC, RBI etc. If the arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever another sole arbitrator shall be appointed in the manner aforesaid by the said Chief General Manager/ Dy. Managing Director (HR) & Corporate Development Officer. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.
 - v) It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each dispute along with the notice for appointment of arbitrator.
 - vi) It is also a term of this contract that no person other than a person appointed by such Chief General Manager aforesaid should act as arbitrator.
 - vii) The conciliation and arbitration shall be conducted in accordance with the provisions of the Arbitration & Conciliation Act 1996 or any statutory modification or re-enactment thereof and the rules made there under. viii) It is also a term of the contract that if any fees are payable to the arbitrator these shall be paid equally by both the parties.
 - ix) It is also a term of the contract that the arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties calling them to submit their statement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees if any, of the arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award (including the fees, if any of

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the arbitrator) shall be in the discretion of the arbitrator who may direct to any by whom and in what manner, such costs or any part thereof shall be paid and fix or settle the amount of costs to be so paid.

37.0 Water Supply: The contractor shall make his own arrangement for the water required for the work and nothing extra will be paid for the same. This will be subject to the following conditions:

i. That the water used of the contractor shall be fit for construction purposes to the satisfaction of the SBI/Architect / Consultant.

ii. The contractor shall make alternative arrangements for the supply of water if the arrangement made by the contractor for procurement of water in the opinion of the Architect / Consultant is unsatisfactory. If the contractor uses water from the source of the employer, recover @0.5% of the bill for water charge shall be affected from the running bill of the contractor from time to time.

37.1. The contractor shall construct temporary well / tube well in SBI land for taking water for construction purposes only after obtaining permission in writing from the SBI. The contractor has to make his own arrangements for drawing and distributing the water at his own cost. He has to make the necessary arrangements. To avoid any accidents or damages caused due to construction and subsequent maintenance of the wells. He has to obtain necessary approvals from local authorities, if required, at his own cost. He shall restore the ground to its original condition after wells are dismantled on completion of work or hand over the well to the SBI without any compensation as directed by the Architect / Consultant.

38.0 Power supply: The contractor shall make his own arrangements for power and supply/distribution system for driving plant or machinery for the work and for lighting purpose at his own cost. The cost of running and maintenance of the plants are to be included in his tender prices. He shall pay all fees and charges required for the power supply and include the same in his tendered rates and hold the owner free from all such costs. He has to obtain necessary approvals from the appropriate authorities, if required. If the contractor uses electrical power from the source of the employer, recover 0.5% of the bill for electricity consumption shall be affected from the running bill of the contractor from time to time.

39.0 Treasure Trove etc.: Any treasure trove, coin or object antique which may be found on the site shall be the property of SBI and shall be handed over to the SBI immediately.

40.0 Method of Measurement: Unless otherwise mentioned in the schedule of quantities or in mode of measurement, the measurement will be on the net quantities or work produced in accordance with up to date. Rules laid down by the Bureau of Indian standards. Measurement shall be as per units of measurement in specification. IS 1200 may be followed if there is any discrepancy. **For steel**, it shall be measured in weight in kg and no allowance is made in the weight for rolling margin. Wastage, binding wires shall not be measured. Authorized overlap, spacers, chairs shall only be measured.

Both cement and steel consumption statement shall be submitted along with bill. Co-efficient for Cement consumption shall be as per CPWD. In the event any dispute/disagreement the decision of the Architect/Consultant shall be final and binding on the contractor

41.0 Maintenance of Registers: The contractor shall maintain the following registers as per the enclosed format at site of work and should produce the same for inspection of SBI /Architect/Consultant whenever desired by them. The contractor shall also maintain the records/registers as required by the local authorities/Government from time to time.

42.0 PRICE VARIATION ADJUSTMENT (PVA) FOR ALL MATERIALS (INCLUDING CEMENT & STEEL) & LABOUR

(Applicable only for completion period beyond 12 months)

In partial modification of the provisions made elsewhere in this contract regarding rate quoted being not subject to any variations, price adjustments to the value of work payable to the Contractor at tendered rates shall be made towards variations in the prices of materials and labour in the manner specified hereunder:-

If, after written order to commence the work and during the operative period of this contract including any authorized extensions of the original stipulated completion period:-

- (a) There be any variation in the Consumer Price Index- General Index- for industrial workers (Base 1982=100) (source – data published from time to time Indian Labour Journal by the Labour Bureau, Government of India);

OR

- (b) There be any variation in the All India Wholesale Price Index for all commodities (Base 199394=100) (as published from time to time in the RBI Bulletin based on the date issued by the Office of the Economic Advisor to the Government of India);

Price Variation Adjustment (PVA) towards (1) Labour Component and (2) Material Component shall be calculated in accordance with the formula A and B respectively, given below, subject to stipulations herein under mentioned:-

FORMULA (A) FOR LABOUR:

$$VL = 0.85P \times \frac{K1 \times (C1 - C0)}{100C0}$$

FORMULA (B) FOR MATERIALS:

$$VM = 0.85X \times \frac{(P-Y) \times K2 \times (I1 - I0)}{100 I0}$$

Where-

VL = Amount of Price Variation Adjustment

Increase or decrease in rupees due to labour component

VM = Amount of Price Variation Adjustment

Increase or decrease in rupees on account of materials component

NOTE: Bill period (noted hereunder) signifies the period of actual execution and not date of measurement or preparation of bill.

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- P = Cost of work done during the period under consideration (bill period) excluding advances on materials and/or adjustments thereof.
- Y = Cost of any other materials supplied/ arranged by the Bank at fixed price during the period under consideration (bill period)
- K1 = Percentage of labour component calculated as indicated in Note (1) below
- K2 = Percentage of materials component as indicated in Note (2) below.
- CO = Consumer Price Index – General Index Number for industrial workers (Base 1982 = 100) referred to at (a) above, ruling on the last due date of receipt of tenders, and as applicable to the centre, nearest to the place of work, for which the index is published)
- C1 = Average of above mentioned Consumer Price Index number during the period under consideration (bill period)
- I0 = All India Wholesale Price Index number for all commodities referred to at (b) above, ruling on the last date for receipt of tenders and as applicable to the centre, nearest to the place of work for which the index is published.
- I1 = Average of above mentioned monthly all India Wholesale Price Index numbers during the period under consideration (bill period)

NOTE (1) : K1 shall be taken as under:-

<u>Component of work</u>	<u>K 1</u>
a) Civil work including ancillary works and external work and RCC / tanks, septic tanks, etc. if any of sanitary and plumbing work	30
b) Sanitary and plumbing works including fittings and fixtures (internal work only)	20
c) Electrical installations work including fittings and fixtures (external and internal works)	20

NOTE (2) : K2 shall be taken as under:-

<u>Component of work</u>	<u>K 2</u>
a) Civil work including ancillary works as detailed under Note (1) (a) above	70
b) Sanitary and plumbing works including fittings and fixtures	

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as detailed under Note (1) (b) above	80
c) Electrical installations work including fittings and fixtures as detailed under Note (1) (c) above	80

Stipulations:

- (i) PVA Clause is operative either way i.e. if the variations in above referred price indices are on the plus side. PVA shall be payable to the contractor and if they are on the negative side PVA shall be recoverable from the contractor for the respective bill period of occurrence of fluctuations.
- (ii) The rates quoted by the Contractor shall be treated as firm for the value of work required to be done in the first 12 months of the contract period from the date of written order to commence work and no PVA is admissible on the same on any grounds whatsoever. The value of work required to be done during the first 12 months of the contract period shall be taken as 80% of the value of work to be done on pro-rata basis in 12 months as compared to the total stipulated completion period. No PVA is admissible on the value of work required to be done in first 12 months as worked out above, even if this value of work is actually done in a period longer than 12 months. However, in case of any delay in the first 12 months due to genuine reasons which are not attributable to the contractor and which are beyond his control, such period of delay will be deducted from 12 months, and the value of work to be done will be 80% of the pro-rata value of work to be done in such reduced period on pro-rata basis.
- (iii) (a) For works where the original stipulated period of completion is not more than 12 months, no PVA whatsoever is permissible under this clause. However, if the period of completion is delayed beyond 12 months on account of genuine reasons which are not attributable to the contractor and which are beyond his control, PVA will be admissible on the value of work done only in excess of value of work required to be done on a pro-rata basis in the first 12 months minus the period of such genuine delay.
- (b) For purpose of admissibility of PVA all the cumulative period of extensions granted for reasons which are solely attributable to the contractor is excluded from the total extended period of the contracts and PVA shall not be admissible on the value of work done during such period of extensions, which are granted for keeping the contract current, but only due to reasons for which the contractor was solely responsible. Periods of extensions granted on account of genuine reasons which are not attributable to the contractor and which are beyond his control will however, be included in the period for which PVA is admissible.
- (c) Notwithstanding anything to the contrary mentioned in any other clause/ clauses of the contract, extensions of the contract period shall be

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granted by the Architect only with prior approval of the Bank. Extensions granted by the Architect without Bank's prior approval shall not bind the Bank for payment of PVA for work done in the concerned period of extensions.

- (iv) (a) Where the total cost of work done beyond the value of work required to be done in the first 12 months (vide note (ii) and (iii) above does not exceed Rs.50 lacs the total amount of PVA worked out on the basis of provisions of foregoing stipulations will be limited to an upper ceiling of 10% of such value of work done in excess of value of work required to be done in the first 12 months, minus the cost of any materials issued/arranged by the Bank at fixed prices i.e. $P - Y$ (these terms being as per definitions given formulae A and B above).
- (b) Where the total value of work done beyond the value of work required to be done in the first 12 months exceeds Rs.50 lacs, the PVA on the first Rs.50 lacs will be calculated as provided for in the foregoing para and for the balance value of work done for which PVA is admissible subject to foregoing conditions, the PVA will have the upper ceiling of 10% but it will be worked out at a lower rate i.e. 80% of the amount worked out as per the formulae A and B referred to earlier.
- (v) In working out the amount of PVA as per all the foregoing stipulations, value of such extra items or such portions of extra items the rates of which are derived from the prevailing market rates of materials and labour will not be included in the value of work done. Value of only such extra items or such portions of extra items, rates of which are derived entirely from tendered rates will be included in the value of work on which PVA as calculated.
- (vi) For claiming the payment for PVA the contractor shall keep such books of accounts and other documents, vouchers receipts etc. as may be required by the Bank/Architect, for verification of the increased claims or reduction to be made as the case may be and he shall also allow Engineers and/or other duly authorized representatives of the Bank/Architects and furnish such information as may be required or called for to enable verification of the claim within a week of such request.
- (vii) The contractor is required to submit to the Bank, through the Architect, his claims for PVA separately for each running Bill for the individual bill periods for the work paid to him by the Bank. He will also be required to submit detailed calculations in support of the claims.
- (viii) No claim will be entertained from the contractor for interest or any other grounds for nonpayment or for any delay in payment of PVA due to late publication or non-availability of the necessary price indices or due to delay in preparation of the Running or Final Bills.

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- (ix) In view of adjustments for variations in process of materials and labor which have been covered in this clause no other adjustments for any reason whatsoever like statutory measures, taxes, levies, etc. will be allowed.

43.0 Force Majeure:

43.1 Neither contractor nor SBI shall be considered in default in performance of their obligations if such performance is prevented or delayed by events such as war, hostilities revolution, riots, civil commotion, strikes, lockout, conflagrations, epidemics, accidents, fire, storms, floods, droughts, earthquakes or ordinances or any act of god or for any other cause beyond the reasonable control of the party affected or prevented or delayed. However a notice is required to be given within 30 days from the happening of the event with complete details, to the other party to the contract, if it is not possible to serve a notice, within the shortest possible period without delay.

43.2 As soon as the cause of force majeure has been removed the party whose ability to perform its obligations has been affected, shall notify the other of such cessation and the actual delay incurred in such affected activity adducing necessary evidence in support thereof.

43.3 From the date of occurrence of a case of force majeure obligations of the party affected shall be suspended during the continuance of any inability so caused. With the cause itself and inability resulting there from having been removed, the agreed time of completion of the respective obligations under this agreement shall stand extended by a period equal to the period of delay occasioned by such events.

43.4 Should one or both parties be prevented from fulfilling the contractual obligations by a state of force majeure lasting to a period of 6 months or more the two parties shall mutually decide regarding the future execution of this agreement.

44.0 Local Laws, Acts, Regulations: The contractor shall strictly adhere to all prevailing labour laws inclusive of contract labour (regulation and abolition act of 1970) and other safety regulations. The contractor shall comply with the provision of all labour legislation including the latest requirements of all the Acts, laws, any other regulations that are applicable to the execution of the project.

- i) Minimum Wages Act, 1948 (Amended)
- ii) Payment of Wages Act 1936 (Amended)
- iii) Workmen's Compensation Act 1923 (Amended)
- iv) Contract Labour Regulation and Abolition Act 1970 and Central Rules 1971(Amended)
- v) Apprentice Act 1961 (Amended)
- vi) Industrial Employment (Standing Order) Act 1946 (Amended)
- vii) Personal Injuries (Compensation Insurance) Act 1963 and any other modifications

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- viii) Employees' Provident Fund and Miscellaneous Provisions Act 1952 and amendment thereof
- ix) Shop and Establishment Act
- ix) Any other Act or enactment relating thereto, and rules framed there under from time to time.

45.0 SAFETY CODE & MEASURES AT SITE:

1. All personnel at site should be provided with Helmets and Safety Boots with some Identification Mark. Visitors also should be provided with Helmets. It should be ensured that these are used properly.
2. First Aid Box should be kept at site with all requisite materials.
3. No one should be allowed to inspect / work at a height without Safety Belt.
4. Suitable scaffolds should be provided for workmen for all Works that cannot safely be done from the ground, or from solid construction except such short period Work as can be done safely from ladders. When a ladder is used an extra Mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well as suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than $\frac{1}{4}$ to 1 ($\frac{1}{4}$ horizontal and 1 vertical).
5. Scaffolding or staging more than 3.5 meters above the ground or floors, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise secured at least 1 Meter high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
6. Working platforms, Gangways, and Stairways should be so constructed that they do not sag unduly or unequally, and if the height of the platform or the Gangway or the Stairway is more than 3-5 Meters above ground level or floor level they should be closely boarded, should have adequate width and should be suitably fenced, as described.
7. Every opening in the floor of a building or in a working platform be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1 Meter.
8. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 Meters in length while the width between side rails in rung ladder shall in no case be less than 30cms for ladder up to and including Meters in length. For longer ladders this width should be increased at least 6mm for each additional 30 CMS. Uniform step spacing shall not exceed 30 CMS.
9. Adequate precautions shall be taken to prevent danger from electrical equipment. For electrical on line works gloves, rubber mats, and rubber shoes shall be used.
10. All trenches 1.2 Meters or more in depth shall at all times be supplied with at least one ladder for each 30 Meters length or fraction thereof. Ladder shall be extended from bottom of the trench to at least 1 Meter above the surface of the ground. The sides of the trenches, which are 1.5 Meters or more in depth shall be stepped back to give suitable slope, or securely held by timber bracing, so as to avoid the danger of

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sides collapsing. The excavated materials shall not be placed within 1.5 Meters of the edge of the trench or half of the depth of the trench whichever is more cuttings shall be done from top to bottom. Under no circumstances undermining or under cutting shall be done.

11. Before any demolition work is commenced and also during the process of the work: -
- a) All roads and open areas adjacent to the Work Site shall either be closed or suitably protected;
 - b) No electrical cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.
 - c) All practical steps shall be taken to prevent danger to persons employed from risk or fire or explosion or flooding. No floor, roof or other part of the building shall be so over-loaded with debris or materials as to render it unsafe.
 - d) All necessary personal safety equipment as considered adequate by the Site Engineer should be kept available for the use of the persons employed on the Site and maintained in a condition suitable for immediate use; and the Contractor should take adequate steps to ensure proper use of equipment by those concerned.
 - e) Workers employed on mixing Asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.
 - f) Those engaged in white washing and mixing or stacking of cement bags or any materials which is injurious to the eyes shall be provided with protective goggles.
 - g) Those engaged in welding works shall be provided with Welder's protective eye-shields.
 - h) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
 - i) When workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into the manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals and boards to prevent accident to the Public.
12. Use of hoisting machines and tackle including their attachments, anchorage and support shall conform to the following standard or condition: -
- a) These shall be of good mechanical construction, sound material and adequate strength and free from patent defect and shall be kept in good repairs and in good working order.
 - b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.
 - c) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in-charge of any hoisting machine including any scaffold, winch or give signals to the operator.

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- d) In the case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of suspension the safe working load shall be ascertained by adequate means.
- e) Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of a hoisting machine having a variable safe working load, each safe working load of the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.
- f) Motor, Gearing, Transmission, Electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards, hoisting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load, adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced.
- g) When workers are employed on electrical installation, which is already energized, insulating mats, wearing apparel such as gloves, rubber footwear etc.

46.0 Accidents: The contractor shall immediately on the occurrence of any accident at or about the site or in connection with the execution of the work report such accident to the Architect/Consultant. The contractor shall also report immediately to the competent authority whenever such report is required to be lodged by the law and take appropriate actions thereof.

47. Assignment Subletting: The whole of the works included in the contract shall be executed by the composite contractor and the same shall not directly or indirectly transfer, assign or underlet therein without the written permission of the bank and no undertaking shall relieve the contractor from any liability or obligation under the contract. No subletting of the work is permitted.

48. BANK'S BUILDING PROJECTS-MAINTENANCE OF RECORDS AT SITE OFFICE

A.	Registers at the site office
1	Measurement Books.
2	Cement Register (Daily Record).
3	Steel Register.
4	Steel Consumption Register – Bill wise.
5	Drawings register
6	Materials at site register.
7	Hindrance Register.
8	Concrete cube Test Register.

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9	File and Register for extra / variation items.
10	Materials test Register and File.
11	Site Order Book (in triplicate).
12	Lead caulking Register.
13	Labour Reports and progress Reports Register.
14	Site Visit & Instructions Register.
15	Certified true copies of the contracts.
16	Format for Bar Bending Schedule (BBS)

SPECIAL CONDITIONS OF THE CONTRACT (SCC)

1	Dimensions and levels: All dimensions and levels shown on the drawings shall be verified by the contractor on the site and he will be held responsible for the accuracy and maintenance of all the dimensions and the levels. Figured dimensions are in all cases to be accepted and no dimension shall be scaled. Large-scale details shall take precedence over small-scale drawings. In case of discrepancy, the contractor shall ask for clarification from the Architect / Consultant before preceding the work.
2	Notice of Operation: The contractor shall not carry out any important operation without the consent in writing from the Architect / Consultant.
3	Construction Records: The contractor shall keep and provide to the Architect / Consultant full and accurate records of the dimensions and positions of all new work and any other information necessary to prepare complete drawings recording details of the work as constructed.
4	Safety of Adjacent Structures and Trees: The contractor shall provide and erect to the approval of the Architect / Consultant such supports as may be required to protect effectively all structures and protective guards to trees which may be endangered by the execution of the works or otherwise take such permanent measures as may be required by the Architect to protect the trees and structures.
5	Site Order Book: A site order book shall be maintained at the site for the purpose of quick communication between the Architect / Consultant. Any communication relating to the works may be conveyed through records in the site order book. Such a communication from one party to the other shall be deemed to have been adequately served in terms of the contract. Each site order book shall have machine numbered pages in triplicate and shall be carefully maintained and preserved by the contractor and shall be made available to the Architect / Consultant as and when demanded. Any instruction which the Architect / Consultant may like to issue to the contractor or the contractor may like to bring to the Architect / Consultant two copies of such instructions shall be taken from the site order book and one copy will be handed over to the party against proper acknowledgement and the second copy will be retained for their record.
6	Temporary Works: Before any temporary works are commenced the contractor shall submit at least 7 days in advance to the Architect / Consultant for approval complete drawings of all temporary works he may require for the execution of the works. The contractor shall carry out the modifications relating to strength, if required by the Architect / Consultant may require in accordance with the conditions of the contract at his own cost. The contractor shall be solely responsible for the stability and safety of all temporary works and unfinished works and for the quality of the permanent works resulting from the arrangement eventually adopted for their execution.
7	Water, Power and Other Facilities:
7.a	The rate quoted by the contractor shall include all expenses that are required for providing all the water required for the work and the contractor shall make his own arrangements for the supply of good quality water suitable for the construction and good quality drinking water for their workers. If necessary, the contractor has to

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	sink a tube well / open well and bring water by means of tankers at his own cost for the purpose. The SBI will not be liable to pay any charges in connection with the above.
7.b	The rate quoted in the tender shall include the expenses for obtaining and maintaining power connections and shall pay for the consumption charges.
7.c	The contractors for other trades directly appointed by the SBI shall be entitled to take power and water connections from the temporary water and power supply obtained by the contractor. However, the concerned contractor shall make their own arrangements to draw the supply and pay directly the actual consumption charges at mutually agreed rates between them. All municipal charges for drainage and water connection for construction purposes shall be borne by the contractor and charges payable for permanent connections if any, shall be initially paid by the contractor and the SBI will reimburse the amount on the production of receipts.
7.d	The SBI as well as the Architect / Consultant shall give all possible assistance to the contractors to obtain the requisite
7.e	Permission from the various authorities, but the responsibility for obtaining the same in time shall be of the contractor
7.f	If the contractor uses water/ electrical power from the source of the employer, recover @0.5% for water charge and 0.5% for electricity consumption shall be affected from the running bill of the contractor from time to time
8	Office Accommodation
8.a	The contractor shall provide and maintain all necessary offices, workshops, stores, shelters, sanitary facilities, canteens, and other temporary structures for themselves in connection with the work at the site at their own cost after getting the approval from the Architect / Consultant.
8.b	A site office for the use of SBI / Consultant shall be provided by the contractor at his own expense.
8.c	All temporary buildings and facilities as mentioned above shall be removed on completion of the work or any other earlier date as directed by the Architect / Consultant. All the expenses for obtaining statutory approvals and maintenance of the above facilities as well as running expenses shall be borne by the contractor at no extra cost. It is also the responsibility of the contractor to obtain statutory approvals for providing the above facilities.
9	Facilities for Contractor's employees: The contractor shall make his own arrangement for the housing and welfare of his staff and workmen including adequate drinking water facilities. The contractor shall also make the arrangements at his own cost for transport where necessary for his staff and workmen to and from site of work at his own cost.
10	Lighting of works: The contractor shall at all times provide adequate and approved lighting as required for the proper execution and supervision and inspection of work.
11	Firefighting arrangements
11.a	The contractor shall provide a suitable arrangement for firefighting at his own cost.

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	For this purpose, he shall provide requisite number of fire extinguishers and adequate number of buckets, some of which are to be always kept filled with sand and some with water. This equipment shall be provided at suitable prominent and easily accessible places and shall be properly maintained.
11.b	Any deficiency in the fire safety or unsafe conditions shall be corrected by the contractor at his own cost and with the approval of the relevant authorities. The contractor shall make the following arrangements at his own cost but not limited to the following.
11.c	Proper handling, storage, and disposal of combustible materials and waste. Work operations that can create fire hazard. Access to firefighting equipment, type, number and location of containers for the removal of surplus materials and rubbish. Type, size, number, and location of fire extinguishers or other firefighting equipment. General housekeeping.
12	Temporary Fencing / Barricading: The contractor shall provide and maintain a suitable temporary fencing / barricading and gates at his cost to adequately enclose all boundaries of the site for the protection of the public and for the proper execution and security of the work and in accordance with the requirement of the Architect / Consultant and regulations of local authorities. These shall be altered, relocated and adopted from time to time as necessary and removed on completion of the work.
13	Site Meetings: Site meetings will be held to review the progress and quality evaluation. The contractor shall depute a senior representative along with the site representative and other staff of approved sub-contractors and suppliers as required to the site meetings and ensure all follow up actions. Any additional review meetings shall be held if required by the Architect / Consultant.
14	Disposal of Refuse: The contractor shall cart away all debris, refuse etc. arising from the work from the site and deposit the same as directed by the Architect / Consultant at his own cost. It is the responsibility of the contractor to obtain from the local authorities concerned to the effect that all rubbish arising out of contractor's activities at the construction site or any other off-site activities borrow pits has been properly disposed of.
15	Contractor to Verify Site Measurement: The contractor shall check and verify all site measurements whenever requested by other specialists' contractors or other sub-contractors to enable them to prepare their own shop drawings and pass on the information with sufficient promptness as will not in any way delay the works.
16	Bar Bending Schedule: The contractor shall prepare a detailed bar bending schedule for all reinforced concrete works and get them approved by the Architect / Consultant well in advance.
17	As-built drawings:
17.a	The Architect / Consultant will issue two sets of drawings to the contractor for the items for which some changes have been made from the approved drawings as instructed by the SBI / Architect / Consultant. The contractor will make the changes made on these copies and return these copies to the Architect / Consultant for their approval. In case any revision is required or the corrections are not properly marked the Architect / Consultant will point out the discrepancies to the contractor.

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	The contractor will have to incorporate these corrections and / or attend to discrepancies either on the copies as directed by the Architect / Consultant and resubmit to him for approval. The Architect / Consultant will return one copy duly approved by him.
17.b	For the drawings prepared by the contractor. The contractor will modify the drawing prepared by him wherever the changes are made by the SBI / Architect / Consultant and submit two copies of such modified drawings to the Architect / Consultant for approval. The Architect / Consultant will return one copy of the approved drawing to the contractor.
18	Approved make: The contractor shall provide all materials from the list of approved makes at his own cost and also appoint the specialized agency for the waterproofing anti-termite, aluminum doors and windows and any other item as specified in the tender. The Architect / Consultant may approve any make / agency within the approved list as given in the tender after inspection of sample / mock up.
19.	Procurement of materials: The contractor shall make his own arrangements to procure all the required materials for the work. All wastage and losses in weight shall be to the contractor's account.
20	Excise duty, taxes, levies etc.: The contractor shall pay and be responsible for payment of all taxes, duties, levies, royalties, fees, cess or charges in respect of the works including but not limited to sales tax, tax on works contract excise duty, and octroi, payable in respect of materials, equipment plant and other things required for the contract. All of the aforesaid taxes, duties, levies, fees and charges shall be to the contractor's account. Variation of taxes, duties, fees levies etc. if any, till completion of work shall be deemed to be included in the quoted rates and no extra amount on this account. Variation of taxes, duties, fees, levies etc if any, till completion of work shall be deemed to be included in the quoted rates and no extra claim on this account will in any case be entertained. If a new tax or duty or levy or cess or royalty or octroi is imposed under as statue or law during the currency of contract the same shall be borne by the contractor.
21	Acceptance of Tender: The SBI shall have right to reject any or all tenders without assigning any reason. They are not bound to accept the lowest or any tender and the tenderer or tenderers shall have no right to question the acts of the SBI.
22	Progress report shall be submitted monthly: The contractor shall furnish Bar chart/PERT chart for completion of work within stipulated time that is within 7 days of issue of LOI/ WO. This will be got approved from architect/Bank. The approved bar/PERT chart shall form a part of agreement. Achievement of miles stones as well as total completion has to be within the time period allowed, that is 18 calendar months. Contractor shall mobilize and employ sufficient resources for completion of all the works as indicated in the agreed BAR chart/ Network. During the currency of the work, the contractor is expected to adhere to the time schedule on miles stone and total completion and his adherence will be a part of contractor's performance under the contract.
23	Centring & Shuttering: Plywood conforming to IS:4990 or steel plates of minimum thickness as approved

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	by architect / EIC shall be used for formwork. The shuttering ply/plates shall be cleaned and oiled after every repetition and shall be used only after obtaining approval of architect/ EIC at site. The number of repetitions allowed for plywood and steel shuttering shall be at the discretion of EIC/ architect depending upon the conditions of shuttering surface after each use and the decision of architect/ EIC in this regard shall be final and binding on the contractor. No claim whatsoever account shall be admissible.
24	Photograph: Site photographs of reinforcement of foundations, columns, beams, slabs, RCC walls shall be submitted to the architect/ EIC (one copy shall be attached during submit of bills). Photographs of concreting shall also be submitted.
25	Reports and returns: The contractor shall maintain at-site records of the progress of work with regard to the works carried out. Contractor shall submit fortnightly / monthly (as directed by architect/ EIC) progress reports (Two copies) highlighting status of various activities and physical completing of the work. These will be used as the basis for the preparation of measurements which are to be furnished to the architect / employer regularly in the form of progress report forms (Bar chart including %age of completion, hurdles, etc. Enlarged site photographs shall also be submitted.
26	Government and local rules: The contractor shall conform to the provisions of all local bye-laws and acts relating to the work and to the regulations etc., of the govt and local authorities and of any company with whose system the structure is proposed to be connected. The contractor shall give all notices by said act, rules, regulations and bye-laws etc and pay all fees payable to such authority/authorities for execution of work involved. The cost, if any, shall be deemed to have been included in his quoted rates, taking into account all liabilities for licenses, fees, for footpath encroachment and restoration etc and shall indemnify the employer against such liabilities and shall defer all actions arising from such claims or liabilities.
27	Provisional Sum (PS): All provisional sum described in the schedule of quantities as P.S. shall be exclusively allotted to the purchase of materials and not for handling and fixing to be done by the contractor. Such cost of handling and fixing with profit including transportation charge required shall be separately included in the contract price as described in SOQ. The disposal of the amounts covered under the head will be absolutely at the discretion of the employer. Contractor is to make payments for these materials to the suppliers on certificate basis or order issued by the employer /architect and realize then through his bills from the employer.
29	Removal of improper works: The employer shall during the progress of work have power to order in writing from time to time. The removal from the works within such reasonable time or times as may be specified in the order of any materials which in the opinion of architect/employer are not in accordance with the specification or the instructions the substitution or proper execution of any work executed with materials or workmanship not in accordance with the drawings and specifications or instructions. No certificate which may be given by the architect shall relieve the contractor from his liability in respect of unsound work.

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30	<p>Account receipt and vouchers:</p> <p>The contractor shall upon the request of the employer furnish them with all the invoices, accounts, receipts and other vouchers that they may require in connection with the works under this contract. If the contractor uses materials less what is required under the contract, the value of difference in the quantity of materials he was required to use and that he actually used shall be deducted from his dues. Similarly, if the contractor uses cement and steel more than the requirement, the excess cement/steel used (5% wastage will be considered) will be reimbursed to contractor upon production of vouchers (excluding GST). The employer decision shall be final and binding on the contractor as to the mount of materials the contractor is required to use for any work under this contract.</p>
31	<p>Escalation:</p> <p>The rate quoted shall be firm throughout the tenure of the contract (inclusive of extension of time If any granted) and will not be subject to any fluctuation due to increase in cost of materials, labour, taxes, octroi, transportation on work contract unless specifically provided in these documents.</p>
32	<p>Drawings and specifications:</p> <p>The contractor shall be furnished by the architect free of cost one sets of each of the drawings, specifications, descriptions of schedules and other details necessary for execution of work.</p> <p>The contractor shall provide all his cost everything for the proper execution of works according to the intents and meaning of drawing, schedule, specification taken together whether same may or may not be shown or described therein provided that the same reasonably inferred therefrom and if the contractor finds any discrepancy in the drawings or between drawings, schedule of quantities and specifications, he shall immediately and in writing refer the same to the architect. The decision of architect/ employer shall be final and binding.</p> <p>Reinforcing steel and bar bending shall be furnished by the contractor to the architect / employer at least 10 days before the items of work to be taken up and approval of the architect/employer shall be obtained before fabrication and placing of reinforcement.</p> <p>Shuttering and tagging drawings if called by architect/employer shall be furnished well in advance for his approval before taking up the work</p>
33	<p>Abandonment- curtailment of work:</p> <p>If at any time after issue of WO, the employer for any reason whatsoever not required part or whole of the work as specified in the contract to be carried out, the architect/employer shall give notice in writing of the fact to the contractor who shall have no claim to payment of any compensation whatsoever on account of profit or advantage which he might have derived from the execution of work in full, provided that the contractor will be paid transport charges of any Bonafede materials actually brought at site and rendered surplus abandonment or curtailment and there taken back by the contractor, the quality and kid of such material rendered surplus is to be certified by the architect whose decision shall be final and binding.</p>
34	<p>Payment withheld:</p> <p>The Bank's engineer may withheld the amount on account of a subsequent discovered evidence nullify the whole or part of any certificate to such extent as may be necessary in his opinion to protect the employer from loss on account of:</p> <p>a). Defective work not remedied;</p> <p>b). Failure of the contractor to make payment properly to sub-contractor for materi-</p>

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	<p>als or labour or supplier,</p> <p>c). A reasonable doubt that the contract can be completed for the balance then unpaid,</p> <p>d). Damages to another contractor or sub-contractor, claims filed or reasonable evidence indicating probable fillings of claims. When grounds are removed, payment shall be made for amounts withheld because of them.</p>
35	<p>Advance payments: No advance payment will be made to the contractor. The Bank does not have any provision for sanctioning any mobilization advance whether secured or unsecured.</p>
36	<p>Inspection of work The proposed work covered under this tender during its progress can also be inspected by the Chief Technical Examiner/ Technical examiner or by an officer of the vigilance cell of authority on behalf of the Bank.</p>
37	<p>Failure by contractor to comply with Bank's/ Architect instructions: If the contractor after receipt of written notice from the bank and / or the architect requiring compliance within 10 days fails to comply with such further drawings and/or Bank's /architects instructions, the Bank through the architect or other person, may employ other person to execute any such work whatsoever that may be necessary to give effect thereto and pay all cost incurred in connection therewith and same shall be recoverable from the contractor by the bank on the certificate of the architect as a debt or shall have right to deduct same from any moneys due to or to become due to contractor</p>
38	<p>Permits, licences and possession prior to completion: Permits and licences that are required to execute this work which are under government control, will be arranged by the contractor. The Bank will render necessary assistance, sign any forms or applications that may be necessary. The Bank shall have right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be an acceptance of any work not completed in accordance with the contract agreement.</p>
39	<p>Guarantee for the specialized works: Whether provision for submission of a guarantee has been advised, the same shall be submitted from the specialized agency along with counter guarantee by the main contractor engaged for the work. The guarantee shall be furnished on a non-judicial stamp paper of appropriate value. If the contractor is required to submit the guarantee for any item/items for a period of more than 12months, the guarantee in case of those items will be valid after expiry of the Defect Liability Period of 12 months as stipulated in contract.</p>
40	<p>Tests, results and site register: The contractor is required to maintain the following registers at site of work and should produce the same for inspection of the Bank/architect whoever desired by them: Sieve analysis of coarse aggregate, fine aggregate, silt content of fine aggregate, cube and slump test of concrete, procurement of cement and steel register, hindrance and site register etc.</p>
41	<p>IT/CESS/Other tax, as applicable, shall be deducted from the bill of the contractor as per Govt rule.</p>

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42	<p>Agreement: The contractor shall execute the agreement as per draft agreement within 15 days of issue of WO. He shall pay all stamp and legal expense incidental thereto. However, the written acceptance of the tender by the employer/ consultant on behalf of employer will constitute a binding contract between the employer and the person so tendering whether such formal agreement is or is not subsequently executed.</p>
43	<p>No compensation for alteration in or restriction of work to be carried out: If at any time after the commencement of work, it is felt by the Bank/architect for any reason whatsoever, not require the whole work thereof as specified in the tender to be carried out, the architect/bank shall give notice in writing of the fact to the contractor who shall have no claim to any payment or compensation whatsoever on account of any profit or advantage with which he might have derived from the execution of work in full, but which he did not derive in consequences of the full amount of work not having been carried out: neither he shall have claim for compensation by reason of any alteration having been made in the original specification, drawing, design, and instructions which shall involve any curtailment of the work as originally contemplated.</p>
44	<p>Declaration: I/we have inspected the site of works and have made me/us fully acquainted with the local conditions in and around the sites of works. I/we hereby declare that I/we have gone through the conditions laid down in the NIT. GCC, SCC and additional terms and conditions, drawings, and specifications and understood the said, and in the basis of the same I/we quoted rates in SOQ attached with the tender document (Called price bid including reverse auction if any) I/we shall also uniformly maintain such progress with the work as may be directed by the Bank/architects to ensure completion of same within the target date as mentioned in the tender document.</p>
45	<p>Contractor to provide everything necessary: The contractor shall provide everything necessary for the proper execution of the work according to the intent and meaning of the drawings, schedule of quantities, and specifications are taken together whether the same may or may not be particularly shown or described therein provided that the same can reasonably be inferred therefrom and if the contractor finds and discrepancies therein, he shall immediately and in writing refer the same to the architect and employer whose decision shall be final and binding. The contractor shall provide himself with ground and fresh water for carrying out the works at his own cost. Rates quoted against individual items will be inclusive of everything necessary to complete the said items of work within the contemplating of the contract and beyond the unit price to extra payment will be allowed for incidental or contingent work, labour, and or materials, inclusive of all taxes and duties whatsoever except for specific items if any stipulated in the tender document.</p>
46	<p>Tenders: The works will be paid for as "Measured work" on the basis of actual work done and not a lumpsum contract. The tender is strictly on percentage rate basis and it should be workable and self-supporting. Details analysis shall be submitted by the contractor if called upon by the architect/ employer. The employer/architects shall not be bound to recognize the contractors' analysis. All items of work described in the Schedule of Quantities/BOQ are to be deemed and paid as complete works in all respects and details including preparatory and</p>

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	<p>finishing works involved, directly, related, to and reasonably detectable from drawings, specifications, and schedule of quantities and no further charges in the tender in respect of any item of works, the payment of such items of work will be made for the actual work done on the basis of lumpsum charges as will be assessed to be payable by the employer/architect.</p> <p>The employer has power to add or to omit from any work as shown in drawings or described in specifications or included in the schedule of quantities and intimate the same in writing but no addition, omission or variation shall be made by the contractor without authorization from the employer. No variation shall vitiate the contract.</p>
47	<p>Other persons engaged by the employer: The employer reserves the right to execute any part of work included in the contract or any work which is not included in this contract by other agency or persons and the contractor shall allow all reasonable facilities and use of his scaffolding for the execution of such work. The main contractor shall extend all cooperation in this regard.</p>
48	<p>Tools, storage materials, protective works, and site office requirements: The contractor shall provide, fix up and maintain in an approved position proper office accommodation for the contractor's representative and staff to receive instructions notices or communications and clear away on completion of the works and make good all works disturbed. Temporary hut for the watchman and clear away when no longer required and to provide all necessary attendance lights etc required shall be provided. Temporary latrines for workers and field staff and keep the same in a clean and sanitary condition to the satisfaction of public health authorities. The contractor shall indemnify the employer against any possible damages to the building, roads or members of the public in course of execution of the work. The contractor shall provide and maintain proper sheds for the proper staging and adequate protection of the materials etc and other works that may be executed on the site including tools, and materials of sub-contractor removal of shade after completion of work.</p>
49	<p>Notice and patents of appropriate authority and banks: The contractor shall conform to the provision of acts of legislation relating to the work and to the regulation and bye-laws of any authority, and or any water, lighting, and other companies and/or authorities with whose systems the structures were proposed to have connection and shall before making any variations from the drawings or specifications that may be associated to so conform give employer/architects written notices specifying the variations proposed to be made and the reasons for making them and apply for instruction thereon. The employer/architect on receipt of such intimation shall give a decision within a reasonable time. The contractor shall arrange to give notices requires for by the said acts, regulations or bye-laws to be given to any authority and to pay such authority or to any public officer all fees that may be properly chargeable in respect of the work and lodge the receipt with the employer.</p>
50	<p>The contractor immediately to remove all offensives matters: All soil filth or other matters of any offensive nature taken out of any trench, sewer, drain, cess-pool or other place shall not be deposited on the surface but shall be at once carted away by the Contractor to place provided by him. The contractor shall keep the foundation and works free from water and shall pro-</p>

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	vide and maintain at his own expense's electricity and other power-driven pumps and other plant to the satisfaction of the employer for the purpose until the building is handed over to the employer. The contractor shall arrange for the disposal of the water so accumulated to the satisfaction of the employer and local authority and no claims will be entertained afterwards if he does include in this rate for the purpose.
51	Access: Any authorized representative of the employer shall at all reasonable times have free access to the works and/or to the workforce, factories, or other places where materials are being prepared or constructed for the works and also to any places where materials are being prepared or constructed for the work and also to any place where the materials are lying or from where they are being obtained for inspection, examination and test of the materials and workmanship.
52	Materials, workmanship and samples, testing of materials/final measurement: The contractor shall have to carry out tests on materials and workmanship in approved materials testing laboratories or as prescribed by the employer/architects in approved material testing laboratories or as prescribed by the employer/ architects at his own cost to prove that the materials, etc under test conform to the relevant IS standards as specified in the specifications. The necessary charges for the preparation of mould (in the case of the concrete cube) transporting testing etc shall have to be borne by the contractor. No extra payment on tis account should in any case be entertained.
53	Contractor's employee: the contractor shall employ technically qualified and competent supervisors for the work who shall be available (In turn) throughout the working hours to receive and comply with instructions of the employer/ architects. The contractor shall engage in the execution of the work. The contractor shall employ in connection with the work persons having the appropriate skill or ability to perform their job effectively. The contractor shall employ local labours on the work as far as possible. No labour below the age 18 years and who is not an Indian national shall be employed on the work. The contractor shall comply with the provision of the Payment of Wages act, Employees liability act, Workman compensation act, control labour (regulation and abolition) act-1970 and central rules-1971, and The Apprentice act-1961.
54	Dismissal of workman: The contractor shall on the request of the employer immediately dismiss from works any person employed thereon by him who may in the opinion of the employer be not suitable or incompetent or who may misconduct himself such discharge shall not be basis of any claim for compensation or damages against the employer or any of their offices or employer.
55	Damage to person and property, insurance etc: the contractor shall be responsible for all injury to the work or workmen to persons, animals or things and for all damages to the structural and/or decorative part of the property which may arise from the operations or neglect or himself of a any sub-contractor or of any of his sub-contractor's employees, whether such injury or damages arise from carelessness, accident or any other cause whatsoever in any way connected with the carrying out of this contract. The clause shall be held to include inter-alia any damage to the building work forming the subject of this contract by rain, wind, earthquake, or other inclemency of the weather. The contractor shall indemnify the employer and hold harmless in respect of all and any expenses arising from any such injury or damages to persons or property as aforesaid and any expenses arising out from any injury or damages to

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	<p>the person or property as aforesaid and also in respect of any claim made in respect of injury or damage under any acts of compensation or damage consequent upon the such claim.</p> <p>The employer shall be at liberty and is hereby empowered to deduct the amount of any damages, compensations, costs, charges and expenses arising or any from or in respect of any such claims or damages from any sums due to or to become due to the contractor.</p>
56	<p>Payments: All interim payments shall be regarded as advance payments by way of advances against the final payment only and not as payments for work actually done and completed, and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the contract or any part of thereof in any respect or the accruing of any claim, nor shall, it conclude determine or affect in any way the power of the employer under these conditions or any other way vary or affect the contract.</p>
57	<p>Final payment: The final bill shall be accompanied by a certificate of completion from the Employer/Architect. The acceptance the final bill by the contractor would indicate that he will have no further claim in respect of the work executed.</p>
58	<p>Variation/ deviation: quantities may be increased or decreased depending on site conditions and employer requirements</p>
59	<p>Substitution: Should the contractor desire to substitute any materials and workmanship, he/they must obtain the approval of the employer/architects in writing for any such substitution well in advance. Material designed in this specification indefinitely by such term as equal or other approved etc specific approval of the employer/architects has been obtained in writing.</p>
60	<p>Preparation of building works for occupation: The whole of the work will be thoroughly inspected by the contractor and the deficiencies and defects put right. On completion of such inspection, the contractor shall inform the employer that he has completed the work and it is ready for inspection.</p>
61	<p>Clearing of the site on completion: On completion of work, the contractor shall clear away and remove from the site all constructional plants and equipment. Surplus materials, rubbish and temporary works of every kind and leave the whole of the site and works clean and in a workman-like condition to the satisfaction of the employer/architects.</p>
62	<p>Concealed work: The contractor shall give due notice to the employer/architect whenever any work is to be buried in the earth concrete or in the bodies of walls or otherwise becoming inaccessible later on, in order that the work may be inspected and correct dimensions taken before such burial, in default whereof the same shall at the opinion of the employer/architect be either opened up for measurement at the contractor's expenses or no payment may be made for such materials.</p>
63	<p>Idle labour: whatever the reasons may be, no claim for idle labour, additional establishment cost of hire and labour charges of tools and plants would be entered under any circumstances.</p>
64	<p>Nomination subcontractor: No subletting of the work is permitted.</p>

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65	Notice of any claim: The contractor shall submit within seven days, in case there is any instance for which the contractor considers himself entitled to or likes to prefer claim for additional payment, a statement giving particulars as full and detailed as possible to enable the architect/employer verification, admissibility and assessment failing which no claims will be entertained.
66	Final claims: Not later than 90 days the issue of the completion certificate the contractor shall submit to the architect/employer a statement of final account with supporting documents showing in detail the value of work done in accordance with the contract together with all considers due to him.
67	Certificate of completion: When the whole of the works have been substantially completed and satisfactorily passed any final test that may be prescribed in the contract, the contractor shall give written notice to that effect to the architect /employer with an undertaking to finish any outstanding work during the DLP for issue of a certificate of completion in respect of the works. The architect / employer within 30 days of receipt of such either issue notice to the contractor with a copy to the employer, a certificate e of completion stating the date of completion on which in his opinion the above work substantially completed in terms of the contractor. Or, give instructions to the contractor specifying all the work which require to be done by the contractor before issue of the certificate. The contractor shall receive the certificate after completion of defect rectification work within 30 days of completing work.
68	Bank's right to determine the contract:
69	Opportunities for other agencies: Employer reserves the right to let other contractors in connection with his work under similar general conditions. The contractor shall afford other contractors' reasonable opportunity for the introduction and storage of their materials and execution of their work and shall properly be connected coordinate his work with them.
70	Claims extra: When any instruction or decision given at site involves an extra or where the contractor may plan to claim extra, it shall be the responsibility of the contractor to inform the architect of the extra amount and get written authorization from the architect before proceeding with the work involved.
71	Superintendence supervision: The contractor shall give all personal superintendence during the execution of the work and this obligation and liability will continue until expiration of the maintenance period. The contractor shall also during the whole time of work when in progress employ a competent representative who shall be constantly in attendance at the site while his men are at work. Any directions explanations, instructions or notices given by the Bank or the architect to such representative shall be deemed to have been given and duly served on the contractor.
72	Possession prior to completion: the bank shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be an acceptance of any work not completed in accordance with the contract agreement.
73	Action where no specification: In case of any class of work for which there is no such specification in technical specifications, such work shall be carried out in ac-

Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

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	cordance with the CPWD specifications and in the event of there being no CPWD specifications, then in such case, the work shall be carried out in all respects in accordance with the instructions and requirements of the Bank/ architect.
74	Technical examination: the project work covered under this tender during its progress is subject to inspection by the CTE / Technical examiner/CVC, Govt of India or by an officer of the Vigilance cell of the Authority, the contractor will be required to extend all assistance or facilities for such inspections.

Signature of tenderer

Date

Address:

List of Mandatory Test

Materials	Test	Frequency
Sand	Silt Content	50 cum and above
	Sieve analysis	Same as above
Aggregate	Particle size distribution	25 cum and above
Bricks	Compressive strength	20000 and above
RCC	Slump	Once a day or as desired for major RCC work
	Cube strength	20cum and above, min 3 cubes to be tested
Cement	Compressive strength	Test certificate to be submitted
Steel	Yield stress, %age elongation	Test certificate to be submitted

Model rules for the protection of health and sanitary arrangement for workers

Contractor has to arrange first aid to workers such as adequate supply of sterilized dressings, sterilized cotton wool. These shall be kept under the charge of responsible person who shall be available during working hours. Covid-19 protocol shall be strictly followed. Some conveyance facility such as car shall be kept readily available to take care of injure person to the nearest hospital.

Contractor shall arrange portable drinking water facility including storage facility so that these cab ne easily available to workers. Drinking water shall not be located near latrine and bah room.

Adequate washing and bathing facility shall be provided for man and woman separately with proper drainage facility. Similarly, separate urinals, toilets shall be provided for man and woman. A poster showing the figure of man and woman shall be exhibited at the entrance of latrine of respective sex. Latrine and urinals etc., shall be constructed of masonry wall with finishing to keep it neat and clean regularly. The septic tank or crèche shall be constructed for disposal of excreta etc. proper ventilation shall be provided.

Separate ventilated shelter shall be provided for rest of man and woman separately with height of shelter shall be 3m. The temporary shed shall be thatched roof of GI Sheet roof with mud flooring and 50cm above ground level. Crèches shall be provided at work place for children under 6 belonging to such women. Two huts will be provided separately for game and bed room each. It shall be thatched roof, mud floor and walls and planks spread over the mud floor and covered with matching. It shall be sufficiently ventilated. One Dai for each hut shall be provided by contractor and toys and other similar materials shall be provided for children.

A coked food canteen on moderate scale shall be provided for the benefit of workers whenever required.

The contract should quote of item f tender considering above factors accordingly.

Format of Guarantee Bond for Anti-termite Treatment (in Rs.100 Non-Judicial Stamp Paper)

This agreement made this _____ day of _____ two thousand _____ between _____ (name of employer) a body corporate constituted under the _____ name of act/ act 19____ having its head office at _____ (herein called employer) of the one part and _____ (name of Firm/contractor) (hereinafter called "The guarantor) of the project.

WHEREAS THIS AGREEMENT is supplementary to a contract (Hereinafter called the contract dated _____ and made between the Employer of the one part and the Guarantor of the other part) where by the firm from any infestation of termites. And whereas the Guarantors agreed to give guarantee to the effect that the said buildings / structurers shall remain free from any infestation of termites for a minimum of period of ten years (10 years) from the date of completion f pre-construction anti-termite treatment carried out as per the relevant IS Code.

Now the Guarantor hereby agrees to make good all defects and render the buildings/ structurers free from any infestation of termites, during this period of guarantee and to the satisfaction of the employer. Th guarantor also agrees to take up such rectification work at his own cost and within one week from the date of issue of notice from the employer, calling upon him to rectify the defects. The decision of employer as to the cost payable by the guarantor will be final and binding, in case guarantor fails to commence the work as per above notice, and the work got done through another agency or contractor. That if the guarantor fails to execute the pre-construction anti-termite treatment or commits breach there under, then the guarantor will indemnify the principal and the successor against all losses of any default on the part of the guarantor in performance and observance of this agreement. As to the amount of loss and damage and or cost incurred by the employer, the decision of employer will be final and binding.

In witness whereof these presents have been executed by the obligator _____ and by the _____ and for and on behalf of the employer on the day, month and year first above written.

Signed and delivered by _____ (employer) by the hands of Sri _____ in the presence _____

Signed and delivered by _____ (Contractor) in the presence of _____.

Proforma of Guarantee Bond for water proofing treatment (Rs 100 Non-Judicial stamp paper)

**The AGM (P&E),
SBI, LHO,
Bhubaneswar**

Water proofing treatment to the basement, retaining wall, roofs including stair roofs underground reservoirs, overhead water tanks, sunken floors to the construction of G+2 storied building for Administrative Office & Regional Business Office at Ambapua, Berhampur, Odisha.

1. We hereby certify that the water proofing treatment to the above places to the construction of multi-storeyed building for SBI, Bhubaneswar described in the schedule of quantities and specifications have been done as per the specification, in accordance with terms and conditions under which he said work has been awarded to us.
2. We hereby guarantee that the basement with retaining wall, roofs, stair roofs, underground reservoir, overhead reservoir and sunken floors of the construction of building for SBI, Bhubaneswar shall be in water proof condition for a period of 5 years from the date of handing over of the completed works to SBI.
3. In the event of any treatment necessary subsequently during the period of guarantee of the said basement with retaining wall, roofs, stair roofs, underground and overhead reservoir, sunken floors of the building required inspection and treatment shall be carried out by us at our own cost.
4. The quotation whether further treatment is or has become necessary during the said guarantee period shall be decided by the bank and decision in this regard shall be final and binding.
5. Notwithstanding anything contained hereinbefore, we shall not be held responsible for any leakage caused by alteration, earthquake or other action causing damage the said basement with retaining wall, roofs, sunken floor stair roof, underground and overhead reservoir of said building.

Witness and address

Signature of contractor with seal

Technical specification of Materials:

1. Materials shall be of approved quality as mentioned in list. Prior approval of materials from architect/employer other than specified is necessary due to non-availability of listed materials. Sample of materials shall be approved by architect/ employer before placing order.
2. Materials shall be tested in govt approved laboratory. Frequency shall be as listed in table. Test certificate of steel, cement, AAC block shall be submitted by contractor for each lot of materials procured for construction. Cos of test shall be borne by contractor including transportation cost and collecting material sample.
3. All equipment and facilities for carrying out field tests on materials shall be provided by the contractor without any extra cost.
4. All works shall be carried out as per specifications given in the SOQ. If there is any discrepancy, architect/ employer will explain the specification. If there is any doubt, CPWD specification shall be followed.
5. Steel scaffolding, centring and shuttering shall be used for RCC work (Slab, beam, column, lintel chajja etc).
6. Surface of Steel reinforcement before placing in position shall be cleaned of loose rust or scaling, dust, grease, and any other objectionable substances as required and directed. Bar bending schedule shall be prepared by contractor as per structural drawing issued and shall be got approved by architect/employer.
7. Binding wire shall be used for securing bars (18-gauge soft annealed steel). No concreting shall be commenced until employer/architect have inspected the reinforcement in position and until their approval have been obtained. A notice of at least 24 hours shall be given to employer / architect by the contractor for inspection of reinforcement. If in the opinion of employer/architect, any materials are not in accordance with specification or the reinforcement is incorrectly spaced, bend or otherwise defective. The contractor shall immediately remove such material from the site and replace with new and rectify any other defects in accordance with the instruction of employer/architect to their satisfaction.
8. Cover to reinforcement shall be as per structural drawing /IS 456.Pre cast cover of ASTRA make shall be used.
9. For brick masonry, plastering and finishing work, bamboo scaffolding shall be used and safety precaution shall be carried out.

Technical specification of materials and workmanship for new tube well with pump set

1. The 200mmx150mm dia tube well is to be sunk to a suitable stratum at a depth of about 105meter below ground level. The depth will be actually determined on examination of the characteristic of the soil and sand particles as well as the extent of the stratum for which accurate data are to be maintained for inspection.
2. The tube well shall have a yield of minimum 32000 ltr of water per hour with a maximum of 3.5 m of depression of water level after 8 hours of continuous pumping. The contractor may make alternative arrangement or suggestions to get the required yield as well as potable water for human consumption.
3. The contractor will be required to supply all materials such as GI/MS pipes, sockets, couplings, companion flanges, caps etc so as to make the tube well complete in all respect. The contractor is also required to supply all tools and plants, drilling rig and

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pipes and labour for boring and sinking the tube well, withdrawal of the boring pipes, washing and developing the tube well yield

4. The contractor must arrange for all water necessary for boring the tube well. The contractor must comply with the rules and bye-laws of the local authorities for sinking tube well for domestic purpose and obtain necessary sanction as may be required, at his cost.
5. The contractor must keep a scientific record of different strata of soil bored through and retain samples of the strata for examination by the bank, samples of the strata are to be sent to the bank in proper glass container for records.
6. All materials shall be of approved make and quality
7. The contractor shall submit chemical and biological test report by PHE department or government approved laboratory about the sample of water drawn by them from the tube well after development. The water must be for for drinking.

FORM 1

PROFORMA OF APPLICATION FOR REGISTRATION OF ESTABLISHMENT EMPLOYING CONTRACT LABOUR

1	Name and location of the Establishment.	
2	Postal address of the Establishment.	
3	Full name and address of the Principal Employer. (furnish father's name in the case of individuals)	
4	Full name and address of the Manager or the person responsible for the supervision and control of the Establishment.	
5	Nature of work carried on in the Establishment.	
6	Particulars of Contractors and Contract Labour:	
(a)	Names and address of the Contractors	
(b)	Nature of work in which contract labour is employed or is to be employed.	
(c)	Maximum number of contract labour to be employed any day through each Contractor.	
(d)	Estimated date of commencement of each contract work under each Contractor.	
(e)	Estimated date of termination of employment of contract labour under each Contractor.	
7	Particulars of Treasury Receipt enclosed.(Name of the Treasury, Amount and Date)	

I hereby declare that the particulars given above are true to the best of my knowledge and belief.

Principal Employer
Seal and Stamp

FORM XII

PROFORMA OF REGISTER OF CONTRACTORS

1. Name and addresses of the Principal Employer _____
2. Name and address of the Establishment _____

Sr. No	Name address and of contractor	Nature of work on contract	Location of contract work	Period of contract from to	Maximum number of workmen employed by the contractor

PROFORMA OF SITE ORDER BOOK

Name of the work _____

Date of Commencement _____

Sr. No	Remarks/ Instructions of the site Engineer/ Architect	Dated Initials of site Engineer/ Architect	Initials of the Contractor for having received the instructions	Action taken with date	Dated initials of the site Engineer	Remarks of the Architects PMC/ C.C. Officials
1	2	3	4	5	6	7

PROFORMA FOR APPLICATION BY CONTRACTOR FOR EXTENSION OF TIME

1.	Name of the Contractor			
2.	Name of the work as given in the Agreement			
3.	Agreement WO			
4.	Tender amount			
5.	Date of commencement of work			
6.	Period allowed for completion as per agreement			
7.	Date of completion as per agreement			
8.	Period for which extension of time has been given			
		<u>Date</u>	<u>Month</u>	<u>Year</u>
	a)	1 st extension vide Bank's Letter No.		
	b)	2 nd extension vide Bank's Letter No.		
	c)	3 rd extension vide Bank's Letter No.		
9.	Reasons for which extensions have been previously given (copies of the previous applications should be attached)			
10.	Period for which extension is applied for and the reasons thereof including hindrances, time for extra work assigned, if any etc.			

Signature of Contractor

Recommendations of Architects

Signature of Architect.

ANNEXURE – 7

PROFORMA OF HINDERANCE REGISTER

Name of Work	:		Date of state of work	:	
Name of Contractor	:		Period of completion	:	
Agreement No.	:		Date of completion	:	

Sr. No.	Nature of Hindrance	Date of occurrence of hindrance	Date which hindrance was removed	of	Period of hindrance	Signature Site Engineer/ Project Engineer	Remarks
1	2	3	4		5	6	7

SE = Site Engineer

PE = Project Engineer

CONTRACT EXECUTION

EXTENSION OF TIME PERIOD FOR THE WORK OF

1.	Name of work & E.C. sanction	
2.	Name of Contractor	
3.	Contract Cost	
4.	Date & Reference of work order	
5.	Date of start of work(As per work order)	
6.	Time period as per tender	
7.	Scheduled Date of completion	
7.A	Interim schedule if any	
8.	No. of extensions	
9.	Date & Reference of last extension	
10.	Reasons for delay and period of delay for each reason including corrective action taken by Bank/Architect (quote & attach references wherever necessary) i) ii)etc	
11.	Total delay due to abovedays
12.	Responsibility for each reason for delay (a) Bank (b) Architect (c) Contractor (d) unforeseen circumstance (e) force measures etc. and corrective action not been taken (Attach references of letters etc.)	
13.	Present status of work – Physical progress, % progress & cost of work remaining/ incomplete	
14.	Any interim schedule / milestone achieved	
15.	Any other hold/restraint envisaged in the completion of the remaining work. suggest corrective actions necessary	
16.	Recommendation for the no. of days of extension along with reasons	
17.	Financial loss to the Bank if any due to this extension and recommendations for liquidated damages if justifiable (State reasons)	

Engineer-in-charge

Recommendation approved

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Proforma for cement and steel consumption statement, running bill, final bill, deviation statement and other relevant proforma shall be collected from consultant or bank.

Quantities of theoretical consumption of cement for major items of work shall be as per CPWD norms wherever applicable.

Note: - Item of work site Engineer shall refer to the C.P.W.D. Specifications and norms. In case of coefficient is available for a specific item, the decision of SBI/Architect shall be final and binding on the contractor.

LETTER FOR GRANTING EXTENSION OF TIME

To

Dear Sirs,

**Bank's Office Building / Staff / Officer's Quarters under
Construction at _____ work- Extension of Time**

Refer your letter No. _____ dated _____ in connection with the grant of extension of time for completion of the captioned work.

The date of completion of the above-mentioned work is _____ as stipulated in the contract. Extension of time for completion of the work upto _____ is, hereby granted by the Bank without prejudice to the right of the Bank to recover liquidated damages in accordance with the provisions of the contract.

Notwithstanding the extension hereby granted, time is and shall continue to be the essence of the said contract.

Yours Faithfully,

Architects

SPECIMEN OF LETTER GIVEN TO THE CONTRACTOR IN REGARD TO THE RECTIFICATION OF DEFECTIVE WORK AND REMOVAL OF SUBSTANDARD MATERIAL

To

M/s. _____

Sir,

SUB: NATURE OF WORK

I, whereas the above work has been awarded to you under the subject contract and the same is in progress/the same has been completed.

2. Whereas the items of works as detailed in schedule attached herewith have been executed with unsound, imperfect and unskillful workmanship/with materials of inferior description and that materials and/on articles provided for the execution of the work are unsound and of a quality inferior to the contracted for.

3. Whereas the materials and/or articles provided by you for execution of the work as detailed in the schedule hereto are unsound and of quality inferior to that contracted for.

4. Now you are hereby called upon to rectify or remove and reconstruct forthwith each item of work as detailed in the said schedule of work in whole or in part as the case may require with sound, perfect and skilful workmanship and/or with materials and articles of sound and proper quality as per the contract at your own cost and charge.

5. I, in exercise of the powers conferred on me by the aforesaid agreement, hereby give you notice to remove the cause set out above within.....
....days to my satisfaction falling which action will be taken against you under clause (8).....of the agreement. Yours faithfully,

Asstt. General Manager (Premises& Estate)/

Dy. General Manager (Premises)

Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

CERTIFICATE

The measurements on the basis of which the above entries for the bill No. _____ were made have been taken jointly on (date) _____ and are recorded at pages _____ to _____ of measurement /sheet book No. _____.

Dated

Signature of Contractor

The work recorded in the above-mentioned measurements has been verified at the site satisfactorily as per tender drawings, conditions and specifications.

Signature of Project Engineer of Architect

Designation:

Dated:

**TECHNICAL SPECIFICATIONS OF VARIOUS TRADES
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Volume – I
TECHNICAL SPECIFICATIONS
FOR
CIVIL & ALLIED WORKS

TECHNICAL SPECIFICATION FOR CIVIL WORK

1.1. General:

Scope of Work: The work contemplated under this contract includes General Builder's work for the aforesaid project, all as detailed in the Bill of Quantities, Specifications and to complete the said work in every respect in accordance with this contractor and with the directions and to the satisfaction of the Architect/ Consultant/ Owner/Employer.

Indian Standard Specification:

The particular Specifications for the work is as detailed hereinafter. These specifications shall be read in conjunction with the relevant Indian Standard Specifications and the obtainable as per local practice as detailed in various regional handbooks of practice and the work shall be executed accordingly. Where the specifications in any of the standards are at variance with the specifications detailed herein, the specifications herein shall govern.

Quality of Materials & General Standards of Work:

The contractor under this contract commits himself to use first class materials and assumes full responsibility for the quality of all material incorporated or brought for incorporation in the work. The work shall be executed in accordance with best engineering practice and as per direction of Architect/Consultant/Owner/ Employer.

Scaffolding:

All scaffolding and ladders required for the proper execution of the work shall be provided by the Contractor. The scaffolding should be stout and strong to prevent any collapse or displacement. Proper measure for safety of workmen working on scaffolding should be taken by the contractor.

Measurements: The mode of measurements, wherever possible is specifically mentioned in these documents, where it has not been mentioned, it shall be as per provision of the relevant Indian Standards. All the measuring tapes and other accessories necessary shall be provided by the contractor.

Tools and Plant: The contractor shall make all tools, plants and machinery necessary for execution of the works. He shall also arrange additional tools, plants and machinery as felt necessary by the Architect/Consultant time to time with no extra cost to owner. It is obligatory on the part of the contractor to arrange tools, plants & machinery at the work site in good and sound conditions, failing of which may constitute a breach of contract under the sole description of Architect/Consultant/Owner/ Employer.

Surveying and Staking: It is the express responsibility of the contractor to bring to site all surveying instruments necessary for the marking out, fixation of levels, etc. and conduct these survey operations himself with utmost accuracy. The contractor shall put up stable bench marks etc. as necessary for the work. Architect/Consultant/ Owner/ Employer/his representative will be present when this work is being carried out and will inspect all these operations with the Contractor's assistance. The contractor shall be entirely responsible for accurate setting out of the work and he shall at his own expense make good any defects arising from errors in line and levels.

Dewatering: Dewatering of accumulated water in all locations on job site from whatever source or cause until the virtual completion of the entire work shall be done by the contractor at his own expense and shall not be separately paid for. The rates quoted by the contractor shall be deemed to be inclusive of this.

Access to site, approach roads and roads within the premises:

The contractor shall at his own cost provide all approach roads required for the purpose of carrying out the work in the most expeditious and efficient manner and shall remove the temporary roads on completion. He shall acquaint himself thoroughly regarding condition and suitability of public roads leading up to the limits of the premises and will provide vehicles for transportation of materials which meet the requirements of these road conditions. It shall also be responsibility of the contractor to maintain at his own cost these roads till the construction is completed. The tenderer also acquainted himself with local laws and bylaws and complying with all police and highway authority requirements.

1.2 Earth Work:

Excavation:

Excavation for trenches over areas and for pits, etc. shall be done to widths, lines and levels as shown in drawings or to such lesser or greater widths lines and levels as directed. The bottom and side of excavation shall be trimmed to required side of excavation shall be trimmed to required levels, profile, etc. watered and thoroughly rammed. Where the contractor excavated below required level in good round inadvertently or carelessness, they shall make up the void in concrete (1:5:10) at his own expense. During excavation the contractor shall take necessary precaution to retain earth, so that the earth will not slide or fall down to avoid any accident and hamper the progress of work. They will take necessary step to prevent the damage the adjacent structure or existing services. They shall repair and make good any such damage at their own expense to the satisfaction of the owner. A suitable path for men and materials around the excavated pit should be maintained throughout the work.

Dewatering: All water which may get accumulated in excavations during the progress of work from whatever cause or source, shall bailed or pumped out as necessary. The rates for excavation shall be deemed to include for the same, if not otherwise specified.

Timbering to excavation (shoring): Where the soil is soft and sides of excavation needs supporting suitably designed planking and strutting shall be provided. The rates for excavation shall be deemed to include for all planking and strutting as necessary.

Refilling around foundations: Refilling around foundations shall be done with approved excavated materials. Refilling shall be done in layers not exceeding 30 cm thick, watered adequately and consolidated. The finished surface of filling shall be slightly proud to bring it to finished level after watering and consolidation as directed. The rates for refilling around foundations shall be deemed to include for this.

Disposal of Surplus excavated Materials: All materials considered surplus shall be removed to destinations and disposed off as directed. The disposal of the materials can be in any of the following ways as directed by the Architect/Consultant/Owner/Employer.

1. Filling in low lying areas
2. Filling in at places of filling such as under floors, in roads, etc.
3. Stacking of materials in pre-designated stacking yard.
4. Removal of material outside the plot for disposal.

Filling: Filling under floors or other places indicated shall be done with approved material obtained from excavation or approved materials brought from outside by the Contractor. The

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material should generally be of good quality. Filling shall be done in layers not exceeding 30 cm. thick and each layer shall be watered adequately and consolidated properly by 8 to 10 tones power rollers in the case of where floor is coming or pneumatic rammers where ever conditions permit. If it is not possible, the consolidation shall be done by hand rollers and pneumatic/hand rammers. The surface of the filling shall be finished to lines and levels as required. The filling shall be compacted in such a manner as to guarantee full stability. The compaction shall be such that minimum relative density obtained on testing is 90%. In general, test shall be performed for every 1000sqm of compacted area. The filling final level after consolidation/then cutting and ready to take up soling work under the floor item, shall be checked by Architect/Consultant/ Owner/Employer.

Measurement: Measurement for all excavation, filling, carting away and earth work shall be in solid measure. The rates quoted by the tenderers are thus for solid measure units. The following factors shall be applied to obtained quantities of solid measure.

Excavation	:	No reduction in volume
Filling watered and	:	Volume shall be determined by levels consolidated in layers levels taken before and after compacted filling and by measuring the length and breadth as required.
Loose measure (as in trucks):	:	Volume of loose measure less or dumping's 25% or as per I.S. code of practice.

The mode of measurement for various type of excavations shall be as under:

- a) In case of trenches, pits and areas, measurements shall be on the basis of width of foundation & the depth of bottom of foundation (bottom of bed concrete if provided) formation. Surface dressing shall be measured in plan projection only.
- b) In case of pipe trenches and drains, measurement of width of trench shall be diameter of the pipe plus an allowance of 50 cm. to allow for collars, flanges etc.
- c) Excavation in rock shall be measured up to levels indicated or required. No undulations as physically appearing after excavation shall be taken into consideration while arriving at the quantities. The rates quoted by the contractor shall be deemed to include for this and no extra is admissible.

Sub-grade Conditions: When no data is available of soil formation and depth of water level of propose works site the contractor should make his own arrangements of preliminary site investigation by actual inspection of the site and surrounding areas to assess the nature of soil and to foresee the difficulties that may arise during construction period. The contractor shall acquaint himself of the above before filling up of the tender.

No claim whatsoever will be entertained on any account of conducting these exploratory works or lack of investigation on the part of the Contractor.

Brick Soling: Where brick soling is required to be provided, it shall confirm to the following specifications:

It shall either be flat or be laid on edge of the bricks touching each other as per item. Soling where specified in two layers, the line of joints in the bottom layer shall cross those in the top

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layer. Soling shall be closely packed leaving no interstices or gaps. The interstices to be filled with fine sand and shall be sprayed with water. If cavities appeared between two bricks after spraying with water it shall be mended again by spreading fine sand. Where ever floor concrete is coming on soling, building paper (polythene sheets) is to be laid to receive the concrete.

Controlled Concrete, Plain & Reinforced Concrete:

General: Concrete and reinforced concrete work shall be carried out generally in conformity with the latest Indian Standards IS:456 except for provisions indicated here in below. All work is to be carried out with utmost precision and up to-date scientific know-how and the contractor shall employ thoroughly competent staff to achieve the highest standards.

Cement: Cement for the work shall be ordinary PPC conforming to the latest Indian Standards and of the best normal setting quality unless a quick setting quality is expressly instructed in the specifications or otherwise during the course of the work by Architect/Consultant/ Owner/ Employer. If directed the contractor shall purchase PPC cement as fresh as possible after manufacture and where there is reason to believe the cement has been long stored, Architect / Consultant / Owner / Employer may demand a Laboratory Test Certificate regarding the character of cement and the contractor shall furnish the same at no extra cost. Architect/Consultant/ Owner/Employer shall reject any cement which in its opinion does not meet the required standards contractor shall consider in his rates during quotation that cement supplied by Client, has to be tested either from engineering College or any professional laboratory to have a judgment on Quality of Cement.

All bags and containers in which cement is packed shall be stored in a dry, weather-tight, properly ventilated structure with adequate provision for prevention and absorption of moisture. The contractor shall at all times maintain for the inspection of Architect/Consultant/Owner/Employer a log book indicating the receipt of cement, brand and agent from whom obtained and the age of cement. Cement which has caked or perished by being wet or otherwise, shall on no account be used on the work.

Cement shall be consumed on the works in the same sequence as that of their receipt at site. Cement reclaimed from cleaning of bags or from spillage from containers or otherwise shall on no account be used.

Sand: Fine aggregate shall generally conform to latest Indian Standards (IS:383). Sand shall be natural sand, crushed gravel sand or crushed stone sand at the discretion of the Contractor. Use of sea sand is prohibited. It shall be composed of hard siliceous material and shall be clean and of sharp angular grit type. Sand shall be properly graded minimizing all voids.

Allowance for bulking of sand shall be made. Silt content on sand should not be more than 5% Laboratory equipment such as measuring jars etc. are to be kept at site for time to time checking of bulkage and silt content.

Coarse Aggregate: Coarse aggregate shall be approved hard aggregate generally conforming to latest Indian Standards.

Aggregate, Gradation, Storage, etc.: Aggregates shall be stock piled properly and separately on the basis of gradation indicated herein below.

Fine : 0 to 3 mm (1/8" and down)

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Medium : 3 to 7mm (1/8" to 5/16")

Coarse : 7 to 30 mm (5/16" to 1.1/4")

Aggregates shall be clean and shall not contain any foreign matter, silt, loose or destructive substances, harmful chemicals, etc.

Aggregates shall be stored in proper bins which shall have good drainage to prevent the inclusion of foreign matter and preserve the gradation. Sufficient live storage shall be maintained to permit segregation of successive shipment, placing of concrete at the required rate and such procedures as inspection and testing.

If directed, the aggregates shall be washed before use. The grading of aggregates for use on works shall be as per the Indian Standards.

Proper sieve analysis shall be carried out to determine the best gradation obtainable from the available aggregates. The sieve analysis shall be performed as per standard practice and as laid out in the relevant Indian Standards.

A complete set of standard sieve shall be provided by the Contractor at the Construction site at all times. The graphs in connection with the sieve analysis and the standards of approvals for the aggregates shall be as per Indian Standards.

Water: Water for all concrete work shall be clean, free from deleterious matter such as oils, acids, alkalies, sugar and vegetable matter. Every attempt shall be made to use water which is fit for drinking purposes. Water storage facilities provided by the contractor shall be maintained properly to preclude contamination of water by any of the harmful substances. The quantity of water to be added to concrete for mixing shall be such as to afford workability consistent with strength. Water/cement ratio shall be recorded in every batch of concrete.

Arrangement for slump cone test shall be kept at site to arrive workability whenever the Architect/Consultant/Owner/Employer wants to check at site.

Tests for determination of strength of concrete: As will be apparent from the Bill of Quantities, the strength of concrete specified is the criterion and the contractor shall make every effort to obtain the specified strengths by good quality control. In case of concrete which does not obtain the specified strength at 28 days. Such work shall be demolished and reconstructed to obtain the requisite strengths all as directed by Architect / Consultant / Owner / Employer. To determine whether concrete in any particular part of the work is of the requisite strength or not, test cubes (works test cubes) shall be made from samples collected from the concrete being poured for the particular part and determined as per acceptance criteria detailed hereinafter. The salient features for the collection of samples is as indicated below.

Testing of Concrete Cubes for determining Compression Strength:

1. Quality As specified
2. Compression strength shall be as specified for the particular type of concrete.
3. Criteria for acceptance of work.

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Part or element of concrete work shall be deemed to be acceptable, provided the three cubes tested for 28 days strength conform to the following:

- a) Average of the three cubes strengths shall not be less than the specified strength.
- b) No individual cube strength shall be less than 90% of the specified strength.
- c) If any individual cube strength exhibits more than 133% of the specified strength, such cube shall be classified as freak and criteria in (a) and (b) above, shall be applied for the remaining two cubes only and the acceptability determined.

4. Quantum of cubes and testing

A set of 6 cubes shall be cast per every 50 M3 of concrete. OR A set of cubes on every day of concreting. OR A set of 6 cubes on every important element as decided by Architect / Consultant / Owner / Employer of the work. The decision of Architect/Consultant/Owner/Employer in this regard shall be final and binding.

Batching and making of concrete: All batching of aggregates and cement shall be by volumes. All the necessary equipment such as measuring boxes, devices for determination of moisture and bulk in sand, slump cone etc. shall be provided by the contractor. Concrete shall be machine mixed until there is a uniform distribution of materials and uniform color and consistence is achieved and under no circumstances for less than two minutes.

A wooden board approximately 30 CMS. x 40 CMS. shall be put up at the concrete mixer on which shall have been legibly written English and the social language, the quality of concrete that is being mixed, the proportions and other relevant data.

Slump: If in the opinion of Consultant, slump cone tests are required to be performed to establish workability the same shall be carried out free of cost. Slump tests are however, to serve as guide only.

Form Work: Generally, all the concrete surfaces are intended to be plastered. Form work shall be properly designed and constructed such that it is rigid enough to remain free from bulging, sagging or replacement during placing of concrete. It should also be so constructed as to facilitate removal of the same without damage to concrete. The form work shall be adequately watertight to prevent any loss of liquid. All form work shall be accurately erected in regard to size, levels etc. In case of timber form work, the surface of forms in contact with concrete surfaces shall be wrought. The joints between boards shall be close fitting and very thin for the concrete surfaces designed to have exposed finish and not intended to be plastered. All form work shall be properly cleaned before any concreting is carried out.

Surface of forms coming in contact with concrete shall be treated with approved form emulsions. It shall be ensured that these emulsions do not stain or discolor the natural color of concrete.

All form work shall be removed as per latest IS:456. Form work shall be removed without shock or vibration. Edges of beams and columns if required to have chamfers shall be obtained by suitably fixing triangular edge beads 20 mm x 20 mm. to the forms. (No extra is admissible to the contractor on account of these incidental and minor works for sizes up to and including 20 mm x 20 mm). Likewise, where drip notches are necessary, they should be formed by suitably shaped fillets nailed in forms.

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Form work for all beams and other horizontal construction members shall be built to an upward camber of 1/300" of the span (in the center) to nullify the effects of optical illusion. The Camber shall be in addition to such camber as may be required and shown in the Static Calculations.

Transporting and Pouring of Concrete: No mixing of concrete shall be started unless the situation where they are to be poured are prepared and kept ready. Concrete shall be poured immediately on preparation. Transporting of concrete shall be done as speedily as possible and also in a manner to prevent segregation of aggregates. No retempered concrete shall be allowed to be used on the works. No concrete shall be allowed fall through a height more than 1.20 M. where the concrete to be placed from more height it should be done through chute as directed by Architect/ Consultant/Owner/Employer.

Lift of concreting shall normally be not greater than 2.00 M in height.

Before fresh concrete is placed against an already cast and hardened section, such surfaces shall be roughened, swept clean, moistened with water and treated with cement slurry. Fresh concrete shall than be poured as required. Under no circumstances, concrete mixed more than 20 minutes shall be used where initial setting has commenced. Dewatering of excavations for concreting where necessary shall be carried out by the contractor as directed and the rates quoted by the contractor are deemed to be inclusive of such dewatering. No concreting shall be done in adverse weather condition without proper precautions or approval from consultant. Where materials are to be mixed by hand mixing as per requirement it is desirable to use 10% more cement that that of machine mixing.

Consolidation and Processing of Concrete:

Concrete for all works shall be compacted by means of suitable vibrating equipment. One or more spare vibrators which are in complete working condition shall always be kept ready at sites to be put into commission in case of failure of the vibrators under use. The vibrators shall be operated by skilled personnel, thoroughly instructed as regards the mode, frequency, duration etc. regarding vibration. Concrete of low quality may however be permitted by Architect/Consultant/Owner/Employer to be consolidated by hand only after prior permission.

Finish to Concrete Surfaces:

Finish to concrete surfaces at various situations shall be as per directions of Architect/Consultant/Owner/Employer. Where form finish is specified, the final surface shall be smooth and even and no-undulations, ridges, spots etc. shall be permitted. They shall be laid to pattern as directed. In case surfaces intended and directed for form finish, exhibit any of the defects above mentioned, the surfaces shall be rubbed with carborundum or plastered and finished as directed at the risk and cost of the contractor. The decision as to the acceptability or otherwise of a surface will be notified by Consultant and the contractor will implement the instructions accordingly.

Concrete cover for reinforcement:

Concrete cover for the reinforcement shall be as per the latest Indian Standards and as per directions at site from time to time proper concrete cover blocks to suit various covers as required shall be provided in adequate numbers sufficiently ahead of the work.

Construction joints:

Construction joints in concrete work shall be provided as far as possible only at predetermined places in consultation with Architect/Consultant/ Owner/ Employer. Joints shall be provided as specified in latest Indian Standards or as directed by Consultant.

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Curing:

It is very important that all cement concrete work shall be cured properly. All concrete work shall be kept continuously in a damp or wet condition by pouring or by covering with a layer of moist sack, canvas, hessian or similar material for a period of seven days at least from the date of concreting. Water used for curing shall also be free from any deleterious substances and shall generally be fit for drinking. The work shall be adequately protected from drying, winds and direct sun rays. The contractor should arrange at his own cost a temporary water supply line with provision of centrifugal pump valves etc. for curing and constructional purpose at higher level. A sample sketch is enclosed for the reference purpose.

Stop coaks with spray nozzles with an interval of 12m are to be put in ring main.

Opening and inserts:

All opening and inserts which are designated in due time or as required for services, will be exactly provided by the contractor including supply of materials. The contractor should also fix the anchors or such items which may be supplied by the proprietor in exact position and in perfect lines and levels. Inserts apply to such items as timber, dowels, bolts, loop, brackets, suspension irons, hooks, screws, plates, pipe of various types and diameter etc. Openings in concrete or masonry must be provided in exact location to correct shape, size and depth or slightly bigger, if directed so, as shown in drawings or as instructed. It must be clearly understood that the provisions of inserts and openings as contemplated in this contract are to be carried out with "utmost precision" and any deviation of the same from that as shown in drawing or instructed have to be rectified by the contractor at his own cost and responsibility. The contractor should make provision of openings to deep beams and their members at bottom or at lower level as necessary for cleaning purpose prior to concreting.

Ready Mixed Concrete (RMC)(IS: 4926-2003)

Concrete Mix Information to be supplied by the purchase:

RMC: _____

Contractor: _____

Site: _____

MIX CODE	
Grade (N/ sqmm) (Characteristic strength)	
Minimum Cement content (Kg/ cum)	
Mineral additives (Pulverized fuel ash/slag others (Kg per cum)	
Maximum free water cement ratio	
Nominal maximum size of aggregate	
Cement type and grade	
Target workability (slump in mm)	
Target workability at site	
Maximum temperature of concrete at the time of placing	
Class of sulphate resistance (if applicable)	
Exposure condition if applicable	
Class of finish if applicable	
Mix application	
Method of placing	
Any other requirement	
Concrete testing	
Material testing (any none routine require-	

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ment)	
Alternatives to be offered (yes.NO)	
Method of curing to be used by contractor	
Quantity	

DELIVERY TICKET INFORMATION:

The following information shall be included in the delivery ticket to accompany the load to the purchaser:

- a. Name or number of the ready mixed concrete depot
 - b. serial number of the ticket
 - c. date:
 - d. Truck number
 - e. Name of purchaser:
 - f. Name and location of site,
 - g. Grade or mix description of the concrete
 - h. Minimum cement content (if specified)
 - i. specified target workability,
 - j. Minimum cement content,
 - k. type of cement and grade
 - l. maximum free water -cement ratio
 - m. nominal maximum size of aggregate,
 - p. General type or name of any chemical and mineral admixtures included
 - q. quantity of concrete in cum
 - r. time of loading,
 - s. signature of plant operator,
- a statement warning the purchaser of the precautions needed to be taken when working with cement and wet concrete

Following information on site shall be added;

- a. Time of arrival, on-site,
- b. Time when discharge was completed,
- c. Any water/admixtures added by the supplier to meet the specified workability,
- d. Any extra water/admixture added at the request of the purchaser of the concrete or his representative, and his signature,
- e. Pouring location.
- f. Signature of the purchaser or his representative conforming discharge of the load.

Tor Steel Reinforcement: FE 500D and above (SAIL/TATA/JINDAL/VIZAG STEEL)

All M.S. reinforcement for concrete work shall conform strictly to the latest Indian Standards (IS:432 - part I & II). They shall be of tested quality with a permissible stress value of 1400 Kg. S_qcm. High yield strength Ribbed Tor steel of cold twisted steel for reinforcement shall be of tested quality and shall conform to the relevant Indian Standards (IS:1786). Reinforcement shall be fabricated to shapes and dimensions shown on the drawing and shall be placed where indicated on the drawings or required to carry out the intent of drawing and specifications or as directed by Architect/Consultant/Owner/Employer. Before placing, reinforcement shall be thoroughly cleaned of loose rust, coating etc. which would result in reducing or destroying the bend. Oiling the bars to clean them is strictly prohibited. Bending, straightening, cutting etc. operations shall be carried out in a manner not injurious to the material.

All reinforcement shall be bent cold. Unless otherwise directed, reinforcement shall not be spliced at points of maximum stresses. Architect/Consultant/ Owner/Employer shall be in-

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formed of the same before such splicing is taken up. Laps and splicing shall conform to the latest Indian Standards.

Reinforcement shall be accurately tied at all intersections and laps with 16 SWG soft drawn binding wire, such that the reinforcement will give a rigid structure. Binding wire will not be measured or accounted for separately. The contractor's rate for reinforcement will be measured and paid for according to bending lists without allowances for cutting, wastage, binding wire etc. Authorized laps, hooks, chairs, spacers etc. shall however be accounted for in case, the contractor or Architect/Consultant/Owner/Employer desires to resort to welding or swivel nuts, there shall however be made as if the laps have been provided and no extra claim whatsoever shall be admissible on this account.

Reinforcement shall be assembled in place with proper concrete cover blocks to suit various covers as required.

Measurements:

All measurements shall be as given below or where not given as per latest IS : 1200 Concrete will be compensated for according to its actual volume.

The computation will be based upon the construction plans only and no site measurements shall be taken for this purpose. All incidental work stated in the Technical Specifications and also dewatering at the time of concreting are deemed to have been included for in the unit prices quoted by the contractor. Openings with an area larger than 0.1 sqm. shall be deducted from concrete quantity and where openings are smaller, these shall not be deducted.

Form work will be measured and paid for according to their contact area. The unit prices of the forms incorporate all scaffolds, nails, clamps and all incidental work. Openings with an area larger than 2 M² shall be deducted from form work quantities and the form work required for sides of such openings shall be paid for. Openings of less than 1 Sqm. area shall not be deducted from form work quantities and no allowance for form work for sides of such openings shall be made.

Reinforcement steel will be compensated for according to the approved bending lists without allowances for cutting, rolling margin and waste. Binding wire, cover blocks etc. will not be measured or paid for separately. The contractor shall prepare the **Bar Bending Schedules** and incorporate the same on the reinforcement drawings all as directed and submit it to Architect/Consultant/ Employer for approval.

All openings and inserts which are indicated in drawings and as per requirements for services shall be provided at exact positions and no payments shall be made for providing or fixing these. Only such openings or inserts which have not been indicated earlier or such additional openings/inserts required especially due to changes made by Architect/Consultant/Owner/Employer shall be paid for.

Excepting for the above, all other measurements shall be as per stipulations under the latest Indian Standards Mode of Measurements for Building Works.

1.4 MASONRY:

Materials:

All bricks shall be fly ash bricks of locally available good quality quality. They shall be hard sound and well burnt with sharp edges and of uniform sizes and shapes. Bricks shall be nei-

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ther under burnt nor over burnt and shall be free from cracks, stone floats, or other such defects.

When immersed in water for 24 hours, bricks shall not absorb more water than 20% of its dry weight. All bricks shall be identical/ equal to samples submitted and approved by Company before the commencement of the work. Crushing strength of bricks shall not be less than 35 Kg. Sq.cm. Metallic sound of brick is also a criterion for quality.

Cement and Sand:

Cement and sand used for masonry and plastering work shall confirm to the specifications laid down "Plain and Reinforced Concrete".

Additives:

Additives, like integral water proofing compounds, shall be of the approved type from reputed manufactures. These shall be used strictly in accordance with the manufacturer's instructions/specifications. The additives shall conform to IS: 9103.

Samples:

When demanded by Architect/Consultant/Owner/Employer, the Contractor shall produce samples of materials or carry out samples of work for Company's approval. All materials used as also works carried out shall conform, to the quality of approved samples. Production of these samples shall be at Contractor's cost.

Brick masonry:

Brick shall be soaked in clear water for at least six hours in a vat before use. The average water absorption of brick after immersion in water shall not be more than 20% by weight. Bricks shall be laid in English bond unless specified otherwise. No half or quarter brick shall be used except as closures. Brick shall be accurately raised to plumb.

Brick work shall be raised uniform all round and no part shall be raised more than 1 meter above another at any time, and the work shall be properly toothed and racked back.

In case of 11.5 cm. thick brick walls, hoop iron reinforcement 25mm x 12 to 16 gauge or wire netting reinforcement shall be provided in every fourth course. The reinforcement shall be properly bedded in mortar, properly lagged etc. all as directed.

The contractor will have to build in holdfast and such other fittings in brick work without extra cost.

Joints in brick work shall not be more than 10mm thick. Brick work shall not be raised more than 10 to 12 courses a day. The work shall be kept watered thrice a day for 10 days and afterwards twice a day for 3 weeks. All joints shall be thoroughly flushed with mortar at every course. Care shall be taken to see that bricks are properly bedded and all vertical joints completely filled to the full depth. The jointed of brick work shall be raised out to a depth not less than 10mm. as the work proceeds. The surface of brick work shall be cleaned down and watered properly before the mortar sets.

Construction joints are to be provided at an interval of 30 m in the case of boundary wall or where the length of brick wall is long.

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The contractor shall also make or leave holes recesses as required and fill in the same at a later date as directed at no extra cost.

Measurements:

1. General

All the rates quoted by the Contractor shall be for a fully finished item of work and shall include for all material, labour, miscellaneous works like storage, loading/unloading, scaffolding, hoisting gear etc. as also all taxes, duties, overhead, profits, etc.

2. Masonry

Accounts on masonry shall be settled on the basis of cubic meters or square meters as indicated in the Bill of Quantities. Quantities will be decided on the basis of pertinent plans. Openings and recesses which exceed 0.10 cum. will be deducted from quantities. Openings left initially on specific instructions or as required shall be closed at a later date, if so, instructed by Consultant, at no extra cost. Similarly, all openings, recesses, grooves etc. shall be provided at no extra cost. All materials supplied by Clients shall be fixed in masonry free of charge.

Lintels above door/window openings, for openings up to 100 cm. clear width shall be treated as part of masonry and the cost therefor shall be settled in the same manner as for masonry, irrespective of what material these lintels are made of. For openings of larger than 100cm. clear width, however, lintels shall be paid for under relevant items and due deduction shall be made in masonry.

1.5 Damp proof Course (D.P.C.):

Damp proof course shall be provided over all walls as directed. Concrete for damp proof course shall be of M-20 grade, as defined under "Concrete" section and shall be 5 cm. thick or as specified in bill of quantities and to the full width of the wall. An integral waterproofing compound shall be provided in the concrete in the proportion specified by manufacturer. The rate quoted for D.P.C. shall be inclusive of the integral waterproofing compound as also for shuttering required. The waterproofing cement additive shall comply IS:2645.

1.6 Wood Work and Joinery:

Timber:

Unless otherwise specified all timber for frames for doors, windows & ventilators should be best quality sal wood, the timber should be free from knots, shakes, fissure, flaws, sub cracks & other defects. The surface shall be smooth & free from blemishes & discolorations.

All timber for carpentry and joinery in touch with masonry of concrete shall be wood preservative before fixing.

All fully fabricated timber shall be air seasoned on site of work for a period of not less than two months to allow for any shrinkage that may take place. The preparation of timber for joinery is to commence simultaneously with the beginning of the project work generally and should proceed continuously until all the wood work is prepared and fixed/stacked on or near the site as the case may be.

Workmanship and Construction:

The workmanship shall be first class and to the approval of Architect/ Consultant/ Owner/ Employer. Scantlings and boarding's shall be accurately sawn and shall be of required width and thickness. All carpenters work shall be wrought except where otherwise described. The workmanship and joinery shall be accurately set out in strict accordance with the drawings and shall be framed together and securely fixed in approved manner and with properly made joints. All work is to be properly tenoned, shouldered, wedged, pinned, braded, etc. and properly glued with approved quality adhesive to the satisfaction of Architect / Consultant / Owner / Employer. Door / Window frames shall have cut rebates. Planted rebates shall not be permitted where door frames are fixed flush with plaster to wall, wooden cover mold of 40 x 12 mm to be provided.

Doors, Windows Frames:

The specifications for frames of doors, windows, ventilators and clearstory windows are described here. The frames shall be wrought, framed and fixed in position as per detailed drawing and as directed by Architect/Consultant/ Owner/ Employer. Specified timber shall be used, and it shall be sawn in the direction of the grains. Sawing shall be truly straight and square. The scantling, shall be planed smooth and accurate to the full dimensions, rebates, rounding's, and moldings as shown in the drawings made, before assembling. Patching or plugging of any kind shall not be permitted except as provided. A tolerance of 2/3mm shall be allowed in the finished cross section dimensions of door and windows frames.

Joints:

These shall be of mortice and tenon type, simple, neat and strong Mortice and tenon joints shall fit in fully and accurately without wedging or filling. The joints shall be glued, framed, put together and pinned with hardwood or bamboo pins not less than 10mm dia, after the frames are put together in position by means of a press.

Gluing of Joints:

The contact surface of tenon and mortice joints shall be treated before putting together with synthetic resin adhesive of make approved by Architect / Consultant / Owner / Employer.

Fixing in Position:

Before the frames are fixed in position these shall be inspected and pressed by Architect/Consultant/Owner/Employer, the frame shall be placed in proper position and secured to walls or columns as the case may be with metallic fastener, iron hold fasts as per direction by Architect / Consultant / Owner / Employer.

In case of door frames without sills, the vertical members shall be embedded in the flooring to its full depth when sills are provided, these sills shall be embedded sunk in the floor to its full depth. The door frames without sills while being placed in position, shall be suitably strutted and wedged in order to prevent warping during construction. The frames shall also be protected from damage, during construction.

Measurements:

Wood work wrought and framed shall be measured for finished dimensions. No allowance shall be made for wastage and for dimensions supplied beyond those specified. Length of

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each piece shall be measured over all nearest to a cm. so as to include projections for tenons, scarves or metres, width and thickness shall be measured to the nearest mm.

In case of moldings, rounding's, rebates, circular and varying sections, the sectional area of the piece shall be taken as the area of the least square or rectangle from which such a section can be cut.

Rate:

The rate includes the cost of materials and labor involved in all the operations described above.

Joinery Work:

Joinery work shall be started immediately after the commencement of the building work. All prices shall be accurately cut and planed smooth to the full dimensions without any patching or plugging of any kind. Rebates, rounding and moldings as shown in drawings shall be made before assembling. The thickness of styles and rails shall be as specified for the shutters.

All members of the door shutters shall be straight without any warp or bow and shall have smooth, well planned faces at right angles to each other. The corners and edges of panels shall be finished as shown in drawings, and these shall be shall have mitered joints with the styles. Styles and rails shall be properly and accurately mortised and tenoned. Rails which are more than 180mm. in width shall have two tenons. Styles and end rails of shutters shall be made out of one piece only. The tenons shall pass through styles for at least 3/4th of the width of the style. When assembling a leaf, styles shall be left projecting as a horn. The styles and rails shall have 12 mm. groove in paneled portion for the panel to fit in.

The depth of rebate in frames for housing the shutters shall in all cases be 1.25mm and the rebate in shutters for closing in double shutter doors or windows shall not be less than 2cm. In the case of double leafed shutters, the meeting of the styles shall be rebated 20mm. The rebate shall be splayed.

The joinery work shall be assembled and passed by Architect/Consultant/ Owner/ Employer and then the joints shall be pressed, and secured by bamboo pins of about 6mm diameter. The horns of styles shall be sawn off.

Tolerance:

The finished work with a tolerance of + 1 mm in thickness + 2/3mm in width of styles and rails shall be accepted.

Glueing of Joints:

The contact surfaces of tenon and mortice joints shall be treated before putting together with bulk type synthetic resin adhesive of a make approved by Architect / Consultant / Owner / Employer. Shutters shall not be painted, oiled or otherwise treated, before these are fixed in position and passed by Architect / Consultant / Owner / Employer. Mountings and glazing bars shall be stub-tenoned to the maximum depth which the size of the member would permit or to the depth of 25mm, whichever is less. Thickness of each tenon shall be approximately one third the finished thickness of the members and the width of each tenon shall not exceed five times its thickness.

Beading:

Timber, plywood, hard board and particle board panels shall be fixed only with grooves but additional beading may not be provided either on one side or on both sides. In so far as glass and asbestos panels are concerned beading shall always be provided without grooves, where beading is provided without grooves, the beading shall be only on the side, the other side being supported by rebate from the styles. For external doors and windows beading shall be fixed on the outside.

Fittings:

Details of fittings to be provided as per the schedule of fittings.

Measurements:

Length and width of the shutters shall be measured to the nearest cm. in closed position covering the rebates of the frame but excluding the gap between the shutter and the frame. Overlap of two shutters shall not be measured. All work shall be measured net as fixed.

No extra payment shall be made for shape, joints etc.

Rate:

It includes the cost of materials and labor involved in all the operations described above.

1.7 ROLLING SHUTTERS, STEEL DOORS, M. S. WINDOWS:

M.S. Door frames:

The M.S. Door framing shall be fabricated as shown in drawing and fabricated with necessary stiffeners, hinges, holdfasts, etc. as per the drawings/sketches attached with the tender. The contractor shall quote the rate taking into account all the above requisites, including the width of frame and erecting at site in line, level, plumb, etc. and with one coat of shop paint of Red Oxide Primer. The metal door shall be stored under cover to prevent damage or distortion when taking delivery of items supplied by owner, the Contractor shall satisfy himself that the items supplied are up to the specified standard. Any defect detected shall promptly be brought to notice of Architect/Consultant/Owner/Employer.

The work shall have to be done in co-ordination with other agencies working at site.

Rolling Shutters:

The specifications shall be generally as per the manufacturer's one. However, the following may be noted. The M.S. laths for rolling shutters shall be 20 gauge and the type of rolling shutter shall be pull and push type. The workmanship should be of first-class quality. The springs and other materials shall be of best quality. The vertical guides shall be straight and of pressed type and the shutters shall be sized to suit the requirements of this tender.

M.S. Windows and Ventilators:

All windows shutters shall be fabricated to correct shape and size as per drawings approved by Company. However, before fabricating any item the contractor has to check the opening dimensions at site. Any discrepancy therein shall be brought to Company's notice in writing mentioning the particular windows. Steel windows shall conform IS:1038 & IS:1361.

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All sections for windows shall be extruded sections of approved quality. All extruded sections shall be of 14 gauge. Z sections shall be of 10-gauge sheet.

All glasses shall be standard glazing quality clear sheet glass and free from waves, specks, disfigurements or blemishes of any kind. All glasses shall be accurately cut and fitted with glazing clips or as directed by Company. The thickness of the glass will be as per the specification mention in the Bill of Quantities. Glass should be fixed in the frame with best quality putty of required thickness.

The contractor shall have to make all necessary holes in concrete masonry for fixing of windows. The contractor shall also fix and grout the shutter in line and level with his own masons.

The steel members shall be given a coat of approved anti-rust paint.

Hardware:

Peg stay arms, handles, hinges etc. shall be of approved quality and details.

Fixed or openable panels of the windows shall be as shown in the drawing.

Measurement:

The rate quoted by the contractor under each item in the Bill of Quantities for a complete finished item of and no claims by the contractor in this regard shall be admissible. Supplying and fixing of all the fittings and iron monger shall be deemed to have been included in contractor's rates and consequently, shall not be paid for separately.

The form work and scaffoldings shall be deemed to have been included in the rates quoted by the contractor and shall not be paid for separately for any of the items.

1.8 CEMENT PLASTERING (INTERNAL & EXTERNAL):

The Cement plaster shall be 6mm, 12mm or 20mm or any thickness as specified in the item.

Scaffolding:

For all exposed brick work or tile work, double scaffolding having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed.

For all other brick work in buildings, single scaffolding shall be permitted. In such cases, the inner end of the horizontal scaffolding pole shall rest in a hole provided only in the header course for the purpose. Only one header for each pole shall be left out. Such holes for scaffolding shall, however, not be allowed in pillars/ columns less than one meter in width, or immediately near the skew backs of arches. The holes left in masonry works for scaffolding purposes shall be filled and made good before plastering.

Preparation of Surface:

The Joints shall be raked out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scraping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced.

In case of concrete surface if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface.

Application of Plaster:

Ceiling plaster shall be completed before commencement of wall plaster.

Plastering shall be started from the top and worked down towards the floor. All putlog holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. To ensure even thickness and true surface, plaster about 15 x 15 cm. shall be first applied, horizontally and vertically at not more than 2m. intervals over the entire surface to serve as gauges. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness. This shall be beaten with thin strips of bamboo about one meter long to ensure thorough filling of the joints, and then brought to a true surface, by working a wooden straight edge reaching across the gauges, with small upward and sideways movements at a time. Finally, the surface shall be finished off true with trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive trowel in or over working the float shall be avoided. During this process, a solution of like putty shall be applied on the surface to make the later workable.

All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arises, junctions etc. where required shall be done without any extra payment. Such rounding or chamfering shall be carried out with proper templates to the sizes required.

In suspending work at the end of the day, the plaster shall be left, out clean to line both horizontally and vertically, when recommencing the plastering, the edge of the old work shall be scraped cleaned and wetted with lime putty before plaster is applied to the adjacent areas, to enable the two to properly joint together. Plastering work shall be closed at the end of the day on the body of wall and not nearer than 15 cm. to any corners or arises. It shall not be closed on the body of the features such as plasters, bands and cornices nor at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet tops and copings, as these invariably lead to leakages.

No portion of the surface shall be left out initially to be patched up later on.

Finish:

The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5m. long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs corners with a plumb bob as the work proceeds.

Thickness:

The thickness of the plaster specified shall be measured exclusive of the thickness of key i.e. grooves or open joints in brick work. The average thickness of plaster shall not be less than the specified thickness. The minimum thickness over any portion of the surface shall not be less than specified thickness by more than 3mm.

The average thickness should be regulated at the time of plastering by keeping suitable thickness of the gauges. Extra thickness required in dubbing behind rounding of corners at junctions of wall or in plastering of masonry cornices etc. will be ignored.

Curing:

Curing shall be started 24 hours after finishing the plaster. The plaster shall be kept wet for a period of seven days. During this period, it shall be suitably protected from all damages at the contractor's expense by such means as the Architect/Consultant/Owner/Employer may approve. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period thereafter can be watched.

Precaution:

Any cracks which appear in the surface and all portions, which should hollow when tapped or are found to be soft or otherwise defective, shall be cut out in rectangular shape and re-done as directed by Architect/Consultant/ Owner/ Employer.

1.9 CEMENT PLASTER WITH A FLOATING COAT OF NEAT CEMENT:

The cement plaster shall be 6mm, 12mm or 20mm thick, finished with a floating coat of neat cement as described in the item.

When the plaster has been brought to a true surface with the wooden straight edge it shall be uniformly treated over its entire area with a paste of neat cement and rubbed smooth, so that the whole surface is covered with neat cement slurry 1.5mm thick while the plaster surface is still fresh. Smooth finishing shall be completed with trowel immediately and in no case later than half an hour adding water to the plaster mix.

1.10 CEMENT CONCRETE FLOORING:

Cement Concrete:

Cement concrete of specified mix shall be used and it shall generally conform to the specifications described in plain concrete.

Sub-grade:

Flooring shall be laid on concrete sub-grade where so provided. The sub-grade shall be provided with the slopes required for the flooring. Flooring in verandahs, kitchens, baths, water closets and courtyards shall invariably be provided with suitable slope to drain off washing and rain water.

If the sub-grade consists of lime concrete, it shall be allowed to set for seven days and the flooring shall be laid in the next three days.

If the sub-grade is of lean cement concrete, the flooring shall be commenced preferably within 48 hours of the laying of sub-grade. The surface of the sub-grade shall be roughened with steel wire brushes without disturbing the concrete. Before laying the flooring, the sub-grade shall be wetted and smeared with a coat of cement slurry at 2 Kgs. of cement spread over an area of one sqm. so as to get a good bond between the sub-grade and concrete floor.

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If the cement concrete flooring is to be laid directly on the R.C.C. slab the surface of RCC slab shall be cleaned and the laitance shall be removed and a coat of cement slurry at 2 Kg. of cement per Sqm. shall be applied, so as to get a good bond between RC slab and concrete floor.

Thickness:

The thickness of floor shall be as specified in the description of the item.

Laying:

Panels:

Flooring of specified thickness shall be laid in the pattern as given in the drawings or as directed by Architect/Consultant/Owner/ Employer. The border shall have mitred joints at the corners of the room and intermediate joints shall be in straight line with the panels joints shall be in straight line with the panel joints. The panels shall be off uniform size.

The panels shall be bounded by wooden angle iron battens. The battens shall have the same depth as the concrete flooring. These shall be fixed in position, with their top at proper level, giving required slopes. The surface of the batten or flats, to come in contact with the concrete shall be smeared with soap solution or non-sticking oil (Form oil or raw linseed oil) before concreting. The flooring shall butt against the masonry wall, which shall not be plastered.

The concreting shall be done in the manner described in plain cement concrete. The battens used for shuttering, shall be removed on the next day of the laying of cement concrete. The ends thus exposed shall be repaired, if damaged, with cement mortar 1:2 (1 cement: 2 coarse sand) and allowed to set for minimum period of 24 hours. The alternate panels shall then be cleaned of dust, mortar droppings etc. and concrete laid. While laying concrete, care shall be taken to see that the edges of the previously laid panels are not damaged and fresh mortar is not splashed over them. The joints between the panels should come out as fine and straight lines.

Finishing:

The finishing of the surface shall follow immediately after the occasion of beating. The surface shall be left for some time, till moisture disappears from it. Excessive trawling shall be avoided. Use of dry cement or cement and sand mixture sprinkled on the surface to stiffen the concrete or absorb excessive moisture, shall not be permitted.

Fresh quantity of cement shall be mixed with water to form a thick slurry and spread over of flooring while the concrete is still green. The cement slurry shall then be properly pressed and finished smooth.

The junctions of floor with wall plaster, dado, or skirting shall be rounded off where so specified.

The men engaged on finishing operations shall be provided with raised wooden platform to site on, so as to prevent damage to new work.

Curing:

The curing shall be done for a minimum period of ten days. Curing shall not be commenced until the top layer has hardened. Covering with empty cement gunnies shall be avoided as the color is likely to be bleached with the remnants of cement matter from the bags.

Precautions:

Flooring in lavatories and bath rooms shall be laid after fixing of water closet and squatting pans and flooring traps. Traps shall be plugged, while laying the floors and opened after the floors are cured and cleaned. Any damages done to S. C's squatting pans and floor traps during the execution of work shall be made good.

The floor shall be protected from any damage during the execution of work.

Measurements:

Length and breadth shall be measured correct to a cm. and its area as laid shall be calculated in Sqm. correct to two places of decimal Length and breadth shall be measured before laying skirting dado wall plaster. No deduction shall be made nor extra paid for any opening in the floor of area up to 0.10 Sqm.

Rate:

The rate shall include the cost of all matters and labor involved in all the operations described above including application of cement slurry on RCC and or on sub-grade including roughening and cleaning the surface. Nothing extra shall be paid for laying the floor at different levels in the same room or courtyard and rounding of edges of sunk floors. In case the flooring is laid in alternate panels, it includes the cost of shuttering.

Marble Stone Flooring:

45mm thick Marble stone flooring in Ground Floor with 20mm thick White Marble stone Tiles dressed, polished and bottom coated with neat cement slurry and fixing in flooring on 25mm thick bed of cement mortar (1:1) mix and joints filled with White cement slurry, properly leveled, washed, Acid cleaned and polished.

Glazed Ceramic Tile Fixing:

66mm thick glazed ceramic tiles of size (150mm x 150mm) up to 1500mm height from floor level of approved make confirming to IS: in Dado/Skirting in toilets Ground Floor fixed in neat cement slurry after soaking the tiles in water over 12mm thick cement plaster (1:3) with white cement pointing in joint, including washing and cleaning with oxalic acid etc. complete.

8mm thick glazed ceramic tiles of size (300mm x 300mm) up to 1500mm height from floor level of approved make confirming to IS in Dado/Skirting in Operation Theater in Ground Floor fixed in neat cement slurry after soaking the tiles in water over 12mm thick cement plaster (1:3) with white cement pointing in joint, including washing and cleaning with oxalic acid etc. complete.

Kotah Stone Flooring:

50mm thick Kota stone flooring to all Toilets in Ground Floor with 25mm thick kotah stone dressed and polished tiles bottom coated with neat cement slurry and fixing in flooring on 25mm thick bed of cement mortar (1:3) mix and joints filled with gray cement slurry, properly leveled, washed, acid cleaned and polished.

Factory Made Shutters:

38mm thick fully panelled Door shutter with style and rail made out of well-seasoned chemically treated 2nd class hard wood of 100mm width style and top rail 175mm width lock all and bottom rail with 12mm inserted panels of marine grade phenol bonded BWP ply confirming to IS:303 or exterior grade pre-laminated board confirming to IS:12406/88 of approved make color and shade etc.

38mm thick Mosquito Proof Door shutter with style and rail made out of well-seasoned chemically treated 2nd class hard wood of 100mm width style and top rail, 175mm width lock rail and bottom rail with inserted panels of Galvanised Steel wire Mesh complete.

30mm thick Partly (1/3) Glazed and Partly (2/3) paneled window shutter, of 75mm width style and rail made out of well seasoned chemically treated 2nd class hard Wood with 12mm thick inserted panels of marine grade phenol bonded BWP ply confirming to IS:303 or exterior grade pre-laminated board confirming to IS:12406/88 and Glazing shall be done by 4mm thick clear Glass.

MATERIALS

Vitrified Tiles: The tiles shall be of approved make generally confirm to the approved standards. They shall be flat and true to shape, free from cracks, crazing spots, chipped edges and corners. Unless otherwise specified, the nominal sizes of tiles shall be as under:

The tiles shall be square or rectangular of nominal sizes such as: 600 x 600 mm; 900 x

900 mm or as per tender schedule / drawings or as directed by the Architect. Thickness shall be as per recommendations of the approved manufacturers.

Technical specifications of the tiles shall be generally conforming to the following standards:

TECHNICAL SPECIFICATIONS FOR VITRIFIED TILES

- 1 Deviation in length (+/-) 0.6%
- 2 Straightness of sides (+/-) 0.5%
- 3 Rectangularity (+/-) 0.6%
- 4 Surface flatness (+/-) 0.5%
- 5 Water absorption < 0.50%
- 6 Mohs. hardness > 6
- 7 Flexural strength > 27 N / mm
- 8 Abrasion resistance < 204 mm
- 9 Skid resistance (friction coefficient) > 0.4
- 10 Glossiness Min. 85% reflection

The tiles shall conform to the relevant standards in all respects. Samples of tiles shall be got approved from the Architects and Employer before bulk procurement for incorporation in the work

1.14 CEMENT PRIMER:

Cement primer coat is used as a based coat on wall finish of cement lime or lime cement plaster or on asbestos cement surfaces before oil emulsion distemper paints are applied on them. The cement primer is composed of a medium and pigment which are resistant to the alkalies present in the cement, lime or lime cement in well finish and provides a barrier for the protection of subsequent coats of oil emulsion distemper paints.

Primer coat shall be preferably applied by brushing and not by spraying. Hurried priming shall be avoided particularly on absorbent surfaces. New plaster patches in old work should also be treated with cement primer before applying oil emulsion paints, etc.

Preparation of the Surface:

The surface shall be thoroughly cleaned of dust, old white or color wash by washing and scrubbing. The surface shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of parties mixed with water on the entire surface including filling up the undulation and then sand papering the same after it is dry.

Application:

The cement primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours, before oil emulsion paint is applied.

1.16 PAINTING:

Materials:

Paints, oil varnishes etc. of approved brand and manufacture shall be used ready mixed paint as received from the manufacturer without any admixture shall be used.

If for any reason thinning is necessary in case of ready mixed paint, the brand of thinner recommended by the manufacturer or as instructed by Architect / Consultant / Owner / Employer shall be used.

Approved paints, oil or varnishes shall be brought to the site of work by the Contractor in their original containers in sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the contract and Architect/Consultant/Owner/Employer. The empties shall not be removed from the site work, till the relevant item of work has been completed and permission obtained from Architect/Consultant/Owner/ Employer.

Commencing Work:

Painting shall not be started until Architect/Consultant/Owner/ Employer has inspected the items of work to be painted, satisfied himself about their proper quality and given his approval to commence the painting work. Painting of external surface should not be done in adverse weather condition like hail storm and dust storm.

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Painting, except the priming coat, shall generally be taken in hand after practically finishing all other builder's work.

The rooms should be thoroughly swept out and the entire building cleaned up, at least one day in advance of the paint work being started.

Preparation of Surface:

The surface shall be thoroughly cleaned and dusted. All rust, dirt, scales, smoke and grease shall be thoroughly removed before painting is started. The prepared surface shall have received the approval of the Architect/Consultant/Owner/Employer after inspection, before painting is commenced.

Application:

Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its containers, when applying also the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform.

The painting shall be laid on evenly and smoothly by means of crossing and laying off, the later in the direction of the grain of wood. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite direction, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off with constitute one coat.

The left over paint shall be put back into the stock tins. When not in use, the containers shall be kept properly closed.

No hair marks from the brush or clogging of paint putties in the corners of panels, angles of mouldings etc. shall be left on the work.

In painting doors and windows, the putty round the glass panes must also be painted, but care must be taken to see that no paint stains etc., are left on the glass. Tops of shutters and surfaces in similar hidden locations shall not be left out in painting.

In painting steel work, special care shall be taken while painting over bolts, nuts, rivets, overlaps etc.

The additional specifications for primer and other coats of paints shall be as according to the detailed specifications under the respective headings.

Brush and Containers:

After work, the brushes shall be completely cleaned of paint and linseed oil by rinsing with turpentine. A brush in which paint has dried up is ruined and shall on no account be used for painting work. The containers when not in use, shall be kept closed and free from air so that paint does not thicken and also shall be kept safe from dust. When the paint has been used, the containers shall be washed with turpentine and wiped dry with soft clean cloth, so that they are clean and can be used again.

Measurements:

The length and breadth shall be measured correct to a cm. The area shall be calculated in Sq. metres (correct to two places of decimal), except otherwise stated, small articles not exceeding 10 sq. decimetres (0.1 Sqm.) of painted surfaces where not in conjunction with similar painted work shall be enumerated.

Painting up to 15 Cm. in width or in girth and not in conjunction with similar painted work shall be given in running metres.

Priming coat on wood, Iron or Plastered Surface:

Primer:

The primer for wood work, iron work or plastered surface shall be as specified in the description of the item.

The primer shall be ready mixed primer of approved brand and manufacture.

Preparation of Surface:

Wooden Surface:

The wood work to be painted shall be dry and free from moisture. The surface shall be thoroughly cleaned. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted. Knots, if any shall be covered with preparation of red lead made by grinding red lead in water and mixing with strong glue sized and used hot. Appropriate filler material with same shade as paint shall be used where specified.

The surface treated for knotting shall be dry before painting is applied. After the priming coat is applied the holes and indentation or the surface shall be stopped with glazier's putty or wood putty respectively. Stopping shall not be done before the priming coat is applied as the wood will absorb the oil in the stopping and the latter is therefore liable to crack.

Iron & Steel Surface:

All rust and scales shall be removed by scraping or by brushing with steel wire brushes. Hard skin of oxide formed on the surface of wrought iron during rolling which becomes loose by rusting shall be removed.

All dust and dirt shall be thoroughly wiped away from the surface. If the surface is wet, it shall be dried before priming coat is undertaken.

Plastered Surface:

The surface shall ordinarily not be painted until it has dried completely. Trial patches of primer shall be laid at intervals and where drying is satisfactorily, painting shall then be taken in hand. Before primer is applied, holes and undulations, shall be filled up with plaster of Paris and rubbed smooth.

Application:

The primer shall be applied with brushes, worked well into the surface and spread even and smooth. The painting shall be done by crossing and laying off as described in painting.

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All other the specifications described under painting shall hold good so far as they are applicable.

Painting with ready mixed paint:

Ready mixed paints of approved brand and manufacture and of the required shades shall be used. They shall conform in all respects to the relevant IS specifications.

Painting of New Surface:

- a) Wood work - The surface shall be cleaned and all unevenness removed as specified in priming coat on wood, iron & plastered surface. Knots if visible, shall be covered with a preparation of red lead. Holes and indentations on the surface shall be filled in with glazier's putty or wood putty and rubbed smooth before painting is done. The surface should thoroughly dry before painting.
- b) Iron and Steel Work - The priming coat shall have dried up completely before painting is started. Rust and scaling shall be carefully removed by scraping or by brushing with steel wire brushes. All dust and dirt shall be carefully and thoroughly wiped away.
- c) Plastered Surface - The priming coat shall have dried up completely before painting is started. All dust and dirt that has settled on the priming coat shall be thoroughly wiped away before painting is started.

The specifications described in painting shall hold good as far as applicable. The number of coats to be applied will be as stipulated in the item. The painted surface shall present a uniform appearance and glossy finish, free from streaks, blisters, etc.

Painting on Old Surface:

Preparation of Surface:

- a) Wood work - If the old paint is sound and firm and its removal is considered unnecessary, the surface shall be rubbed down with pumice stone after it has been cleaned of all smoke and grease by washing with lime and rinsing with water and drying. All dust and loose paint shall be completely removed. The surface shall then be washed with soap and water.
- b) Plaster surface - It shall be as specified for (a) wood work.

If before painting any portion of the wall shows signs of dampness, the causes shall be investigated and the damp surface shall be properly treated. Such treatment shall be paid for separately. A thin coat of white lead if so, required shall be applied on the wet or patchy portion of the surface before painting is undertaken and this shall be paid extra.

- c) Aluminum Paint - Aluminum paint of approved brand and manufacture shall be used. The paint comes in compact dual containers with the paste and the medium separately. The two shall be mixed together to proper consistency before use. Each coat shall be allowed to dry for 24 hours and lightly rubbed down with fine grade sand paper and dusted before the next coat is applied. The finished surface shall present an even and uniform appearance. As aluminum paint is likely to settle in the contain-

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er, care shall be taken to frequently stir the paint during use. Also, the paint shall be applied and laid off quickly, as surface is otherwise not easily finished.

Painting with Wood Preserved:

Oil type wood preservative of specified quality and approved make conforming to IS: 218-1961 shall be used. Generally, it shall be creosote oil type-1 or anthracene oil.

Painting on New Surface:

Preparation of surface:

Painting shall be done only when the surface is perfectly dry to permit of good absorption. All dirt, dust or other foreign matter shall be removed from the surface to be painted. All roughness shall be sand papered and cleaned.

Application:

The preservative shall be liberally with a stout brush and not daubed with rags or cotton waste. It shall be applied with a pencil brush at the joints of the wood work. The first coat shall be allowed at least 24 hours to soak in before the second (the final) coat is applied. The second coat shall be applied in the same manner as the first coat. The excess of preservative which does not soak into the wood shall be wiped off with a clean dry piece of cloth.

The specifications described in painting shall hold good in so far as they are applicable.

Structural Steel Work and Asbestos Work:

Structural Steel Work:

The work covered by this contract comprises the supply, fabrication and erection of structural steel work in accordance with the drawings, furnished by Company and as directed in the Bill of Quantities and Specifications hereinafter.

The static calculations shall be worked out by Company. The current rules and practices set forth in the latest Indian Standards for materials, fabrication and erection of structural steel work including metal are welding shall be strictly followed unless otherwise indicated hereinafter.

In case the Contractor wishes to suggest certain alterations substitutions or modifications of design, sections, details, etc. he shall provide the necessary drawings therefore together with calculations and details. These details shall be checked by Company and approved.

It is intended that the drawings and specifications include everything requisite and necessary to finish the work properly notwithstanding the fact that every time may not be specifically mentioned. All supplementary parts such as bolts, clips and angles necessary to complete each item shall be deemed to be included though not specifically stated. All work when finished shall be delivered in a complete and undamaged state.

Materials:

All material (such as structural, steel, rivet steel and electrodes) required for the work shall be best tested quality conforming strictly to the relevant Indian Standard Specifications. Materials shall be free from scale, blisters, Laminations cracked edges and other defects.

Workmanship (Fabrication):

All workmanship shall be first quality in every respect, greatest accuracy being observed to ensure that all parts will fit together properly on erection.

All ends shall be cut true to fit the abutting surfaces accurately. Butt ends of compression members shall be in close contact through the area of the joint. Stiffeners, if any, shall bear tightly at both ends.

Shop Drawings:

The Contractor shall submit 3 sets of shop and erection drawings with erection sequence necessary for the construction for approval of Company free of charge. No fabrication work shall be undertaken until the written approval is obtained from Company. The approval of drawings by Company, Indicates only the general method of construction and that the detailing is satisfactory. Approval of such drawings shall not relieve the contractor of the responsibility for any errors or compliance with the requirements of contract, plans and specifications. The contractor shall be responsible for the dimensions and designs of adequate connections, supports, details and satisfactory construction of the work.

Welding:

Welding shall be permitted to be carried out by licensed welders. All welding work shall be fillet welds in general and shall strictly conform to the relevant Indian Standards. The diameter of the electrodes, the throat thickness of the weld, etc. shall be as per Standard Practice or as directed.

Riveting:

Where necessary shall be Machine riveting and shall be carried out all as laid down in the relevant Indian Standards.

Shop Erection:

If so directed, the fabrication steel work shall be shop erected to check the accuracy of fit and fabrication.

Erection and making at Site:

During erection, the work shall be securely braced and fastened temporarily to provide safety for all erection stresses at. No. permanent bolting or riveting or welding shall be carried out until proper alignment has been obtained.

Painting:

a) Shop Coat:

All Steel work shall be properly cleaned of all loose mill scale, rust, dirt and other foreign matter. Except where encased in concrete and surface area adjacent to edges to be field welded all steel work shall be given one coat of approved anti-rust (Red Oxide) well worked into the joints. All paint shall be applied to dry surfaces.

b) Inaccessible Parts:

Parts inaccessible after assembly shall be given two coats of shop paint of different shade No spots of bottom coat shall show through.

c) Contact surface:

All contract surfaces shall be properly cleaned by effective means but not painted.

d) Surface to be filled welded:

Surfaces which are to be welded after erection shall where practicable not receive a shop coat of paint. If painted, such paint shall be removed before field welding for a distance of at least 50mm on either side of the joint.

Measurements:

The measurements shall be as per the final fabrication drawings. Payment shall be made on the actual tonnage erected. The rate quoted shall be inclusive of welding, riveting or bolting and grouting bolts. The latest code of practice of Indian Standard Institution for Method of Measurement purposes.

Asbestos Work:

Scope of work:

The work under this contract comprises of the following:

- a) A.C. Sheet Roofing with accessories
- b) A.C. Gutters with accessories
- c) A.C. Sheet Cladding.

Materials:

Asbestos Cement Sheets for roofing, cladding and A.C. rain water gutters shall be procured from the approved manufacturer.

Roofing and cladding shall be carried out with "Corrugated Sheets".

Workmanship:

Workmanship shall be strictly in accordance with the Code of Practice issued by Asbestos Cement Co. and will conform with the drawings and instructions issued by Consultants.

A.C. Sheets for roof and cladding will be procured in the specified sizes so as to minimize the wastage.

Corrugated sheets in roof shall be laid from right to left. The first sheet shall be laid uncut but the remaining sheets in the bottom shall have the top right and corners cut of miters. The sheets in the second and other intermediate rows shall have the bottom.

Wherever four sheets met at a lap, two of them shall be mitered to provide a snug fit. The length of mitre shall be 20 cm. width equal to the width of the corrugation. Mitering shall be done with an ordinary wood saw.

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The ends of all sheets at the eaves shall be supported and the support shall be placed as near to the margin of the sheets as practicable.

Cat ladders or roof boards shall be used when working to avoid damage to the sheets and to provide security to workmen. These shall also be used when fixing roofing accessories, gutters and accessories.

Corrugated sheets shall be laid with smooth side upwards. End mark 'Top' on the smooth side always point the ridge. End lap sheets shall be 20 Cm. and side lap shall be on one corrugation, the left-hand small corrugation of each sheet being covered by the right hand large corrugation of the next sheet.

Holes in A.C. sheets for fixing shall be 11.11 mm (7/16") dia drilled never punched, in the crown of the corrugation. Fixing bolts, screws shall be 7.94mm (5/16") dia and all fixing accessories including nuts and washers shall be galvanized iron. "Everest" bitumen washer shall be screwed lightly at first and lightened when a dozen or more sheets are laid screwing the sheets down too lightly on the purlins will be avoided. Every vertical side lap corrugation will carry a fixing accessory also as the urges and also through one of the two intermediate corrugations on each sheet. When the sheets are supported one intermediate purlin as in the case of lengths over (1.83m) and additional fixing accessory shall be provided through each side lap corrugation only.

A.C. gutter shall be supported along its girth through its length by adjustable brackets fabricated out of suitable M.S. straps at approx. 45 cm. c/c fabricated to the same profile as the gutter is fixed to the adjacent M.S. tuners/purlins by suitable M.S. accessories.

Gutters and accessories to be joined shall be perfectly dry and clean. Asbestos ropes 6.35mm (1/4") dia smeared with "Everest" bitumastic jointing compound shall be placed on both sides of the union clip, 1.25cm. inside from the edge along its inner cutout.

The space between the ropes shall be filled with "Everest" bitumastic jointing compound and levelled uniformly with a piece of wood or the edge of a trowel to the height of the rope.

Gutters and accessories shall be placed in position with 1.59mm (1/16") dia space between the butt joints and the prepared union clip shall be fixed underneath the butt joint.

From the inside the gutter 7.94mm (5/16") dia. G.T. Seam bolts shall be inserted in the ready drilled holes with an "Everest" bitumen washer adjacent to the gutter and a G.T. flat washer in top of it and shall be screwed with a nut.

The bolts shall be so positioned that "Everest" bitumen washers shall be correctly centred on the holes in the gutter as also in the union clip.

Over tightening of nuts shall be avoided to prevent sheets from cracking.

After a complete gutter line has been fixed in position all brackets supporting the gutter shall be adjusted to give the required slopes towards the gutter outlets.

Gutter line shall be tested for water tightness after jointing. All outlets shall be plugged and the entire length of the gutter line filled with water and retained these for 24 hours for observations.

Measurements:

The sloping area of roof coverings and claddings as laid shall be measured in square meters without allowance for laps and corrugations, if any.

Portions of roof covering overlapped by ridge or hip etc. shall be included in the measurements of the roof.

Any opening not exceeding 0.4 Sqm. shall not be deducted and forming such openings requiring cutting shall be enumerated.

Any opening exceeding 0.4 Sqm. shall be deducted and cutting required shall be measured in running meter.

WOOD COMPOSITE DOOR/FRAME WORKS

WPC FRAMES: The factory made single extruded WPC (Wood Polymer Composite) solid door/window/Clerestory windows & other Frames/Chowkhat comprising of virgin PVC polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 gms) fabricated with miter joints after applying PVC solvent cement and screwed with full body threaded star headed SS screws having minimum frame density of 750 kg/cum, screw withdrawal strength of 2200 N (Face) & 1100 N (Edge), minimum compressive strength of 58 N/mm², modulus of elasticity 900 N/mm² and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant and fixed in position with M.S hold fast/lugs/SS dash fasteners of required dia and length complete as per direction of Engineer-In- Charge. (M.S hold fast/lugs or SS dash fasteners shall be paid for separately).

Note: For WPC solid door/window frames, minus 5mm tolerance in dimensions i.e depth and width of profile shall be acceptable. Variation in profile dimensions on plus side shall be acceptable but no extra payment on this account shall be made.

WPC DOORS: The factory made single extruded WPC (Wood Polymer Composite) solid plain flush door shutter of required size comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 gms) having minimum density of 650 kg/cum and screw withdrawal strength of 1800 N (Face) & 900 N (Edge), minimum compressive strength 50 N/mm², modulus of elasticity 850 N/mm² and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant and fixing with stainless steel butt hinges of required size with necessary full body threaded star headed counter sunk S.S screws, all as per direction of Engineer-In-Charge. (Note: stainless steel butt hinges and necessary S.S screws shall be paid separately)

UNPLASTICIZED POLY-VINYI CLORIDE (uPVC) WORKS

The factory made uPVC glazed/wire mesh windows/doors comprising of lead free uPVC multi-chambered frame, sash and mullion/coupler (where ever required) extruded profiles

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having minimum wall thickness of 1.70 mm for Series R1 and R2 profiles and 2.10 mm for Series R3 and R4 profiles conforming to EN: 12608 in any shape, colour and design duly reinforced with galvanized mild steel section made of required shape & size as per CPWD Specification, uPVC

extruded glazing beads, interlocks and Inline sash adaptor (where ever required) of appropriate dimension, EPDM gasket, hardware, SS 304 grade fasteners of minimum 8 mm dia with countersunk head, comprising of matching polyamide PA6 grade sleeve for fixing frame to finished wall as per IS 1367 : Part 1 to 14, plastic packers, plastic caps and necessary stainless steel screws etc. Profile of frame, sash & mullion (if required) shall be mitred cut and fusion welded/mechanically jointed duly sealed at all corners, including drilling of holes for fixing hardware and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealant over backer rod of approved size and quality, all complete as per approved drawing conforming to CPWD specification & direction of Engineer-in-Charge. Section of steel reinforcement and cross sections of uPVC profiles to be as per design approved by Engineer-in-Charge.

Wire mesh / Glazing of plain/ toughened/ laminated/ double glass unit with / without high performance coatings as per design requirements and conforming to IS: 3548 & IS: 16231 shall not be paid separately, window with frame, glazing necessary hardware shall paid as one item.

Note:- Structural design proof checked from a Government Engineering Institute, to be provided by the manufacturer for :

- (i) Sites with basic wind speed > 45 m/sec as per IS 875 — Part 3
- (ii) Sites with structure height more than 20m for all wind speeds

HPL (HIGH PRESSURE LAMINATE) WORKS AT ALL HEIGHT

Procurement of manufacture's specification such as fundermax 6mm thick exterior grade F-quality panels of standard size with both side décor. Fundermax exterior panels are duromer high-pressure laminates (HPL) as per EN 438-6 type EDF manufactured with norm conformity of EN 438-7 using patented NT technology (NT is Non fading high performance acrylic polyurethane surface technology). Panels will be double hardened including acrylic polyurethane resin and thermally cured under high pressure. These panels will have CE-mark necessary for their use in building applications. Installation of Funder max panels will be done by MBE rivets (with fixed and sliding points) with recommended Aluminium section of 2 mm thick and L section 2 mm thick held by Aluminium wall bracket with wind load and dead load slot as per design, anchored by standard anchor fasteners along with Thermal separator. Design of Aluminium should be submitted to the architect with design calculation, Installation of fundermax panels will be done using rear ventilated principles only, which is ensured by providing ventilation gap minimum 200cm²/per meter (for free flow of air behind the façade) for the façade and using the framework with no horizontal section.

Guarantee:

The Contractor shall be required to furnish a guarantee in respect of the water tightness of the roof for a period of one year from the date of final completion of work.

LIST OF MATERIALS OF APPROVED BRAND AND MANUFACTURE

No	Item	Approved make
1	Cement (PPC)	Ultratech (Super), OCL, Dalmia DSP, ACC, Lafarge
2	RMC	Ultratech RMC, Duramix, Kalinga RMS, RDC, Nuvoco RMC as approve by Engineer in charge/Architect
3	Sand (coarse and fine)	Locally available good quality river sand
4	Brick (Fly ash)	Locally available good quality bricks
5	Steel (TMT FE 500 grade)	TATA TISCON 500SD /SAIL TMT EQR 550 /JINDAL PANTHER 550D/VIZAG STEEL
6	Floor and wall tiles (ceramic/Vitrified)	Somany, Johnson, Kajaria, NITCO
7	Tile Adhesive	Sika, Fosroc, MYK Laticrete, Bal endura /Roff
8	Construction Chemicals	Sika/Fosroc/MYK Laticrete/Dr Fixit/ Roff
9	Paints, putty, primer (Exterior and interior)	Berger, Asian, ICI
10	Glass	Saintgobain/ Modi/Tata/Asahi
11	Concrete Cover	Astra/ equivalent
12	Flush door	Century/Sylvam/Green
13	AAC Block	Ultractech/Fast build block/ ABSS construction/ equiv as approved
14	WPC door & frames	Duroplast/Fenesta/Symta/Prominence
15	uPVC windows & frames	Duroplast/Fenesta/Symta/Prominence
16	HPL	FunderMax / Trespa / RHEAU
17	GI sheet/Angles	JINDAL/TATA/SAIL
18	STAILESS STEEL	JINDAL/SALEM-SAIL/RINL/TATA
19	Water Proofing Compound	Pidilite/Sika/Fosroc/Dr.Fixit
20	Aluminium section	Hindalco/ Jindal/OEL

Volume – II
TECHNICAL SPECIFICATIONS
FOR
PUBLIC HEALTH WORKS

TECHNICAL SPECIFICATIONS FOR SANITARY FITTINGS

- 1.0 SANITARY WARES AND ALLIED FITTINGS.** All sanitary wares with their allied fittings must be first quality (best) of approved make and brand.
- 2.0 SQUETTING PATTERN W.C. PAN (INDIAN TYPE):** The W.C. Pan shall be of white vitreous China of specified size and pattern (Orissa or long pattern as specified) with an integral flushing rim. It shall have the flushing horn in the back unless it is not possible to accommodate cistern to suit this design. The pan shall be of approved quality. It shall have 100 mm. C.I. or porcelain trap 'P' or 'S' type with minimum effective seal of 50 mm. and 50 mm. vent arm.
- 2.1 FIXING OF W.C. PAN:** The squatting type W.C. pan shall be sunk in floor sloped towards the pan in a workmanship like manner, care being taken not to damage then pan in the process of fixing. It damaged in any way it shall be replaced at contractors' cost. It shall be fixed on a proper cement concrete base of 1:3:6 proportion taking care that the cushion is uniform and even without having any hollows between the concrete base and pan and finished just below level of rim of pan to receive the specified thickness of the floor finishing. No extra for concrete bed shall be paid for.
- The joint between the pan and the trap shall be made with cement mortar 1:1 and shall be leak proof.
- 3.0 PEDESTAL WASH DOWN SYPHONIC (SINGLE OR DOUBLE TRAP) WATER CLOSET (EUROPEAN TYPE):** The W.C. Pan shall be of white vitreous chine unless otherwise specified of one piece construction of wash down type with integral 'P' or 'S' trap as required. It shall be of approved quality and pattern.
- 3.1 INSTALLATION:** The weight of the fixture and user are supported on the floor and not on the drainages pipe and this should be done in standard approved method.
- 3.2 SEAT AND COVER:** The double solid seat with lid shall be of well-seasoned teak wood varnished or mahogany polished or plastic seat as specified with rubber buffers and shall be fixed in position by using chromium plated brass hinges and screws. The seat shall be nonabsorbable and free from cracks and crevices in the materials. The plastic seat and cover, where specified, shall conform to I.S. specifications and shall be of white color unless otherwise specified.
- 4.0 FLUSHING:** The flushing of the squatting and pedestal W.C. pan shall be done by low level valve less symphonic flushing cistern of approved quality and capacity as specified. In the former case the connection between the flush pipe of the cistern and W.C. pan shall be made by Rigid PVC pipe connection as specified. The other specification will be as for squatting pattern W.C. pan.

The flush pipe shall be fixed to wall by using holder bat clamps or embedded as required.

As specified low level Cisterns of specified capacity shall be fitted with all internal fittings brackets and C.P. brass flushing handle, and connected to the W.C. pan by means of 40 mm. diameter chromium plated brass bend and rubber or any other as specified.

- 4.1 BRACKETS:** The cistern shall be fixed on cast Iron or rolled steel cantilever brackets of required strength which shall be firmly embedded in the wall or fixed by using

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wooden plug and secret, to the satisfaction of the Consultant/Employer. Depending on the quality of work and type of sanitary fixtures, the fixing of cistern should vary in quality of materials and design also. Or it may be installed in other ways like placing on the top at the back of the W.C.

- 4.2 OVERFLOW:** The cistern shall be provided with 20 mm. pipe with fittings which shall terminate into mosquito proof coupling secured in a manner that will permit it to be readily cleansed or renewed, when necessary.
- 4.3 FLUSH PIPE.:** Unless otherwise stated in the schedule of quantities, the outlet or flush pipe from the low level cistern shall be of 40 mm. Rigid PVC/Brass chromium pipe minimum thickness of 2.6 mm. as specified or P.V.C. pipe as required by the Consultant/Employer which shall be connected to the W.C. pan by means of an approved type of joint adapts. The flush pipe shall be fixed to wall by using holder bat clamps or embedded as required.
- 4.4. PAINTING C.I. CISTERN:** Inside of cisterns and fittings shall be painted with approved bituminous paint and outside of the cisterns, if required, brackets, overflow and flush pipes, if required, etc. shall be painted with two coats of synthetic enamel paint of approved shade and make to given an even appearance. The cost of such painting shall be included in the rate quoted for the flushing cistern.
- 5.0 STANDING URINALS:**
- 5.1 BOWL URINAL:** The urinal shall be flat back or angular pattern lipped front basin of required dimensions of white vitreous china and one piece construction with internal flushing box rim of an approved make as specified. It shall be fixed in the position by using wooden plug embedded in the wall with screw of proper size. Each urinal shall be connected to a 40 mm. diameter waste lead pipe unless otherwise specified, which shall discharge into a channel or a floor trap, or as specified.
- 5.2 HALF STALL URINALS:** The urinal stall and its screen shall be of white vitreous china of approved quality and manufacturer. The stall shall be 114 cm. high and 46 cm. wide and 40 cm. deep. the stall shall be provided with 84 cm. x 36 cm. division plates. In case of two or more urinals there shall be further division plates similar to end screens. The range shall have 15 cm. deep tread plates of first-class quality unless otherwise specified.
- 5.3 FLUSHING:** Where not specified the stall shall be provided with white glazed vitreous china automatic flushing cistern of proper capacity with 6 mm. minimum body thickness unless otherwise specified. The cistern shall be complete with fittings and brackets which shall be fixed to the wall. The cistern shall be connected to the stall through standard size C.P. brass flush pipe with spreader arrangement and clamp unless otherwise specified. Where the cistern has not been specified it will be from distribution line through Brass C.P. connector and spreaders.
- 5.4 OUT-LET.** Each of half stall shall be provided with C.P. Brass outlet (dome shape) grating of size 32 mm. for each half stall and then through PVC pipe to urinal channel.
- 6.0 SQUATTING URINALS.**

6.1 SQUATTING PLATES.: The urinal plates shall be of white glazed vitreous chine integral flushing rim of size 600 mm. x 350 mm. as specified. There shall be white vitreous channel with stop and outlet pieces in front. The plate and channel shall be of approved quality.

The joint between the urinal plate and the flush pipes shall be made with putty or white lead mixed with chopped hemp.

6.2 OUT-LET: The squatting plate or a range of squatting plates shall be provided with a 65 mm. diameter standard urinal C.I. trap with vent arm having 65 mm. C.P. brass out-let grating or as specified.

6.3 WALLING.; The squatting plate shall have 1.22 M. high wall in front and on either side. These shall be lined as specified.

7.0 CISTERN.

7.1 MATERIAL.: If not specified a high-level cistern is intended to operate with a minimum height of 191 cm. and a low-level cistern within the height of 60 cm. approx. from the floor finish and the underside of the cistern.

The body thickness of an earthenware cistern 1.3 cm. The cistern with internal parts shall be free from manufacturing faults and other defects and operate smoothly and efficiently. The cistern shall be considered mosquito proof only if there is no clearance anywhere which would permit a 1.6 mm. wire to pass through coupling in the permanent position (i.e; flushing or filling) of the cistern. The outlet fitting of each cistern shall be securely connected to the cistern. In the case of outlet shall be from low level 40 mm. dia. (nominal bore). The outlet of flush pipe from the cistern shall be connected to the pan by means of putty or cement and for E.P.W.C. with rubber joint and putty. The flush pipe shall be fixed to wall by using holder bath clamp.

The discharge rate of cistern shall be about 5 liters in 3 seconds when connected to an appropriate flush pipe and there shall be no appreciable change in the full discharge. The cistern shall have discharge capacity of 5, 10, 12.5, 13, liters with tolerance of +/-0.5 liter and 15 liters with tolerance of +/-1 liter.

The cistern for a `Stall' type urinal or a W.C. may depending an situation be of glazed vitreous china, color or white with the best quality fittings including brackets, as specified.

7.3 FOR SQUATTING PLATE URINAL:

Capacity : The capacity of the flushing cistern and the size of the flush pipe for the number of squatting plate urinals in a range will be as follows.

Number of urinals of range	Capacity of flushing cistern.	Size of plush pipe Main Distribution.
1	5 liters	25 mm
		20 mm.

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2	10 liters	25 mm	20 mm
3	15 liters	32 mm	20 mm
4	15 liters	32 mm	20 mm

The cistern shall be fixed on R.S. or C.I. cantilever brackets of requisite strength which shall be embedded or fixed to the wall by means of wooden plug and screws.

8.0 WASHING BASINS

8.1 BASIN: The wash basins shall be of white or colored vitreous china as specified and of approved quality, make and pattern. It shall be one-piece construction with an integral combined overflow. The size of the basin shall be as specified.

8.2 FITTINGS: Each wash basin shall be provided with 15 mm C.P. brass pillar taps as specified, 32 mm C.P. waste - chain and rubber plug, unions, joints etc. complete in all respects of approved quality.

8.3 FIXING. The basin shall be supported on a pair of M.S. or C.I. Cantilever or Nylon type brackets of requisite strength embedded or fixed in position by means of wooden cleats and screws. These metal brackets shall be painted to the required shade including a coat of anti-corrosive paint. The plaster on the rear shall be cut to overhang the top edge of the basin.

8.4 WASTE CONNECTION. The waste shall discharge into a floor trap leading to a gully trap, on ground floor and on upper floor it may be connected to waste pipe stack.

Where specified wash basins shall be provided with a 20 mm. G.I. puff pipe terminating with a brass perforated cap screwed on to it on the outside of the walls or connected to anti-siphoned stack. When the waste pipe discharges freely into a channel or floor trap and is of short length without any bends, no puff will be necessary.

9.0 KITCHEN SINKS: Unless otherwise mentioned the kitchen sink with drain boards shall be of stainless steel and of approved quality, make and pattern. It shall be of one-piece construction with an integral combined overflow, the size of the sink & drain board shall be as specified.

9.1 FITTINGS: Each sink shall be provided with 15 mm. brass C.P. long body bib cock, 40/32 mm. waste, chain and rubber plug, unions joint etc. complete in all respect as specified and of approved quality.

9.2 FIXING: The sink shall be supported on a pair of M.S. or C.I. cantilever brackets or requisite strength embedded or fixed in position by means of wooden cleats and screws. The brackets shall be painted to required shade including a coat of anticorrosive paint.

9.3 WASTE CONNECTION: The waste shall discharge into a floor trap leading to a gully trap, on ground floor and on upper floor it may be connected to waste pipe stack with bottle tap/PVC waste pipe.

10.0 TOILET REQUISITES.

- 10.1 MIRROR:** The mirror shall be of approved make glass with beveled edges. The size and shape of the mirror shall be as specified. It shall be mounted on an asbestos sheet and shall be fixed in position by means of 4 C.P. brass screws and washers over rubber washers and wooden plugs firmly embedded in the wall C.P. brass clamps with C.P. screws an alternatively with fiber glass frame.
- 10.2 SHELF.** The shelf shall be of glass of approved quality with edge rounded off or of vitreous china (colored or white) of approved made. The size of the shelf shall be as specified. The shelf shall have C.P. brass or aluminum guard rail with rubber washers on positions resting on glass plate and C.P. brass or aluminum brackets which shall be fixed with C.P. brass or aluminum screws to wooden plugs firmly embedded on the wall.
- 10.3 TOWEL RAIL.** The towel rail shall be of C.P. brass of aluminum with two C.P. brass or aluminum brackets. The size of the rail shall be as specified. The bracket shall be fixed by means of C.P. brass or aluminum screws to wooden cleats firmly embedded in the wall.
- 10.4 CHROMIUM PLATED STOP COCK, TAPS, BIB COCKS, SHOWER SET, GUN-METAL PEETS VALVES:** If not mentioned otherwise schedule, cocks and taps are to be of brass standard head chromium plated of approved make and pattern. They must be capable to withstand at least 10.5 Kg/Sqcm pressure applied for 5 minutes without leakage. The valve is to be of peet type gunmetal valves. Other conditions remain same as cocks and taps.
- 10.5 LIQUID SOAP HOLDER:** This shall be glass or P.V.C. or C.P. brass specified. It shall be fixed in position by means of C.P. brass screws to wooden cleats embedded in the wall. The liquid soap holder shall be of approved make.
- 10.6 TOILET PAPER HOLDER.** The paper holder shall be of C.P. brass or vitreous china as specified. The rolled wooden paper holder shall be made of well-seasoned teak wood.

**TECHNICAL SPECIFICATION FOR INTERNAL SANITARY INSTALLATIONS
AND DRAINAGE WORK**

1.0 GENERAL SPECIFICATIONS

All water supply, internal sanitary installation and drainage work will be carried out by skilled and licensed plumbers in proper workman like manner complying in all respect with the requirement of the relevant by laws. Preparation and obtaining sanction of drainage and water supply plans, necessary punching of G.I. pipes and fittings from statutory body, which will be incorporated in the work, including any charges if payable to the Municipal or to the local bodies in whose jurisdiction the work is to be executed, shall be borne by the contractor. Items of works not covered by the Technical Specification shall be carried out as per best practice according to the direction of the Architect / Consultant / Owner / Employer. Unless otherwise specified in the general cost of all stages of works mentioned in the schedule of quantities shall be deemed included in the rates of the items.

2.0 LAYING AND JOINTING OF H.C.I PIPES AND FITTINGS EXTERNAL WORKS

H.C.I. pipes and fittings: Cast iron, soil waste and vent pipes and fittings where specification shall conform to the latest B.S. 1729 for these pipes. The pipes shall have spigot and socket ends.

Weight: Standard weight and thickness of pipes are given below and a tolerance upto 10% may however be followed against these standard weights.

Sl. No.	Nominal dia of pipe	Soil Waste & Vent Pipes I.S. 1729-1964	
		Minimum Thickness	Nominal weight for 1.8 M long pipe exclusive of ears
1.	50	5	11.41
2.	75	5	16.52
3.	100	5	21.67
4.	150	5	31.92

These shall be free from cracks and other flaws. The interior of pipes and fittings shall be clean and smooth and painted inside with an approved anti-corrosive paint.

Laying Any deviation either in plan or elevation less than $11 - \frac{1}{4}$ degree shall be effected by laying the straight pipes round a flat curve of such radius that minimum thickness of lead at the face of the socket shall not be reduced below 6 mm or the opening between spigot and socket increased beyond 12 mm at any joint. A deviation of about $2 - \frac{1}{4}$ degree can be effected at each joint in this way. At the end of each day's work the last pipe laid shall have its open ends securely closed with a wooden plug to prevent entry of water, soil, rats and any other foreign matter into the pipe.

Lead Caulked Joints with Pig Lead This type of lead caulking is generally done in providing joints in gas water and sewer lines wherever it is practicable to use cost lead caulking, but not in case of wet conditions. The approximate depth and weight of pig lead for various diameters of C.I. pipes and special shall be as given below.

LEAD FOR DIFFERENT SIZES OF PIPES

Nominal Size of Pipe	Lead / Joint (Kg.)	Depth of Lead Joint (mm)
88	1.8	45
100	2.2	45

Note – The quantity of lead given in the table are provisional and a variation of 20 percent is permissible.

Just sufficient quantity of spun yarn shall be put so as to give the specified depth of lead.

JOINTING: The spun yarn shall first be inserted and caulked into the socket as described under jointing with pig lead. Lead wool or yarn shall then be introduced in the joint in strings not less than 6 mm thick and the caulking shall be repeated with each turn of lead wool or yarn. The whole of the lead wool or yarn shall be compressed into a dense mass. The joint shall then be finally finished flushes with face of the socket.

TESTING: All H.C.I. pipes and fittings including joints shall be tested by smoke test and left in working order after completion. The Contractor shall have to rectify all defects traced in such tests of his own expenses to the complete satisfaction of the Architect /Consultant / Owner / Employer.

PAINTING: All exposed H.C.I. pipes and fittings shall be painted with the approved colour with two coats of 1” quality synthetic enamel paint over a coat of primer including preparation of surface.

MEASUREMENTS: The net length of pipes as laid or fixed, shall be measured in the running meters correct to a cm. specials shall be excluded and enumerated separately. The portion of the pipe within the collar at the joints shall however, not be included in the length of pipe work.

Excavation, refilling, shorting and timbering in trenches masonry or concrete pillars and thrust blocks, wherever required, shall be measured separately, under relevant items of work.

RATE: The rate shall include the cost of materials and labor involved in all the operations described above.

2.1 STONEWARE PIPES FOR DRAINAGES

Salt-glazed Stoneware Pipes / Lead Glazed Stoneware Pipes

Stoneware pipes and Gully Traps shall be of first-class quality, Salt-glazed and free rough texture inside and outside and straight. All pipes shall have the manufacturer's name marked on it and shall conform to I.S. 651/1971.

Alternatively, Salt-glazed pipes and fittings which conform to the following specifications may be used.

"The pipes and fittings shall be known as Best Commercial Quality and shall be manufactured of similar materials, and in a similar manner by similar process to those used in producing pipes and fittings in conformity with IS: 561/1955. Every pipe and fittings shall have legibly impressed upon it before fixing the pipes and fittings shall be examined and only those which are sound well glazed, free from visible defects which would impair the efficiency of the pipes or fittings, given a sharp clean note when struck with a light hammer and which are straight, shall be deemed to comply with this specifications".

Laying of Stoneware Salt-glazed Pipes / Lead Glazed Stoneware Pipes

Pipes are liable to be damaged in transit and not withstanding tests which may have been made before dispatch, each pipe will be examined carefully on arrival at site. Each pipe shall be rung with a wooden hammer or mallet and those that do not ring true and clear, shall be rejected. Sound pipes shall be carefully stacked to prevent damage. All defective pipes should be segregated, marked in a conspicuous manner and their use in the works prevented and liable to remove from the site as and when ordered.

The pipes shall be laid with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipe jointer room to work right round the pipes and as short as practicable to admit the socket and allow the joint to be made.

Where pipes are not bedded on concrete the trench bottom shall be left slightly high and carefully bottomed up as pipe laying proceeds so that the pipe barrels rest on firm ground. If excavation has been carried too low, it shall be made up with cement concrete mix 1:4:8 at the contractor's expenses and charges.

If the bottom of the trench consists of rock or very hard ground that can not be easily excavated to smooth surface the pipes shall be laid on concrete cradles to ensure even bearing. Nothing extra shall be paid on this account.

Each pipe shall be individually set for line and level by means of sight rails and boning rods as per standard practice.

JOINTING OF PIPES: Tarrad Gasket shall first be wrapped round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid, the pipe shall then be adjusted and fixed in its correct position and the gasket caulked tightly home so as to fill not more than one quarter of the total depth of the socket.

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The remainder of the socket shall be filled with stiff mix of sand cement mortar filled; A fillet should be formed round the joint with a trowel forming an angle of 45 degrees with the barrel of the pipe.

The mortar shall be mixed as needed for immediate use and no mortar shall be beaten up and used after it has begun to set.

After the joint has been made any extraneous materials shall be removed from inside of the joint with a suitable scraper. The newly made joints shall be protected until set from the sun, drying winds, rain or dust. The joints shall be exposed and space left all-round the pipes for inspection by the Employer / Engineer. The inside of the sewer must be left absolutely clear in bore and free cement mortar or other obstructions throughout its entire length. The joints shall be cured for at least for 24 days.

TESTING: All lengths of the sewer and drain shall be fully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manhole to man hole. All pipes shall be subjected to a test pressure of at least two-meter head of water at the highest point of the section under test.

The pipes shall be plugged preferably with standard drain plugs (with rubber strings) on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required bead.

DRAIN LINES SHALL BE TESTED FOR STRAIGHTNESS BY: Inserting a smooth ball of diameter 12 mm less than the bore of the pipe. In the absence of obstruction such as yarn or mortar projecting at the joints the ball should roll down the invert of the pipe and emerge at the lower end.

Means of a mirror at one end and a lamp at the other end. If the pipe line is straight the full circle of light will be seen otherwise obstruction or deviation will be apparent.

All man-holes shall be tested for water tightness by filling them with water and observing and water subsidence of level. The downstream pipe line shall be filled too with water to avoid the difficulty of removing the stopper from the outgo from the man-holes.

MEASUREMENT: For providing, laying and joining of stoneware pipes measurement shall be recorded for the finished length of the pipe line (including joints) i.e. from inside of one manhole to the inside of other manhole in running meters.

Length between gully traps and manholes shall be recorded between the socket of the pipe and inside of the manhole.

No extra payment is admissible for testing as described earlier.

- 2.2 **MANHOLES:** Manholes of different types and sizes shall be constructed in the Drain Line at such places and to such levels and dimensions as shown in the drawings or as directed by Architects / Consultants / Owner / Employer. The size specified shall indicate the inside dimensions of the manholes. The work shall be done strictly as per the drawings and specifications.

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The manholes shall be executed true to dimensions and levels shown on the plan or as directed by Architects / Consultants / Owner / Employer. The excavation shall be done as directed.

Bed Concrete: The manholes shall be built on a bed of cement concrete (1:2:6) 1 Cement: 3 Coarse Sand : 6 Jhamma chips 40 mm size. The thickness of the bed shall be 100 mm unless otherwise specified or directed by Architects / Consultants / Owner / Employer.

Brick Work: The brick work shall be with 1st class bricks cement mortar 1:4 (1 cement: 4 coarse sand).

Plastering & Pointing: The walls of the manholes shall be plastered inside with 20 mm thick cement plaster 1:4) (1 cement: 4 coarse sand) finished with neat cement finished.

Where the saturated soil is met with also the external surface of the walls of the manhole shall be plastered with 12 mm thick cement plaster (1:4) finished smooth up to 30 cm above the highest sub-soil water level with the approval of "Architects / Consultants / Owner / Employer. The plastered area shall be water proofed with addition of approved water proofing compound as per manufacturer's recommendation.

Benching: The channels and benching shall be done in cement concrete 1:2:4 (1 cement: 2 coarse sand : 4 stone ballast 20 mm and rendered with neat cement finish.

R.C. C. Work: R.C.C. work for slabs shall be in cement concrete 1:2:4: (1 cement: 2 coarse sand : 4 stone ballast 20 mm). The thickness of the slab and reinforcement shall be as per standard drawings or as directed.

Foot Rests: All manholes deeper than (1.2 M) shall be provided with M.S. foot rests. Foot rests shall be 20 mm M.S. Square rods or 20 mm dia. M.S. round bars. They shall be embedded in cement concrete blocks 20 x 20 x 10 CMS of 1:3:6 mix.

Foot rest shall be fixed 30 CMS apart vertically and staggered laterally and shall project 10 CMS beyond the surface of the wall.

Foot rest shall be painted with 3 coats of anticorrosive bitumastic paint the portion embedded in the masonry or cement concrete block being painted with thick cement slurry before fixing.

Manhole Cover and Frames: Manhole Cover and Frames shall conform to I.S. 1726

The covers and frames shall be neatly cast and they shall be free from air and sand from cold shuts. They shall be neatly dressed and carefully trimmed. All castings shall be free from voids, whether due to shrinkage gas inclusion or other cause. Covers shall have raised chequered design on the top of it to provide an adequate non slip grip.

The covers shall be capable of easy opening and closing. It shall be fitted in frame in workman like manner. The cover shall be gas tight and water tight. The covers used in manholes in drainage line shall invariably bear the work "DRAIN" on the top and those used for storm water drains shall bear the word "STORM WATER DRAIN".

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These marking shall be done during casting of the covers. The size of covers specified shall be taken as clear internal dimensions of the frame. The approximate weight of the various types of manhole covers and frames shall be as per able given below.

Description	Weight of Cover	Weight of Frame	Weight of Cover and frame
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Medium duty 500 mm 58 Kgs 58 Kgs. 116 Kgs.

2 – ½% variation in weight shall be permissible

Covers and frames shall be firmly embedded to correct alignment and levels in R.C.C. slab in plain concrete as the case may be on the top of the masonry.

After completion of the work manhole covers shall be sealed by means of thick grease.

All manhole covers and frames should be painted both two coats of Acid Alkali proof paint both from inside and outside.

2.3 MODE OF MEASUREMENT: Unless otherwise stated, all pipes shall be measured net, length as laid or fixed and measured liner overall fittings, such as bends, junctions, etc. and given in running meters. The length shall be taken along the center line of the pipes and fittings.

Length of fittings viz; taps, valves, traps, etc. which are paid under appropriate item shall not be re-measured under linear measurements as enumerated above.

Soil, waste and vent pipes shall be measured along the center line of the stack including the connecting bends / tees to W.C. Pan, Nahani trap etc. and shall be paid as enumerated above.

W.C. pan, Lavatory basins, Sinks, drain board, Urinal, Mirrors, Glass Shelf, Toilet paper holder shall be measured by number and shall include all accessories as enumerated in detailed specifications under each item.

Unless otherwise specified, all types of taps, valves, etc. shall be measured by number and paid separately.

Manholes, Inspection Chambers, Gulley traps, etc. shall be constructed according to detailed specifications and measured by number and paid separately. The depth of man hole shall mean the vertical distance from the top of the manhole cover to the outgoing invert of the main drain channel.

LIST OF MATERIALS OF APPROVED BRAND AND MANUFACTURE

No	Item	Approved make
1	Plumbing Fittings	Jaquar/Parryware/Cera/Hindware/Johnson
2	Ci Pipes	Jaiswal/Gini/ equivalent
3	PVC/CPVC uPVC pipes	Supreme/Astral/Ashirwad/ Oriplast
4	Motor pumps	Kirloskar/Crompton/KBC, Willow
5	Foot valve/ Bal Valve	Leader /equivalent
6	PVC water tank	Sintex, Supreme/ Asirwad
7	GI Pipe	TATA/JINDAL/Prakash
8	SWR pipe	Locally available best quality
9	CAST iron Moanhole cover & frame	ISI approved
10	Mirror	As approved

Volume – III
TECHNICAL SPECIFICATIONS
FOR
ELECTRICAL WORKS (LT)

TECHNICAL SPECIFICATIONS FOR AUTOMATIC POWER FACTOR CORRECTION (APFC) PANEL BOARD FOR LOW VOLTAGE DISTRIBUTION NETWORKS

1.0 GENERAL

- This specification covers the general requirement of Design, Manufacture, Supply and Installation and Commissioning of Automatic Power Factor Correction equipment intended to be used with low voltage distribution networks.
- Power Correction equipment shall be able to improve the power factors as per regulations and shall be suitably rated to improve the system power factor such that power factor shall be near near 1 i.e. Unity, based on the actual load.
- **Panel shall be fabricated/ manufactured by CPRI approved/ authorized/ certified fabricator/ manufacturer only confirming to International standards (IS) & in accordance to the Rules and regulations of IEC. The contractor has to take prior approval from the Bank after the completion of design part. The contractor shall provide CPRI tested certification for the LT panel board without fail.**
- The power factor correction equipment shall normally be connected to the main LV Distribution Boards through dedicated feeders.
- This equipment's installed shall be stand alone with LV Distribution Board.
- Power Factor Correction Equipment's would improve the power factor as per the local utility regulation. This equipment's shall be routine tested (CPRI approved testing) at Panel manufacturer's before dispatch.

2.0 APPLICABLE STANDARDS

Unless specified otherwise the capacitor banks shall conform in design, material, construction and performance to the latest editions of the IEC standards, their corresponding British European /(BS EN) standards and in particular to the following publications :

IEC 61921:	Power capacitors – Low voltage power factor correction banks.
IEC 60831-1 & 2: having a	Shunt power capacitors of the self-healing type for A.C. systems rated voltage up to and including 1000 V.
IEC 60076-6:	Power transformers - Part 6: Reactors
IEC 60085-1:	Electrical insulation – Thermal evaluation and designation.
IEC 60664:	Insulation coordination for equipment within low-voltage systems.

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IEC 61439-1: eral	Low-Voltage Switchgear and Control gear Assemblies Part 1: General Rules
IEC 60947-1:	Low-voltage Switchgear and Control gear - Part 1: General Rules
IEC 60947-2:	Low-voltage Switchgear and Control gear - Part 2: Circuit Breakers.
IEC 60947-4-1: and Motor-	Low-voltage Switchgear and Control gear – Part 4-1: Contactors starters.
IEC 62208:	Empty enclosures for low-voltage switchgear and control gear assemblies – General requirements
IEC 60529:	Degree of protection provided enclosures (IP code)
IEC 62262:	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
IEC 61000-6-4:	Electromagnetic compatibility – Generic standards – Emission standard for industrial environments
IEC 61000-6-2: 61000-3 distorting installations	Generic standards – Immunity for industrial environments IEC Assessment of emission limits for the connection of to MV, HV and EHV power systems.
IEEE 519-2014: Control in	IEEE Recommended Practices and Requirements for Harmonic Electric Power Systems.

- In addition to the above listed standards, the Rules and Regulations for electrical installations issued by CEA regulation shall also be adhered to.

3.0 MARKING

The contractor shall arrange the following minimum information provided by the CPRI approved panel manufacturer/ fabricator in an instruction sheet and on a rating plate to be fixed on the assembly:

- 1) Manufacturer's name or trademark.
- 2) Serial number.
- 3) Date of manufacture

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- 4) Rated reactive power, QN in kilovars (kVar).
- 5) Rated voltage, UN in volts (V).
- 6) Rated frequency, fN in hertz (Hz).
- 7) Minimum and maximum ambient temperatures in degrees Celsius (°C).
- 8) Degree of protection.
- 9) Short-circuit withstand strength, in amperes (A)
- 10) Number of stages
- 11) Step Size

4.0 CONSTRUCTION OF AUTOMATIC CAPACITOR BANK

- The enclosure housing the capacitor units shall be of minimum 1.5 mm thick electro galvanized sheet steel folded and welded construction, floor mounted, free standing or wall mounted type with a minimum degree of protection of IP54 complete with a hinged lockable door.
- The enclosure system for capacitor bank shall be of certified design as per IEC 62208.
- The enclosure system should have a minimum of IK 10 certification (external mechanical impacts) in accordance with IEC 62262.
- All enclosures or partitions including locking means and hinges for doors shall be of a mechanical strength sufficient to withstand the stresses to which they may be subjected in normal service, and during short-circuit conditions.
- The enclosure will be wired at manufacturer/fabricator and comprise mainly of the following:
 1. Power factor improvement 3 phase capacitors, arranged in a suitable number of stages.
 2. Detuned three phase iron cored series reactors for harmonic current suppression.
 3. Microprocessor based power factor regulator for automatic power factor correction.
 4. 3 pole contactors for capacitor switching.
 5. MCCB for each capacitor stage unless stated otherwise.
 6. Main incomer isolating switch / MCCB.
- The automatic capacitor bank should be ready for field connection with all the components clearly labeled for identification.
- To ensure safety, reliability and accountability of component coordination, all the major capacitor bank components such as capacitor units, de-tuning reactors, PF controllers, Contactors called for in this specification should be preferably from a single source (manufacturer/ fabricator).
- The Power Correction Equipment shall be installed in cool ventilated locations away from other heat radiating elements.
- The Capacitor bank shall be designed for trouble free service under the arduous Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

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temperature conditions as defined in Regulations and typical of Indian Continental. The capacitor banks shall be operable on 50 Hz and shall meet or comply with IEC, IEC 61921 and IEC 61439-1.

- The Design and component selection shall consider continuous operation at a maximum system voltage of 415V and ensure reliable performance in consideration of room ambient temperature of 50 degree Centigrade.
- All Components shall can withstand the dynamic, thermal and dielectric stresses resulting from prospective short circuit currents without damage or injury to personnel. Due to the presence of harmonic currents and to manufacturing tolerances, components (MCCB/ isolator, busbar & power cables) shall be designed for 1.5 times nominal current.
- Ventilation fan and air inlet filter unit shall be provided for the capacitor banks to facilitate better heat dissipation. The ventilation fan shall be operated by two numbers of thermostat set at 35° and 55° Centigrade respectively.

Dimensional Details: Standard dimensions shall be ensured confirming to the IS and IEC standards mentioned above.

5.0 BUSBARS

- The bus bar section of power factor assemblies shall withstand, as a minimum, the fault current of the system at the point where it is intended to be connected. Usually, these assemblies are connected onto a section of the main installation where the fault current are quite high. Busbars shall be tin plated copper, rectangular and rigid construction.
- The phase busbar shall be arranged systematically and assembled using insulators.
- The busbars shall be protected with poly carbonate shrouds from all sides.
- The busbar assembly shall be fully shrouded (at least IP20) so that no live parts are accessible. Phase identification (colour code) shall be done systematically.
- The rating of the main busbar assembly shall be to suit the incoming switching device rating. The main busbars of the capacitor banks are preferred and recommended to be in separate busbar chamber, wherever applicable.
- Tin plated copper busbar and earth busbar shall be located on both sides of the in-comer Busbars shall be provided with a suitable termination facility for connecting the main neutral and earth cable. Extra termination shall be provided on the earth bar for the bonding purpose.

6.0 TECHNICAL REQUIREMENTS

6.1 CAPACITOR UNITS:

Capacitor units shall be/of/have

1. Dry type
2. Suitable for a network voltage of 415 volts and shall be rated at minimum 525V for 14% detuned banks.
3. Suitable for continuous operation line current of 1.3 times the current which occurs at rated sinusoidal voltage and rated frequency excluding transients
4. Temperature category of the capacitor units shall be -5/D. Casings shall be metallic. Completely leakage proof.
5. Self-healing ability, where a damage of some part of the dielectric due to a microscopic flaw in the dielectric film, caused by over-voltage, can be self-healed quickly and returned to normal state.
6. A 3-phase pressure switch disconnecter for protection against internal faults, over pressure, etc. should be available. The pressure switch disconnecter must isolate all the three phases simultaneously in the event of fault. To ensure full functionality of the pressure switch disconnecter, its elastic elements must not be hindered, i.e.
 - a. Connecting lines must be flexible leads.
 - b. There must be sufficient space for expansion above the connections
7. The built-in discharge resistors shall not be accessible (fitted at CPRI approved manufacturer/ fabricator) and tamper proof. The discharge resistors shall ensure reduction in capacitor voltage to less than 50 volts in 1 minute after switch off.
8. The total losses including discharge resistors to be less than 0.5 Watt/KVAR. Capacitance tolerance shall be within +/- 5% of the rated value.
9. The Capacitor unit shall be capable of withstanding the inrush current up to 200 times of its rated current.
10. The rated output of the capacitor Unit has to be at the supply voltage of 415V and 50 Hz frequency. The capacitors used in conjunction with reactors shall be suitably de-rated to deliver the designed output at 415V.

6.2 DE-TUNING REACTORS:

1. Capacitors with detuned filtering technique shall be employed to correct power factor while avoiding the risk of resonance condition. This shall be performed by shifting the resonance frequency to lower values where no harmonic currents are present, by introducing a filter reactor in series with the capacitors, such that the capacitor / reactor combination is inductive at the dangerous frequencies but capacitive at fundamental frequency. The circuit should be tuned such that the series resonant frequency should be below the lowest harmonic order expected to be present in the electrical network.
2. The de-tuning reactors shall be connected in series with each capacitor stage and

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shall be of iron cored type.

3. The Detuned Reactor Should be equipped with Thermal Switch inside the Winding which should cut-off the respective contactor in case of Over-temperature.
4. The capacitors used in conjunction with reactors shall be suitably de-rated to deliver the designed output at 415V.
5. The reactor insulation shall be Class "F" or above. The maximum temperature of the reactor at maximum continuous RMS amperage shall be no higher than 145°C at a 50°C ambient. The capacitor and reactors shall be tuned for 135 Hz and 14% relative impedance (2.7 tuning order) for 3rd Harmonics present in the network.
6. Tolerance of reactors shall not exceed +/-3% of rated value.

6.3 POWER FACTOR CONTROLLERS:

The power factor controller shall/ be able to:

1. Microprocessor based and shall be able to sense the reactive current requirement of the network and shall switch ON / OFF the required stages of a capacitor bank.
2. Insensitive to wirings such as reversed CT connection, PT on a wrong phase etc.
3. Detect any stage size by automatic recognition and the switching sequences should be user defined. Detect the capacitor bank size if in case the present capacitor is replaced by a new capacitor of different rating is equipped with LCD display which shows at any time power factor, internal capacitor bank temperature and monitors the line frequency. Suitable for 1A or 5 A current input and operating in temperatures up to +50 degrees C.
4. The capacitor Bank and controller shall ensure that after the loss by fault of any one stage, it shall continue to operate automatically and shall follow rotational switching.
5. Recognize the connection of CT and Voltage and be able to automatically adjust itself to the phase angle difference. Regulator shall have capability to automatically search and set the C/K setting, it shall be also possible to program the C/K setting manually.
6. Have a minimum time delay of 120 seconds for switching on a capacitor into circuit, from its last disconnection from the circuit.

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7. The ingress protection of the regulator shall be minimum IP 40.
8. The regulator must be panel mounted, shall be easily programmable and shall conform to safety guidelines as per IEC 61010-1:2001
9. The regulator must be suitable for 1 A or 5 A current input and shall be sensitive to a minimum current input of 40mA. The threshold value for the operating temperature and system harmonics shall be programmable and the regulator shall be able to switch off the connected capacitor stages if the actual values exceed the thresholds.
10. Be equipped with RS 485 communication port.
11. Dual Cos Phi – The Controller should have programmable dual cos phi to differentiate the need in compensation (Cos Phi) when the operating condition changes. Like Peak Hour (2:30- 3:30PM when the target PF could be increased to 0.98) or Power factor correction needs with a utility supply changes when the input power is from an in house Generator.
12. The Power factor controller/regulator should allow the following readings.
 - a) Automatic initialization and stage rating detection
 - b) Any step sequence detection (User definable step sequence)
 - c) Measurement of capacitance per stage
 - d) Cap bank over load current ratio
 - e) THD Voltage
 - f) 4 Quadrant operation
 - g) Active , reactive and apparent power
 - h) Record of the Max temp internal of the capacitor bank since reset
 - i) System Voltage (V AC)
 - j) Frequency
 - k) Apparent Power (kVA)
 - l) Apparent current (A)
 - m) Temperature (°C)
 - n) Real time Cos phi
 - o) kVAr value to target Cos phi
13. **The controller shall initiate alarms and warnings in the following events.**
 - a) Temperature limit is exceeded
 - b) Insufficient capacitor output
 - c) Overload current ratio limit is exceeded
 - d) Under voltage, Over voltage
 - e) THDU limit is exceeded
 - f) Low power factor/ under compensation.
 - g) Over compensation
 - h) Over current
 - i) Capacitor step defective

6.4 SHORT CIRCUIT AND OVER LOAD PROTECTION:

1. The capacitor bank shall be protected by a suitably rated MCCB/Isolator at the incomer. It shall have a rotary front operating door mounted handle and should be interlocked with the door to ensure that the capacitor bank is de-energized when door is open.
2. The MCCB/Isolator shall be a three pole and shall fully comply with the requirements of the IEC 60947-1 & 2. The MCCB shall be rated for a minimum insulation voltage of 660 V and designed for an ambient temperature of 50 degrees C.
3. The current rating shall be at least 1.5 times the full load current of the capacitor bank and shall have a better mechanical endurance. Each stage of the capacitor bank shall also have a suitably rated MCCB with an electronic over-current relay for overload protection. The electronic over-current relay shall be adjusted to trip if the RMS current of the stage exceeds the overload setting.
4. The combination of bus bars and stage breakers shall be designed for a short circuit withstand of 50kA/1sec minimum.

6.5 CONTACTORS (STAGE SWITCHING):

1. Depending on the requirements either electromagnetic contactors or electronically controlled (using durable and reliable electronic switch) contactor shall be used for switching PFC capacitors. For transient free switching, suitable and durable electrical/ electronic switches viz. **capacity duty contactors** shall be employed.

6.5.1 ELECTROMAGNETIC CONTACTOR:

1. The contactors shall be of type three poles, specially designed for switching capacitors and shall be able to make against large transient current peaks at a high frequency of several kHz that can occur on capacitor switching.
2. The contactors shall isolate all the three supply phases to the capacitor on switch off. Contactors along with damping resistors (AC6b) shall be used where there is a possibility of high inrush peak current to reduce it.
3. The capacitor contactors shall be weld resistant up to a possible peak inrush current of $200 * IR$.
4. In case capacitor banks are supplied with Harmonic Blocking Reactors, contactors for capacitor switching shall be without damping resistors (AC3), because the peak current limitation is provided by Reactor impedance.

6.6 ENCLOSURE SYSTEM:

1. The enclosure system for capacitor bank shall be confirming to above mentioned IS and IEC and to be manufactured/ fabricated by the CPRI approved manufacturer/ fabricator.
2. The degree of protection of enclosures system shall be in accordance with IEC 60529.
3. The enclosure system should have a certification for steady-state sinusoidal vibration in accordance with standard IEC 60068-2-6.
4. Components such as capacitor units, series reactors, power factor controller, electro-magnetic / thyristor switched contactors, switch-disconnector, MCCBs etc. shall be housed in this enclosure. The capacitor bank shall be free-standing type and the doors must incorporate 3- point locking system.
5. The enclosure door shall be interlocked with the incomer MCCB / switch-disconnector. Doors shall not be provided on the sides / rear of the capacitor bank.

7.0 TESTING AND INSPECTION

7.1. ROUTINE TESTS:

1. All tests shall be carried out in the presence of engineer in charge, at such times as he may reasonably require.
2. All samples used for testing shall be to the contractor's expense and shall not affect the quantities to be supplied under this contract.
3. All instrument used for testing purposes, shall be calibrated by an approved/ competent authority.
4. The cost of all tests shall be included in the contract price and shall not be quoted separately.

a) Routine Tests on Capacitor Bank

- Routine tests shall be carried out on every Low voltage power factor correction banks before delivery at site.
 - Inspection of the assembly including inspection of wiring and, if necessary, an electrical operation test
 - Dielectric test

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- Checking of protective measures and of the electrical continuity of the protective circuit
- Verification of insulation resistance

b) Routine Tests on Capacitor Units

Routine tests shall be carried out on every capacitor unit before delivery at site. Capacitor Banks should accompany the test reports of the Capacitor Units used issued by the manufacturer/supplier.

- Capacitance measurement and output calculation
- Voltage test between terminals
- Voltage test between terminals and container
- Test of the internal discharge device
- Sealing test

7.2. SITE TESTS:

1. The contractor is responsible for submitting all contract works to site inspection by the Engineer/Architect, before site tests are commenced. Before commissioning, the contractor shall depute an experienced and qualified testing Engineer from the manufacturer's works to carry out the following tests on the equipment and such other tests that may be considered necessary by the Purchaser.
2. The Site Acceptance Test (SAT) format for the capacitor bank shall be forwarded to the purchaser prior to the SAT.
3. The contractor's test engineer shall complete all pre-commissioning tests, commission all plant and equipment supplied by him and hand over the entire contract works to the Purchaser in good shape. All the charges connected with the pre-commissioning tests of the equipment shall be included in the tender price.
4. The contractor's testing engineer shall carry out all commissioning tests in cooperation with and to the satisfaction of the Purchaser's engineer who will take part in all these tests.
5. The contractor shall arrange all test equipment required for different test purposes at site. The following test / inspections at site shall be carried out:

7.2.1. Mechanical Tests:

1. Visual inspection to verify degree of protection, creepage and clearance distances.
2. All conductors and cables are checked for proper routing and all devices for Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

proper mounting.

3. Check effectiveness of all mechanical devices, e.g. handles, locks, interlocks, operating devices, etc. Check panel conformity to drawing and Engineer's requirements.
 - a) Checking of all mounting plates/fasteners.
 - b) Checking of dimensions and components as per drawings.
 - c) Electrical circuits fasteners tightness/ surface area contacts.
 - d) Crimping and ferrules as per drawing.
 - e) Labels / Identification/ Nameplate.
 - f) All doors checking, safety and accessibility.
 - g) APFC cabinet surface finish / smoothness.

7.3.2 Electrical Tests:

1. Insulation resistance test shall be carried out at all main circuits through to final terminals. Insulation resistance shall exceed 10 mega ohms. Record all measurements.
2. Function test of all circuit breakers switches, contacts, etc. and every circuit to verify correct operation.
 - a) Insulations resistance tests between phases and earth and between neutral and earth.
 - b) Operational test on components.
 - c) Switching ON / Off of capacitor bank on various kVAR requirement.
 - d) Checking of Display parameters.
 - e) Switching On / Off logic verification.
 - f) Data communication through Serial / optical port
 - g) Verification of data/reports/functions in base computer software.

7.3.3 Final Inspection

Prior to energizing the capacitor bank the following checks shall be carried out at site:

1. Operate the equipment through all design functions, including remote operation, actuation of alarm and indicating devices, mechanical and electrical tripping and closing and operation of the protective devices.
2. Insulation resistance measurements on the buses, phase to phase and phase to ground, with all breakers in the fully connected position and contacts open.
3. Control circuit insulation resistance to ground.
4. Inspect all relays and protective devices, and verify settings in accordance with the manufacturer's instructions. Inspect current transformers and relays for correct polarity of connections and the installation of jumpers on unused current

transformer circuits.

5. Manually close and trip each breaker checking and adjusting the main contact alignment and wiring action in accordance with the manufacturer's instructions.
6. Test protective relay operation for incomer air circuit breakers.

With the capacitor bank in operation, measurement of the power factor and system harmonics shall be carried out after commissioning of equipment.

8.0 DRAWINGS AND INFORMATION

The contractor shall furnish the following drawings and documents placed inside the drawing pocket of the equipment supplied:

- Dimensioned drawing showing outline of the capacitor bank
- Single line diagram showing all the major electrical components.
- Protection and control schematics of the capacitor bank
- Details of cable terminations and fittings.
- Technical Manual giving installation, operation and maintenance instructions

9.0 GROUNDING

- All bank and enclosure shall be connected to a 40mm x 6mm earth copper bus bar.

10.0 HANDLING

1. The equipment shall be provided with lifting rings, or provided with provision for using a fork lift truck for handling.
2. For installation, a 250 mm space shall be provided from the front of the bank, in order to have an optimal position of the bank for good ventilation.

11.0 Warranty

The equipment will be guaranteed on our workmanship for a period of 12 months from the date of commissioning or 18 months from the date of dispatch whichever is earlier.

12.0 GENERAL PARTICULARS AND GUARANTEES

CAPACITOR BANKS

- 1) Manufacturer & Country of Manufacture.
- 2) Type and reference
- 3) Supply Voltage V
- 4) Highest System voltage V
- 5) Rated Frequency Hz
- 6) Rated Capacity of Complete Bank
- 7) Number and Capacity of each stage.
- 8) Connection configuration
- 9) Method of control
- 10) Electrical Clearances
 - a. Phase to phase
 - b. Phase to earth

CAPACITOR UNIT

- 1) Manufacturer/Country of Manufacture
- 2) Type reference
- 3) Standards Applicable
- 4) Rated Power kvar
- 5) Rated Voltage V
- 6) Rated Current A
- 7) Rated Frequency Hz
- 8) Rated Capacitance Mf
- 9) No.of Elements(Capacitors)
 - a) In Series
 - b) In parallel

- 10) Continuous Over voltage withstand capability %
- 11) Maximum permissible Overload current %
- 12) Capacitor loss at rated Voltage W
- 13) Type of active element
- 14) Built in Discharge device resistance
- 15) Discharging time to achieve 50V
- 16) Service indoor/outdoor

POWER FACTOR CONTROLLER

- 1) Manufacturer/Country of Manufacture
- 2) Type
- 3) Rated Current
- 4) Supply Voltage
- 5) Measuring Accuracy
- 6) Regulation steps
- 7) Setting range
- 8) Over compensation monitoring Yes/No
- 9) Manual Mode Yes/No
- 10) Degree of Protection
- 11) Communications
- 12) Operating conditions Temp, Humidity

DE TUNING REACTORS

- 1) Tuning frequency
- 2) Detuning Factor
- 3) Inductance
- 4) Nominal Voltage
- 5) Insulation Temperature class

ENCLOSURE

- 1) Type
- 2) Degree of Protection
- 3) Sheet Thickness
- 4) Painting thickness
- 5) Mechanical Protection
- 6) Compartments
- 7) Cooling arrangements and louvers
- 8) Dimensional details

TECHNICAL SPECIFICATIONS FOR INDOOR L.T. DISTRIBUTION PANEL BOARD

- Main LT Distribution Panel Board shall be covered under this section. Panels/Boards shall be suitable for operation on 3 Phase/single phase, 415/240 Volts, 50 cycles, 4 wire system with neutral grounded at transformer. All switchgears shall be fully rated at an ambient of 40 Degree C.
 - The scope of supply covers design, supply, installation, testing and commissioning
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of L V PCC Panel. **Panel shall be fabricated/ manufactured by CPRI approved/ authorized/ certified fabricator/ manufacturer only. The contractor has to take prior approval from the Bank after the completion of design part. The contractor shall provide CPRI tested certification for the LT panel board without fail.**

- The equipment covered under this specification shall conform to the latest revisions of relevant Indian and International Standards some of which are listed below.

IS 13947 1993	:	General requirements of Switchgear and Control Gear for Voltage not Exceeding 1000 / 1200V AC
IS 11353 1985	:	Guide for uniform system of marking Identification of Busbar and Terminals.
IS 13703 1993	:	Low voltage fuses
IS 2705 1992	:	Current transformers
IS 694 1990	:	PVC insulated cables for voltages including 1100 V with Copper and Aluminum conductor)
IS 1248 1983	:	Direct Acting Electrical Indicating Analog
IS 8623 1993	:	Low voltage Switch gear & control gear assemblies
IS 5082	:	Electrolytic Aluminum Busbar, Trunking system, Rod tubes & sections for Electrical purposes.
IS 13779 1999	:	AC Electric Meters / Static Meters.

1.1 Construction Features

1. The panel board shall be metal clad sheet steel enclosed cubicle, fully compartmentalized, floor mounting type suitable for indoor installations and extensible type.
2. The panel board shall be metal clad sheet steel enclosed cubicle, fully compartmentalized, floor mounting type suitable for indoor installations. All the doors and covers shall be fully gasket to prevent any ingress of dust. The enclosure shall be for Indoor type and completely dust, damp and vermin proof. Gasket used for all doors shall be of double lip type.
3. The switchboard cubicles shall have structural steel frame work enclosed on all sides and top by CRCA sheet steel of minimum thickness.
4. The panel board shall have integral base frame.
5. Removable undrilled gland plates shall be fitted for bottom cable entry.
6. All fixing bolts, screws etc. appearing on the panel shall be so arranged as to present a neat appearance.

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7. Door hinges shall be concealed type.
8. Front access shall be available to all components in each cubicle which require adjustment, maintenance or replacement.
9. Unless otherwise approved, incomer and bus section panels or sections shall be separate and independent and shall not be mixed with sections required for feeders.
10. Overall height of the panel shall not exceed 2.4 meters. Operating levers, handle etc. of highest unit shall not be higher than 1.7 meters.
11. Distribution panels shall be of adequate size as indicated in layouts with a provision of spare switchgear as indicated on the Single Line Diagram. Feeders shall be arranged in multi-tier. Knockout holes of appropriate size and number shall be provided in the Distribution panels in conformity with the location of cable/conduit connections. Removable sheet steel plates shall be provided at the top/Bottom to make holes for additional cable entry at site if required.
12. Every cabinet shall be provided with Trifoliate or engraved metal name plates. Panel board shall be provided with single line circuit diagram showing the arrangement of circuit inside the distribution board shall be pasted inside of the panel door and covered with transparent laminated plastic sheet. All live accessible connections shall be shrouded and shall be finger touch proof and minimum clearance between phase and earth shall be 20 mm and phase to phase shall be 25 mm.

1.2 Bus Bar & insulating materials

1. The busbars connections and bus taps to individual feeders shall be by means of electrolyte copper bus bar. Busbars shall be colour coded for ready identification of phases. The Busbar sizes shall be determined taking into consideration the continuous rating and fault level of 50 KA (1 sec) without exceeding the final temperature of 105 degree C under rated current.
2. Auxiliary busbars each of minimum 25 sq. mm thick electrolytic tough pitch copper shall be provided for following applications. Exact number of busbars shall depend on various controls, metering and auxiliary power distribution requirements.
3. All the Phases and Neutral Busbar shall be provided in the same compartment for main power as well as for DG power.
4. The busbars shall be supported of regular intervals using SMC or DMC insulators It should have Very high Comparative Tracking Index (CTI > 600 as per IS 2824). Only zinc passivated high tensile strength steel bolts, nuts & washers etc. shall be used for all bus-bar joints & supports.
5. The busbars shall be colour coded using identifying colour rings at regular interval. Red, Yellow & Blue colour shall be used for phases & Black for neutral. The earth Busbar shall be identified with Green colour rings at regular intervals. Minimum clearance between phases / live parts shall be 25 mm and phases / live

parts / neutral to ground shall be 19 mm except on the equipment terminals.

6. Spare contacts shall be wired up to terminal block. Auxiliary contacts in the „trip“ circuit shall close before the breaker main contacts close and shall open after the main contacts have opened. All other contacts shall operate simultaneously with the main contacts.

1.3 Small Wiring

All small wiring for Controls, Indication etc. shall be of FRLS (Flame retardant Low Smoke) copper conductor cables. Minimum size of conductor for power circuits shall be 2.5 sq. mm copper or 6 sq. mm aluminum. All control wiring except CT secondary wiring shall be carried out with minimum 1.5 sq. mm copper conductor. CT secondary wiring shall be carried out with 2.5 sq. mm copper conductor. All wiring shall be securely fixed and neatly arranged to enable easy tracing of wires. All terminal blocks and wires shall be tagged/ Ferruled at both the ends for identification in accordance with IS 11353. All wiring for external connections shall be brought out to the individual terminals on a readily accessible Terminal block; all terminal block shall be shrouded or provided with transparent covers. Clamp type control terminal blocks shall be provided for outgoing control cables. Minimum 10% spare terminals shall be provided for future use. **Control terminal block shall be separated from power terminal blocks by means of an insulating barrier**

1.4 Earthing

Earthing - Two earth terminals shall be provided on each side of switchboard. An earth bar size must be at least 50 x 10 mm Aluminium suitable for 30kA for 1 sec. shall be provided. The earth bar shall be electrically continuous and shall run the full extent of each board. This earth bar shall be on the same side as the cable entry. Each unit shall be constructed to ensure satisfactory electrical continuity between all metal parts not intended to be alive and earth terminals of the unit. Suitable holes with bolts and nuts shall be provided at each end of earth bar of switchgear for connection to a main Earthing grid. The earth bar shall be accessible in each cable entering compartment either directly or through a branch extension to ground the cable armour and shields. 10 mm Ø holes shall be drilled and hardware for connection provided through the earth bus.

Door earthing shall be provided for all the compartment.

The armour shall be properly connected with earthing clamp and the clamp shall be ultimately bonded with the earth bar.

1.5 Cable Terminations and Marshalling Box

Cable entry to switchgear shall be from top/bottom of the switchgear or as specified in the technical particulars. Ample space shall be provided in the cable compartment to accommodate XLPE insulated aluminum conductor cable as specified in the technical particulars.

Removable undrilled gland plate shall be provided for termination of Cables

1.6 Painting and Finishing

All metal works and metal parts of the panel boards shall undergo a process of degreasing, pickling in acid, cold rinsing, phosphatizing, passivating and then sprayed with double coated a high corrosion resistant primer shall be applied before painting.

The finishing treatment shall be by application of 2-coat of **RAL 7032**.

1.7 Name Plates & Label

A separate name plate mentioning designation of the feeder/panel board shall be affixed prominently on the front top. Details of designation shall be specified. Labels giving following details shall be affixed on each feeder panel

- 1.7.1 Feeder No - As per feeder list
- 1.7.2 Equipment tag Number and Description
- 1.7.3 Rating (kW/kVA/Amp)

A name plate with the panel's designation in bold letters shall be fixed at top of the central panel. A separate name plate giving feeder details shall be provided for each feeder module door.

Inside the feeder compartments, the electrical components, equipment, accessories like switchgear, control gear, lamps, relays etc. shall suitably be identified by providing stickers.

All components whether mounted inside the switchboard or on the door shall be permanently and clearly labeled with reference number and/or letter of their function. Labels for feeder panel designation shall be fixed on the front side of respective panels shall be engraved name plates preferably of 3 ply (Red-White-Red or Black-White-Black) lamicold sheet. However, black engraved Perspex sheet name plates shall also be acceptable. Engraving shall be done with square groove cutters.

1.8 Testing and Inspection

The following tests shall be carried out by the contractor:

- 1.8.1 All routine tests specified in relevant Indian Standards and witnessed by buyer.
- 1.8.2 Vendor shall submit all following test report as per the latest IS & IEC Standards:
 - 1.8.2.1 Short Circuit withstand test for main Busbar and neutral Busbar
 - 1.8.2.2 Temperature rise test
 - 1.8.2.3 IP test
- 1.8.3 Operation of all meters.
- 1.8.4 Secondary wiring continuity test with a low voltage (6 volts) tester.
- 1.8.5 Insulation test with 1000 volts megger, before and after H. V. test.
- 1.8.6 H. V. test at 2.5 kV for 1 mtr.
- 1.8.7 Earth continuity test with a low voltage (6 volts) tester.

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1.8.8 Simulating control circuits for various operations of feeders

1.8.9 C. T. Polarity Test.

1.9 Technical Requirements - PCC

General Requirements

Service	:	Indoor
Enclosure	:	CRCA sheet steel
Min Degree of Protection	:	IP 54
Execution	:	Double front
Incomer MCCB	:	Thermal magnetic
Outgoing MCCB	:	Thermal magnetic
Extensibility	:	Extensible on both sides

Enclosure

Sheet steel thickness (mm)	:	Base frame/channel – 2.5 mm Front door & Load Bearing member – 2 mm Internal partitions – 1.6 mm
Surface treatment	:	7 Tank surface treatment.
Painting	:	Epoxy painted.

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Paint shade : Light Grey

Main Busbar

Material : Electrical grade Copper

Rated continuous current : As per TTA design certification

Maximum operating
Rated short time current (kA- RMS) : 21 kA sym
for 1

Heat shrinkable sleeving : Yes with Shrouds for
Joints Current rating of busbar : As per requirement
droppers in vertical section

Busbar support : SMC/DMC

Earth Bus

Material (min.) : Aluminium 50 x 10 Sq.mm size

Short circuit capacity (KA) : 36kA current for 1 Sec.

1.10 Moulded Case Circuit Breaker (MCCB)

1. The MCCB should be current limiting type with trip time of less than 10 ms under short circuit conditions. The MCCB should be either 3 or 4 poles as specified in BOQ. MCCB shall comply with the requirements of the relevant standards IS13947 – Part 2/IEC 60947-1&2 and should have test certificates for Breaking capacities from independent test authorities CPRI/ ERDA or any accredited international lab.
2. The MCCB shall be rated at operational voltage of 415V, 50/60Hz supply system, and 40°C ambient temperature. In case of deration due to operating temperature the same should be indicated and should be done in line with the required ratings of MCCB
3. MCCBs shall be available in fixed or plug-in/withdrawable versions as well as in 3-pole and 4-pole versions. For plug-in/withdrawable versions, a safety trip shall provide advanced opening to prevent connection and disconnection of a closed circuit breaker.

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4. MCCBs shall be designed for both vertical and horizontal mounting, without any adverse effect on electrical performance. It shall be possible to supply power either from the upstream or downstream side.
5. MCCB shall comprise of Quick Make -break switching mechanism, arc extinguishing device and the tripping unit shall be contained in a compact, high strength, heat resistant, flame retardant, insulating moulded case with high withstand capability against thermal and mechanical stresses
6. Beyond 300Amps capacity MCCBs shall have positive isolation and preferably double break / contact repulsion & double insulation features.
7. The breaking capacity of MCCB shall be as specified in the schedule of quantities. The rated service breaking capacity (Ics) should be equal to rated ultimate breaking capacities (Icu).MCCBs for motor application should be selected in line with Type-2 Co-ordination as per IEC-60947-2, 1989/IS 13947-2. The breaker as supplied with ROM should meet IP54 degree of protection.

a) Current Limiting & Coordination

The MCCB shall employ maintenance free minimum let-through energies and capable of achieving discrimination up to the full short circuit capacity of the downstream MCCB.

Protection Functions:

1. MCCBs with ratings up to and including 630 A shall be equipped with thermal magnetic trip units in order to ensure the protection against overload and short-circuit.
2. Electronic and thermal-magnetic trip units shall be adjustable and it shall be possible to fit lead seals to prevent unauthorized access to the settings
3. MCCBs, the current ratings of which are identical with the ratings of their trip units, shall ensure discrimination for any fault current up to at least 50 kA rms
4. Protection settings shall apply to all circuit breaker poles.
5. Thermal-magnetic trip units (up to and including 630 A) shall have adjustable thermal protection from 0.8 to 1.0 times the current rating , Adjustable magnetic protection for current setting values from 10 to 15 times of rated current. It shall be possible to ensure neutral protection. The tripping threshold shall be equal to that of the phases or to a reduced value (generally half of that of the phases). Thermal magnetic MCCBs shall be provided with identification facility for short circuit fault.
6. In the event of repeated overloads, the electronic trip unit shall optimize protection of cables and downstream devices by memorizing temperature variations.
7. Thermal-magnetic trip units shall be adjustable and it shall be possible to fit lead seals to prevent unauthorized access to the settings
8. Protection settings shall apply to all poles of circuit breaker.

Additional details for individual accessories

a) Internal Accessories

Functions: 3 different types of auxiliaries shall be available:

1. Auxiliary Switch
2. Signaling Switch
3. Lading contact
4. Shunt Trip - continuous rated, with wide band site selectable voltage (24-48V AC/DC or 110V DC or 230-500V AC or 230V DC)
5. Under voltage Release- continuous rated, with wide band site selectable voltage (24-48V AC/DC or 110V DC or 230-500V AC or 230V DC)
6. Mounting electrical auxiliaries should not affect the performance of the breaker.
7. Each auxiliary shall be provided with a proper packaging and instruction notice.

b) Mounting and IP

1. The electrical auxiliaries shall be field installable.
2. Electrical auxiliaries shall be easily and rapidly snapped inside the breaker without any tool, behind the auxiliary cover.
3. Lead-wires shall not affect the mounting of the breakers side by side.
4. When auxiliary cover is opened:
 - a) Auxiliaries are held in place by themselves,
 - b) When auxiliaries are mounted, protection against electric shock must be IP20 or IP30.

c) External accessories

1. Mounting accessory on the breaker shall not affect its performances.
2. Accessories shall be field installable.
3. Each accessory shall be provided with a proper packaging and instruction notice.

d) Phase barriers

Phase barriers shall be mounted without any tool and hold in place firmly. They Mounted between phases of a breaker and between breakers mounted side by side. The phase barriers shall be made of an isolating material and should be flexible.

e) Terminal shields

Terminal shields shall be mounted without any tool and hold in place firmly. They shall be made of an isolating material. There shall no requirement of special tool to replace the terminal covers.

f) Direct rotary handle

Standard:

The rotary handle mounted on the breaker shall meet the IEC60947-2 requirements and will not affect the performance of the breaker. The rotary handle shall meet IEC60447. When the breaker is mounted with a rotary handle, the isolation function remains and fulfils IEC60947-2.

Installation:

The direct rotary handle shall be mounted easily and rapidly on the breaker on site without removing any part of the breaker or external accessories. The rotary handle shall be mounted easily on 2, 3 and 4 pole breakers.

Operation:

The rotary handle shall indicate the position of the breaker: OFF, TRIPPED or ON. Door should have a door defeat facility to open when the circuit breaker is ON in case of emergency. The door cannot be open if the breaker is ON.

g) Extended rotary handle

Standard:

The rotary handle mounted on the breaker shall meet the IEC60947-2 requirements and will not affect the performance of the breaker. The rotary handle shall meet IEC60447. When the breaker is mounted with a rotary handle, the isolation function remains and fulfils IEC60947-2.

Installation:

The mounting of the rotary handle should be done without removing the breaker if mounted on its back plate. The rotary handle shall be mounted easily on 3 and 4 pole breakers. The rotary handle shall have pad locking facility in OFF position to take care of the lock outs. The rotary handle shall also provide door defeat facility to open the door for emergency requirement in ON position.

Operation:

The rotary handle shall indicate the position of the breaker: OFF, TRIPPED or ON.

h) Plug-in mounting Standard

When the breaker is mounted on a plug-in, the system remains and fulfils IEC60947-2.

Installation

- I. The device shall include the complete accessories for assembling the circuit breaker in plug-in design. Interlocking connecting rod shall be provided ensuring automatic switching off the circuit breaker for handling, inserting & removal.
- II. The plug in device and circuit breaker shall be provided with a keying set, which prevents inserting any other circuit breaker into the plug-in device.
- III. The plug-in device shall be provided with position signaling switch

i) Mechanical interlocking

The mechanical interlocking facility shall have front mounting mechanical interlocking and parallel switching

j) Testing

- I. Original test certificate of the MCCB as per IEC 60947-1 &2 or IS13947 shall be furnished.
- II. Pre-commissioning tests on the panel board panel incorporating the MCCB shall be done as per standard specifications.

1.11 Multifunction meters

a) Multifunction Meters (For Incomer MCCB Feeders)

The meters shall conform to IEC 61557-12, IEC 62053-22, and IEC 62053-23 standards
General Requirements

1. The meter shall be suitable for operation in single - or multi- phase networks, balanced as well as unbalanced load
2. It shall be possible to use the multifunction meter directly in 440V networks
3. The current inputs shall be configurable at site for measuring on x/1 A or x/5 A current transformers
4. The multifunction meters shall be suitable for operation up to 55 Deg C
5. The meters shall be suitable for operation with AC auxiliary power and shall have wide tolerance band of 95V to 240 V ($\pm 10\%$)
6. The multifunction meters shall have high degree of protection (IP65 from the front) against ingress of dust & water
7. The multifunction meters shall have backlit LCD display with adjustable contrast
8. The meter shall be tamper-proof (password protected) to avoid mishandling by unauthorized person
9. The entire multifunction meter should be IP based and can be hooked up to existing Intranet.

➤ **Technical Requirements**

1. All meters should be with accuracy class 0.2 at least.
2. Meters must have an Ethernet port onboard for communication over Modbus TCP/IP protocol.

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3. All Gateways or converters shall be avoided for sending the data to SCADA Server.
4. All basic electrical parameters (Current, Voltage, Power, Frequency, Power factor) should be available on display as well for communication with EMS software.
5. All Meters should have inbuilt and / or expandable Digital input, output for reading the breakerstatus (Trip / ON / OFF) on inputs and remote ON/OFF of breakers.
6. Power Monitoring Device must have Battery back up to save data in inbuilt memory (i.e. DailyEnergy Counters and Event log reports) which can be retrievable in excel Format
7. Digital inputs shall be self wet or by external 24V DC / AC safety extra low voltage power supply.
8. Digital outputs shall be able to drive contactor or a relay contact. Also outputs shall be usable with limit or Boolean logic of multiple limits overflow or underflow and limit function shall be parametrical for value, parameter, underflow or overflow and hysteresis.
9. All meters shall have possibility of remote parameterization & monitoring using the software apart from front fascia programming using soft keys
10. All metered values will be in "true RMS" values. The monitor shall include a keypad allowing for the viewing of different selected values. The monitor shall display the following values:

Voltages	Phase-phase / phase-neutral
Currents	Per phase
Apparent, active and reactive power	Per phase and total
Power factor	Per phase and total
Frequency	48...52 Hz
THD for voltage and current	Per phase
Min. / max. values	Voltage - phase-phase, phase-neutral, Current / Power / Power factor / THD per phase, Frequency, Three phase average voltage and current

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Average values	Voltage - phase-phase, phase-neutral Voltage min. / max. : for phase-phase, phase-neutral
Active energy	Current: Current min. / max. Import / export; high / low tariff
Reactive energy	Positive / negative; high / low tariff
Apparent energy	High / low tariff
Energy demand per measuring period	Three phase average rating for active and reactive power: 1 to 60 min.
Min. / max. rating values within the measuring period	Should be possible to be measured
Meter running counter	Uptime in hours
Universal counter	Pulse counting of external devices like water, gas, etc.

b) Multifunction Meters (For Outgoing MCCB Feeders)

The meters shall conform in all respects to International standards – IEC 61557-12, IEC 62053-22, IEC 62053-23 or the relevant Indian standards with latest amendments thereof.

General Requirements

- 1. The meter shall be suitable for operation in 3 - phase networks, balanced as well as unbalanced load**
2. It shall be possible to use the multifunction meter directly in 440V networks
3. The current inputs shall be configurable at site for measuring x/5 A current transformers
4. The multifunction meters shall be suitable for operation up to 55 Deg C
5. The meters shall be suitable for operation with AC auxiliary power and shall have wide tolerance band of 100V to 240 V ($\pm 10\%$)
6. The multifunction meters shall have high degree of protection (IP65 from the front) against ingress of dust & water
7. The multifunction meters shall have backlit LCD display with adjustable contrast

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8. The meter shall be tamper-proof (password protected) to avoid mishandling by unauthorized person
9. All metered values will be in "true RMS" values. The monitor shall include a keypad allowing for the viewing of different selected values. The monitor shall display the following values

Voltages	Phase-Phase / Phase- neutral
Currents	Per phase / neutral
Apparent, active and reactive power	Per phase and total
Power factor	Total
Frequency	48...52 Hz
Min. / max. values	Voltage - phase-phase, phase-neutral/ Current/ Neutral current/ Power/ Power factor/ Frequency
Active energy	Import/ export/ net
Reactive energy	Import/ export/ net
Energy demand measuring period	Three phase average rating for active and reactive power: 1 to 60 min.
Min. / max. rating values within the measuring period	Should be possible to be measured

c) Measurement Accuracy

The multifunction meters shall be of high accuracy type and shall have the following levels of accuracy. (Accuracy class in accordance with IEC 61557-12:2007-08)

- | | |
|--------------------|---|
| 1. Voltage | Class 1 |
| 2. Current | Class 1 |
| 3. Power | Class 1 |
| 4. Power factor | Class 2 |
| 5. Active energy | Class 1 in accordance with IEC 62053-22:2003-01 |
| 6. Reactive energy | Class 3 in accordance with IEC 62053-23:2003-01 |

The meter shall have at least 2 Digital Input and 2 Digital Output as standard.

d) Communication

The meters shall have inbuilt RS485 MODBUS RTU. It shall be possible to parameterize the device either by the keys on the device or through parameterization software.

1.12 Analogue Meters

All voltmeters and ammeters shall be flush mounted of size minimum 96 mm conforming to class 1.5 of IS:1248 for accuracy.

- a) All voltmeters and indicating lamps shall be through MCB's.
- b) Meters and indicating instruments shall be flush type.
- c) All CT's connection for meters shall be through Test Terminal Block (TTB).
- d) CT ratio and burdens shall be as specified on the Single line diagram.

1.13 Current Transformers

- a) Current transformers shall be provided for Distribution panels carrying current in excess of 60 amps. All phase shall be provided with current transformers of suitable VA burden with 5 amps secondary's for operation of associated metering – [630 / 5 amp, 8 VA].
- b) The CTs shall conform to relevant Indian Standards. The design and construction shall be dry type, epoxy resin cast robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitable to a terminal block which shall be easily accessible for testing and terminal connections. The protection CTs shall be of accuracy class 4.5 and measurement CTs shall be of accuracy class I.

1.14 Potential Free Contacts

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

1.15 Indicating Panel

- a) All meters and indicating instruments shall be in accordance with relevant Indian Standards. Meters shall be flush mounted type. Indicating lamps shall be of low burden, and shall be backed up with 2 amps MCB/MPCB as per relevant fault level and toggle switch.
- b) On all the incomers of panels, ON/OFF indicating LED lamps shall be provided and shall be suitable for operation on AC supply. Phase indicating LED lamps shall be associated with necessary ON/OFF toggle switch

1.16 Miniature Circuit Breaker (MCB)

- a) Miniature Circuit Breaker shall comply with IS-8828-1996/IEC898-1995. Miniature circuit breakers shall be quick make and break type for 240/415 VAC 50 Hz application with magnetic thermal release for over current and short circuit protection. The breaking capacity shall not be less than 10 KA at 415 VAC. MCBs shall be DIN mounted. The MCB shall be Current Limiting type (Class-3). MCBs shall be classified (B, C, D ref IS standard) as per their Tripping Characteristic curves

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defined by the manufacturer. The MCB shall have the minimum power loss (Watts) per pole defined as per the IS/IEC and the manufacturer shall publish the values. MCB shall ensure complete electrical isolation & downstream circuit or equipment when the MCB is switched OFF.

- b) The housing shall be heat resistant and having a high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection. All DP, TP, TPN and 4 Pole miniature circuit breakers shall have a common trip bar independent to the external operating handle.

1.17 Power Contactors:

1. Contactors shall comply with IS/IEC 60947-4 or EN 60947-4-1
2. Contactors for motor application shall be of 3 Pole AC3 duty as specified in standards.
3. Main contacts of contactors shall be silver plated copper. Spare contact kits & spare coils replacement shall be possible for the entire range, for maintenance purpose.
4. For ratings higher than 80A, coil replacement shall be possible without disturbing busbar / cable termination.
5. Contactors shall be electro-magnetically controlled, double air-break type. Contactors shall be four-pole, triple-pole, double-pole or single-pole as shown on the Drawings.
6. The contactors shall be capable of frequent switching and shall operate without de-rating at 55°C for AC3 applications.
7. The rated voltage of the contactor and the rated insulation voltage shall be 415V and 690V respectively.
8. The rated impulse voltage of the contactor shall be at least 8 KV.

1.18 Painting

1. All metal works and metal parts of the panel boards shall undergo a process of degreasing, pickling in acid, cold rinsing, phosphatizing, passivating and then sprayed with double coated a high corrosion resistant primer shall be applied before painting.
2. The finishing treatment shall be by application of 2-coat of grey colour paint conform to RAL code 7302.

1.19 Labels

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

TECHNICAL SPECIFICATIONS OF FLOOR RACEWAY AND ALLIED EQUIPMENT

RACEWAY:

Supply, Installation, Testing and commissioning of raceways made of pre-galvanised sheet with thickness of 1.6mm for distributing LV and ELV cabling (LAN cabling) in screed/ concrete floors installations as per BOQ of the tender.

1. Raceways shall be combined with junction boxes, floor boxes for wiring devices, fixing and coupler accessories. It shall consist of body & cover. Cover fitted on to the body with screws & can be opened easily, if required.
2. Raceway should be specially treated corrosion proof rectangular shape to ensure high tensile strength.
3. Top and bottom plates are double folded and spot welded together to give the required rigidity and at the same time to prevent seepage of concrete or screed water.
4. Material: Pre-galvanized sheet steel
5. Thickness: 1.6mm
6. Length: 2.5m
7. Depth: 25mm
8. Compartment: Double
9. Material Specification as per IS277:2003
10. Race ways should be supplied with complete accessories i.e. fixing brackets & couplers for joining raceways from the same manufacturer. Junction/Floor boxes shall be for direct access to wires/cables at the intersection of raceways.
11. Zinc Coating Thickness: 275 GSM
12. Load Bearing Capacity: 2.5 Ton force (metric)
13. Temperature Handling: -5°C To 60°C
14. IP42 protection
15. 3rd party test certifications from Govt. approved agency or Govt. institute or Reputed Private agency to provide against all the above specification. And salt spray test certificates for the raceways need to be provided for corrosion resistance.

UNDERFLOOR JOINT SLEEVES:

Material:

The joint sleeves shall be made from high-quality galvanized steel or a comparable corrosion-resistant material with a 275 GSM (grams per square meter) thickness for durability and long-lasting performance.

Dimensions:

Height: 25 mm to match the height of the under-floor trunking.

Lid Thickness: 1.6 mm, designed to provide robust support and ensure proper alignment and secure joining of trunking segments.

Length: 75 mm, suitable for covering and securely joining adjacent sections of the trunking system, providing a seamless connection.

Compatibility:

The joint sleeve shall have a smooth design, free from sharp edges or burrs to ensure safety during installation and to prevent damage to cables within the trunking.

It should allow for easy assembly and disassembly for maintenance purposes.

Installation:

The joint sleeves should be installed securely to connect two sections of the under-floor trunking, ensuring no gaps or misalignment.

Proper fixing methods (such as screws, clips, or other appropriate fasteners) shall be used to ensure the joint sleeve is tightly affixed to the trunking sections.

The sleeve should ensure a firm connection, maintaining the structural integrity and preventing any movement or displacement.

ACCESS OUTLET BOX (150mmX150mm):

Material:

275 GSM (grams per square meter) indicates the thickness and durability of the joint sleeves, usually representing galvanized steel or a similar material.

Dimensions:

Height: 25 mm.

Lid Thickness: 1.6 mm (this likely refers to the thickness of the material covering or sealing the joint).

Length: 75 mm (this is the length of the joint sleeve).

Compatibility: The sleeves should be specifically designed for use with 150 mm width, 2-compartment underfloor trunking systems, ensuring proper alignment and secure installation.

Installation Process:

Preparation: Ensure that the trunking system is laid out properly, with correct spacing for the joint sleeves.

Fitment: The sleeves should slide or snap onto the trunking, aligning with both compartments securely.

Fastening: Depending on the design, the sleeves may require screws or other fasteners for a more permanent installation.

Ensure that the sleeves are supplied as per the required material standards and comply with any relevant building or electrical safety codes.

ACCESS OUTLET BOX (350mmX350mm):

Material:

The access outlet box shall be made from high-quality metallic material, such as stainless steel or galvanized steel, to ensure durability, corrosion resistance, and fire safety.

Dimensions:

Size: 350 mm x 350 mm, suitable for housing the required electrical and data sockets.

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Height: Adjustable between 65 mm to 80 mm to cater for different floor heights and installation needs.

Top Recess: The box shall have a top recess of 8 mm to allow for floor finishes such as carpet, vinyl, or tiles, ensuring a flush and aesthetic finish with the floor.

Lid:

The access outlet box shall be equipped with a metallic lid to ensure durability and load-bearing capacity, while providing easy access to the sockets and switches when required. The lid must be sturdy enough to withstand foot traffic or light furniture weight if installed in walkable areas.

Electrical Outlets:

The box shall be equipped with the following electrical outlets:

10 Nos. 6/16 Amp sockets: Suitable for standard office equipment and devices requiring power supply.

4 Nos. 16 Amp switches: To control the power supply to the sockets, ensuring convenience and safety.

Data and Communication Sockets:

2 Nos. RJ45 sockets: For network (Ethernet) connections, ensuring proper connectivity for computers or other network devices.

2 Nos. RJ11 sockets: For telephone connections, enabling voice communication lines.

Wiring Management:

The outlet box shall have adequate internal space for safe and organized wiring management, preventing overcrowding and minimizing interference between power and data cables. Proper grommets and bushings must be used to ensure that cables are routed safely without sharp edges that could damage insulation.

UNDERFLOOR JUNCTION BOX :

Material:

The junction box shall be made of high-quality metallic material, such as galvanized steel or stainless steel, to ensure durability, corrosion resistance, and fire safety.

Dimensions:

Size: 150 mm x 150 mm to provide adequate space for housing electrical connections or cables at cross-points.

Height: Adjustable between 55 mm to 70 mm to cater to different under-floor heights and to facilitate smooth cable management.

Top Recess:

The junction box shall have a top recess of 8 mm to accommodate floor finishes such as carpet, vinyl, or tile, ensuring a flush installation with the finished floor surface for aesthetic and practical purposes.

Lid:

The box shall be equipped with a metallic lid that is designed to fit snugly over the box, providing protection for the cables and connections inside.

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The lid must be robust enough to withstand normal floor traffic and light loads, while also being easy to remove for maintenance access.

Conformity:

The junction box should conform to relevant international and local standards (e.g., IEC or BS standards) for electrical and cable management systems, ensuring it is safe for use in commercial or industrial environments.

VERTICAL ACCESS BOX:

Material:

The vertical access box shall be made from high-quality metallic material, such as galvanized steel, aluminum, or stainless steel, ensuring durability, corrosion resistance, and long service life.

Dimensions:

Size: 250 mm (height) x 200 mm (width) x 45 mm (depth), providing adequate space for housing electrical connections, data cables, or other utilities.

The depth of 45 mm ensures that the box is compact while providing sufficient space for secure cable management and access.

Design:

The box shall feature a vertical orientation, suitable for installation on walls or other vertical surfaces where access to wiring or cable connections is required.

The design must include provisions for secure mounting, ensuring the box is flush with the surface where it is installed.

The access box should include knockouts or cutouts for easy entry and exit of cables or conduits, with smooth edges to prevent damage to the cables.

Lid/Cover:

The box shall be fitted with a removable metallic lid or cover, which is easy to open for access to the contents but securely fastened to protect the internal components from external damage or tampering.

The lid should be designed to blend seamlessly with the box, providing a neat and professional appearance when installed.

Mounting:

The access box should come with mounting brackets or pre-drilled holes to facilitate easy and secure installation on walls or other vertical surfaces.

The mounting system must ensure that the box is securely fixed, level, and capable of withstanding regular use or environmental conditions.

Volume – IV
TECHNICAL SPECIFICATIONS
FOR
ELECTRICAL WORKS (HT)

TECHNICAL SPECIFICATIONS OF 315kVA, 11kV/415V COMPACT SUB STATION

1.0 CODE & STANDARDS:

1. All equipment and material shall be designed manufactured and tested in accordance with the latest applicable Indian Standard / IEC standard.
2. Equipment and material conforming to any other standard which ensures equal or better quality may be accepted. In such case copies of English version of the standard adopted shall be submitted.
3. The electrical installation shall meet the requirement of Indian Electricity Rules as amended upto date relevant IS code of practice and Indian electricity act.
4. The Package Sub-station offered shall in general comply with the latest issues including amendments of the following standards but not restricted to it.

Title	Indian & IEC Standards
High Voltage Low Voltage Prefabricated Substation	IEC:62271-202
11 kV, Switchgear cubicles	IS: 13118, IS: 3427, IEC:60694. IEC:60298
Ring main unit 11 kv grade,	IS:9920, IEC:60265
Code of practice for selection, installation, and maintenance of Switchgear	IS:10118
Distribution Transformer	IS: 1180 and IS 2026
Indian Electricity Rules	1956
Indian Electricity Act	1910

2.0 DESIGN CRITERIA

2.1 Package Sub-station shall consist of 11KV SF6 Insulated compact switchgear with SF6 / Vacuum Circuit Breaker as protection to transformer + Transformer + L.T. Switchgear with all connection accessories, fitting & auxiliary equipment in a prefabricated Enclosure to supply Low-voltage energy from high-voltage system as detailed in this specification. The complete unit shall be installed on a substation plinth (base) as **Outdoor substation**. 11KV Load Break Cable Switches controls incoming-outgoing feeder cables of the 11KV ring distribution system. The SF6 / Vacuum Circuit Breaker shall be used to control and isolate the 11kV/433V Distribution transformer. The transformer's L.T. side shall be connected to L.T. switchgear by means of Copper busbar. The connection cables to consumer shall be taken out from the L.T. switchgear. All the equipment like RMU, Transformer, LT switchgear with all connection, accessories, fittings shall be mounted within a prefabricated common enclosure having a common roof as outdoor substation for better performance and safety.

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2.2 The PSS should house HT /Transformer/LT components in a common enclosure & HT Compartment tested for “A” & “B” category with an IAC rating of 21kA for 1 sec and temperature rise as per IEC 62271-202, tested in an International/National Government Lab/ Recognized Laboratory. The prefabricated Package substation shall be designed for:

- a) Compactness,
- b) Fast installation,
- c) Maintenance free operation,
- d) Safety for worker/operator & public.

2.3 The Switchgear and component thereof shall be capable of withstanding the mechanical and thermal stresses of short circuit listed in ratings and requirements clause without any damage or deterioration of the materials.

2.4 For continues operation at specified ratings temperature rise of the various switchgear components shall be limited to permissible values stipulated in the relevant standard and / or this specification.

2.5 Service Conditions:

1. The equipment offered shall be suitable for continuous satisfactory operation in tropical area of Installation.
2. The Enclosure consisting of High Voltage switchgear-control gear, Low Voltage switchgear-control gear & Transformer of the Package substation shall be designed to be used under **normal outdoor service condition**. The enclosure should take minimum space for the installation including the space required for approaching various doors & equipment inside. Transformer compartment inaccessible from outside considering general-public safety and can be accessed only from HV & LV compartments from inside. The enclosure construction shall be such that it fully protects ingress of rainwater, dust & rusting.

3.0 SPECIFIC REQUIREMENT

3.1 The main components of a prefabricated- Package substation are Transformer, High-voltage switchgear-control gear, Low-voltage switchgear-control gear, corresponding interconnections (cable, busbars) & auxiliary equipment. **There shall be common enclosure having three different compartments for HT Switchgear, Transformer and LT Switchgear.** All the components shall comply with their relevant IS/IEC standards.

3.2 PSS manufactured by Licensee Partner of OEM shall also be acceptable. Licensee Partner is who manufacture, assemble, test and sell the Equipment in accordance with the terms and conditions of the licensee agreement using the know-how and technology of the licensor (OEM). Licensee partner should furnish Technology Licensee certificate from the parent OEM along with latest periodic Audit / Quality check report / Evaluation report conducted by the Licensor OEM of the Licensee partner.

3.3.0 Ratings:

Description	Unit	Value
Rated Voltage / Operating Voltage	kV rms	11
Rated frequency & Number of phases	Hz & nos.	50 & 3
Rated maximum power of substation	kVA	315 KVA, (Oil Type Hermetically Sealed Transformer)
Rated Ingress protection class of Enclosure	IP:	IP: 54 for LT Switchgear & HT Switchgear compartments. IP-34 for Transformer compartment.
HV Network & Busbar		
RMU		3 Way (2Nos.Isolators+1No. Breaker)
Rated current	Amp	630A for 11kV
Rated short time withstand current	kA rms / 1secs	21 for 11 kV,
LV Network		
LV Incomer: ACB 800A, 4P,50KA, MDO Type, Microprocessor based release with O/L ,E/F & S/C Protection LV Outgoing: 630 Amp. 4 Pole Thermal Magnetic (Breaking capacity 50KA) type MCCB 250 Amp. 4 Pole Adjustable thermal (Breaking capacity 36 KA) type MCCB .		

4.0 OUTDOOR ENCLOSURE:

The enclosure shall be made of 2.0 mm thickness Galvanized Sheet Steel tropicalized to meet Indian weather conditions including all the sheets & doors. The base of the enclosure shall be of 4.0 mm thickness Hot Dip Galvanized Sheet Steel to ensure rigidity for easy transport & installation. The entire Package Substation shall be Factory Assemble & Factory Fitted.

The structure of the substation shall be capable of supporting the gross weight of all the equipment & the roof of the substation compartment shall be designed to support adequate loads. In case of relocation of the Package Substation, the entire substation should be capable of getting lifted and placed as a Single Unit without dismantling of any of the major equipment inside. The lifting arrangement should be from the bottom of the enclosure & not from the top.

There shall be proper / adequate ventilation inside the enclosure so that hot air inside enclosure are directed out by help of duct. Louvers, apertures shall be provided so that there is circulation of natural air inside the enclosure. The

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Package Substation should be designed & engineering to have natural cooling & ventilation instead of forced cooling / ventilation as the same would de-rate the Transformer further and shall be an additional load on the Transformer.

The complete design shall be compartmentalized.

Interconnection: The connection of HT switchgear to Transformer shall be with the help of suitable size of cables from Transformer to LT switchgear with the help of suitable size of copper busbars.

Internal Fault: Failure within the Package substation due either to a defect, an exceptional service condition or mal operation may initiate an internal arc. Such an event may lead to the risk of injury, if persons are present. The PSS should house HT/Transformer /LT components in a common enclosure & HT Compartment tested for "A" & "B" category with an IAC rating of 21kA for 1 sec and temperature rise as per IEC 62271-202, tested in an International/National Government Lab/ Recognized Laboratory.

- 3.2.1 **Covers & Doors:** Covers & doors are part of the enclosure. When they are closed, they shall provide the degree of protection specified for the enclosure. All covers, doors or roof shall be provided with locking facility or it shall not be possible to open or remove them before doors used for normal operation have been opened. The doors shall open outward at an angle of at least 90degrees & be equipped with a device able to maintain them in an open position. Proper padlocking facility shall be provided for doors of each compartment. Transformer compartment doors must be open from both the sides & should not have access from outside. Transformer compartment shall have safety interlock such that it can be accessed from HT & LT compartment from inside only.
- 3.2.2 **Earthing:** All metallic components shall be earthed to a common earthing point. It shall be terminated by an adequate terminal intended for connection to the earth system of the installation, by way of flexible jumpers/strips & Lug arrangement. The continuity of the earth system shall be ensured considering the thermal & mechanical stresses caused by the current it may have to carry. The components to be connected to the earth system shall include:
- a) The enclosure of Package / prefabricated substation,
 - b) The enclosure of High voltage switchgear & control gear from the terminal provided for the purpose.
 - c) The metal screen & the high voltage cable earth conductor,
 - d) The transformer tank or metal frame of transformer,
 - e) The frame &/or enclosure of low voltage switchgear,
- 3.2.3 **Internal Illumination:** There shall be arrangement for internal lighting activated by associated switch on doors for HV & LV compartments separately.
- 3.2.4 **Labels:** Labels for warning, manufacturer's operating instructions etc. & those according to local standards & regulations shall be pasted / provided inside and shall be durable & clearly legible.

3.2.5 Painting and Fabrication process :

- a) The paints shall be carefully selected to withstand tropical heat rain. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling. For this purpose, powder coating shall be used.
- b) Special care shall be taken by the manufacturer to ensure against rusting of nuts, bolts and fittings during operation. All bushings and current carrying parts shall be cleaned properly after final painting.
- c) The fabrication process shall ensure that there are no sharp edges on the GI sheets used.

3.2.14 Enclosure GTP:

1)	Ambient Temperature	40° C
2)	Type of Ventilation for a) Normal Condition b) Hot Condition	- Natural - Natural
3)	Compartmentalized	Yes
4)	Rated temperature enclosure class	10
5)	Degree of protection for external enclosure	IP34 Transformer Compartment. IP54 MV & LV Compartment
6)	Applicable Standard	IEC 62271 / 61330
7)	Enclosure material	Galvanized sheet Steel (GI)
8)	Thickness of sheet (GI only)	2mm for enclosure. 4mm for PSS Base.

Note: No capacity de-ration of equipment / components up to 40°C ambient temperature.

3.1 11kV Switchgear

The equipment to be supplied shall be in the form of a compact switchboard and shall meet the following requirements:

- 1.1 Easy to install
- 1.2 Safe and easy to operate
- 1.3 Compact
- 1.4 Low maintenance

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The supplier shall be capable of proving that he has a broad experience in the area of MV switchgears and shall provide proof that he has already supplied equipment of the equivalent type and brand which has been in operation for at least seven years.

3.3.1. Standards

In order to be accepted, the switchgear shall comply with the requirements stated in the latest editions of the following recommendations, standards and specifications:

IEC standards

IEC 62271-1	common clauses for MV switchgear standards,
IEC 62271-200	2017 MV metal-enclosed switchgear,
IEC 62271-103	2011 MV Switches
IEC 62271-102 2013	AC disconnectors and earthing switches,
IEC 62271-100	2012 MV AC circuit breakers,
IEC 62271-105	2012 MV AC switch-fuse combination,
IEC 60529 2013	Degrees of protection procured by enclosures (IP code).
DIN EN 50181 2011	Plug-in type bushings above 1 kV up to 52 kV
IEC 60376 2005	Specification of technical grade sulphur hexafluoride (SF6) for use in electrical equipment
IEC 61869-3	Voltage transformer (former IEC 60044-1)
IEC 61869-2	Current transformer (former IEC 60044-2)
IEC 61557-12	Electrical safety in low voltage distribution systems
IEC 61000-4-30	Power quality
IEC 61131-3	Automation language
IEC 870-5-104	Protocol
IEC 870-5-101	Protocol
IEC 62351-5	Security of protocol
IEC 62351-8	Role Base Access Control (RBAC)
IEC 61000-4	Electromagnetic Compatibility
IEC 60068	Environmental testing
IEC 60044-7	- Electronic voltage transformers

3.3.2. Service conditions

1. The RMU shall be suitable for operations at a height up to 1000 meters above sea level without any derating.
2. The RMU shall be capable of operating normally within the following temperature range:
 - a) Design ambient air temperature: + 40 ° C (option +50°C with derating)
 - b) Minimum air temperature: - 5 ° C (option -25°C)
1. Manufacturer shall declare whether RMU is able to operate in air temperature higher than + 40 °C and level of air temperature for which current derating is necessary.
2. The RMU shall be capable of being operated in electrically exposed locations.

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3. The RMU shall be capable of being exposed to high relative humidity and ambient air pollution.

3.3.4. System Parameters

Network	Three phases - Three wires
Rated Voltage	12 kV
Service Voltage	11kV
System Frequency	50Hz
Lightning Impulse withstand Voltage Phase to phase, phase to earth Across the isolating distance	75 kVp 85 kVp
Power Frequency withstand voltage	28 kV rms – 1 min
Rated Normal Current Line switch Transformer feeder Branch circuit breaker feeder	630 A 400/630 A 400/630 A
Rated Short time current withstand (1 sec)	25 kA
Rated Short circuit making capacity of line switches(isolator) and earthing switches at Rated Voltage	62.5kA
Number of operations at rated short circuit current on line switches(isolator), earthing switches of isolator & circuit breaker	5 closing operations (Earth switch operations independent of Circuit Breaker – E2 Class)
Rated load interrupting current Line switch (Isolator)	630 A rms
SC Breaking Capacity for Breaker	25 kA rms
SC Making Capacity for Breaker	62.5 kA peak
Internal Arc Classification Tank Cable Box	AFL 21 kA for 1 sec. AFL 21 kA for 1 sec.
Number of mechanical operations Line switches(isolator) and earthing switches Switch-fuse combination Circuit breaker O - 3 min CO	1000 O/C (M1) 1000 O/C (M1) 2000 O/C (M1) (Independent operation, only for Circuit breaker)
Number of electrical operations at full load rated current Switches(isolator) Circuit breakers	100 O/C (E3) 2000 O/C (E2)
Number of operations at rated short circuit Current (25 kA) on circuit breakers	50 breaking operations (E2) at 25 kA.

All of the switchgear shall be capable of withstanding this current without any damage being caused, in accordance with the recommendations IEC 62271-1 and IEC 62271-200.

3.3.5. Function requirements

The following functions shall be available:

- Feeder with switch-disconnector
- Transformer protection with vacuum circuit breaker

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- Busbar riser
- MV Metering

3.3.6 General stipulations regarding the design and development of switchgear

3.3.6.1 Introduction

The RMU shall meet the criteria for compact, metal-enclosed indoor switchgear in accordance with IEC 62271-200:

- 1.1 Switchgear classification: PM class
- 1.2 Loss of service continuity class: LSC2

It shall include, within the same metal enclosure, the various MV functional units required for connection, power supply and protection of transformers, i.e.

- 1.3 Two or three feeders with switch-disconnector
- 1.4 One or two feeders with breakers for transformer protection,
- 1.5 Line Earthing switches.

3.3.6.2 Switchboards

The switchgear and busbar shall all be contained in a stainless-steel enclosure filled with SF6 at 0.3 bar (300 hPa) relative pressure to ensure the insulation and breaking functions. Sealed for life, the enclosure shall meet the "sealed pressure system" criterion in accordance with the IEC 62271-1 standard: "a volume for which no further gas processing is required during its entire expected life". In addition, manufacturer shall confirm that maximum leakage rate is lower than 0,1 % / year. RMU tank shall provide full insulation, making the switchgear insensitive to the environment with degrees of protection of IP67, in accordance with recommendation IEC 60529. Thus assembled, the active parts of the switchgear shall be maintenance-free and the switchboard shall be low-maintenance.

The switchgear operating mechanism shall have an IP2X protection.

- 1) The cable compartment shall integrate:
 1. Adjustable cable fixing devices
 2. Earth connecting point
 3. Metal partition between cable compartments and tank pressure relief area.
- 2) The cable compartment shall be designed to be arc resistant for IAC AFL 1 sec.
- 3) In the event of any accidental pressure, gas will be released to the rear of the switchgear away from the operator to ensure safety of the operating personnel and all the manual operations will be carried out on the front of the switchboard.

4) The RMU must be tested for IAC AFL to ensure safety of the personnel around the RMU during Internal arc. All manual operations shall be carried out on the front of the RMU.

5) The colour shall be **RAL 7032** for the enclosure.

6) Ring main units shall be suitable for mounting on a cable vault, trench, utilities space or base. Each Ring main units shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics.

7) The Ring main units shall be designed so that the position of the different devices is visible to the operator on the front of the switchboard and operations are visible as well. In accordance with the standards in effect, the RMUs shall be designed so as to prevent access to all live parts during operation without the use of tools.

3.3.6.3 Bus Bars

The main bus bars should be completely encapsulated inside SF6 gas tank. The same shall be of suitable size as per type tested design. Copper bus bars should have continuous rating of 630A at 40 deg. C as per IEC. The bus bar current density should not be more than 1.6A/sq.mm.

3.3.6.4 Dielectric medium

- a) SF6 gas is the preferred dielectric medium for MV RMUs. Oil filled switchgear will not be considered.
- b) SF6 gas used for the filling of the RMU shall be in accordance with IEC 60376

3.3.6.5 Earthing of metallic parts

- a) There shall be continuity between the metallic parts of the switchboard and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people.
- b) The substation earthing circuit shall be connected to one main earthing bar on the left side of the switchboard. By this main earthing connection, all functional units shall be connected to earth thanks to earthing interconnection between all functional units without dismantling any busbars.

3.3.6.6 Earthing of the main circuit

- a) The cables shall be earthed by an earthing switch with short-circuit making capacity, in compliance with IEC 62271-102 standard. The earthing switch can only be operated when the switch/circuit breaker is open.
- b) The earthing switch shall be fitted with its own operating mechanism and manual closing shall be driven by a fast-acting /snap action mechanism, independent of operator action.

- c) Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earthing switch when the disconnect/circuit breaker is closed. Earth switch and Circuit breaker /isolator position indication should not be showing close status at the same time.

3.3.6.7 Feeder with switch-disconnector

- a) They shall be maintenance-free, with breaking in low pressure SF6 gas. The position of the power contacts and earthing contacts shall be clearly indicated on the front of the switchboard through mimic. The position indicator shall provide positive contact indication in accordance with IEC 62271-103 standard. In addition, manufacturer shall prove reliability of indication in accordance with IEC 62271-102 standard.
- b) The switches shall be of the "increased operating frequency" in accordance with IEC 60265-1 § 3.104 standard. The switches shall fulfil E3 classification for electrical endurance. They shall have 3 positions, open or disconnected, closed and earthed, and will be constructed in such a way that interlocking prevents unauthorized operations. The switch-disconnector and earthing switch shall be equipped with two separate operating entry points.
- c) The switches shall be fully mounted and inspected in the factory. Manual opening and closing will be driven by a fast-acting /snap action mechanism, independent of operator action. Each switch can be fitted with an electrical operating mechanism in especially reserved location, by addition of a motorization unit and without de-energizing the switchboard. The switch operating mechanism shall have a mechanical endurance M1.

3.3.6.8 Transformer protection with vacuum circuit breaker

- a) The circuit breakers shall be of the maintenance-free, vacuum type. The position of the power and earthing contacts shall be clearly visible on the front of the switchboard through mimic. The position indicator shall provide positive contact indication in accordance with IEC 62271-102 standard. The circuit breakers shall have 2 positions: open or disconnected and closed. A separate and independent 3 position earthing switch and disconnect shall be fitted to open and earth the cables in such way that interlocks prevent all unauthorized operations.
- b) The earthing switch shall be provided on the cable side and can only be operated when the switch/circuit breaker is open. Earth switch should have 5 closing operations at short circuit current (making operations E2 Class) independent of breaker. The earthing switch shall be fitted with its own operating mechanism and manual closing shall be driven by a fast-acting /snap action mechanism, independent of operator and vacuum circuit breaker action. Cable earthing through VCB shall not be envisaged as the same reduce the operational life of the vacuum circuit breaker. They shall be fully mounted and inspected in the factory.

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- c) An operating mechanism can be used to manually close the circuit breaker and charge the mechanism in a single movement. An independent mechanism shall be fitted for the 3 positions earthing switch and disconnecter.
- d) It shall be fitted with a local system for manual tripping by an integrated push button. There will be no automatic reclosing.
- e) The circuit breaker shall be associated with an integrated protection unit that will operate without any auxiliary power supply and shall include:
 - 1. Three ring core type mounted on the cable,
 - 2. An electronic relay,
 - 3. A series trip coil

3.3.6.9 MV Metering

MV Metering shall be provided, if required by the customer. Connection with adjacent modules will be direct through busbar via metering bushing or through MV cables. VT's and CT's from the manufacturer and according to IEC61869-3 and IEC 61869-2 respectively shall be accepted.

3.7 RMU bushings and Cable terminations

3.7.1 Bushing

It is preferable to have all bushings accessible from the front of the RMU. Bushings along the sides or the rear of the RMU are not acceptable. For each cable compartment, the bushing shall be at the same height. The bushing should be conveniently located for working with cables specified and allow for the termination of these cables:

- a) 630 A M16 bolted connectors for switch-disconnectors and vacuum circuit breakers functions.
- b) The profiles of the cable connection bushings shall be in compliance with EN 50181 standard.
- c) Considering the ring network requirement (present or future), Isolator Function should have cable compartment suitable for termination of 2R*3C Cables up to 300 sq.mm.

3.7.2 Cable termination

Each Cable compartment shall be provided with three bushings of adequate sizes to terminate the incoming outgoing 11kV, 3 Core cables. There shall be enough height from the base of the mounted switchgear so that the cables can be bent and taken vertically up to the bushings.

The Cable termination shall be done by Heat shrinkable Termination method so that adequate clearances shall be maintained between phases for Termination.

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Cable Termination boots shall be supplied by the switchgear manufacturer. The bushings should be in front only. Side/rear cable connection is not permitted. A metallic cable clamp arrangement must be provided for all network cables terminated on the RMU.

3.8 Padlocking and interlocking facilities

Circuit breakers, switch-fuse combination, switches and earthing switches can be locked in the open or closed position by at least 1 padlock.

The contractor/manufacturer shall be able to provide the following key interlocking facilities:

- a) Inter-locking the “ring” between two functional units (Conditions the closing of the earthing switch on a Functional Unit in relation to the opening either of a load-break switch or the line isolator on the second Functional Unit. Only applies between two Cable functions.
 1. “Ring “interlock between 2 cable functions
 2. “Ring “interlock between 2 incomer functions with connection in parallel forbidden

3.10 Fault Passage Indicators

The FPI shall facilitate quick detection of faulty section of line. The fault indication may be on the basis of monitoring fault current flow through the device. The FPI should be self-powered and should have internal lithium battery for external indication and setting of FPI in the absence of current.

The FPIs shall include:

- a) Fault detection - Phase to phase and Phase to earth faults.
- b) One potential-free output contacts for hardwiring to RTUs. On this basis, the SCADA/DMS will be able to monitor phase / earth fault condition.
- c) Local fault indications - LCD display on FPI front panel along with LED indication on front panel of RMU enclosure.
- d) Multiple reset option –
- e) End of time delay (Adjustable from 2 to 16 Hrs)
- f) Remote reset (Via potential free input contact of FPI)
- g) Manual reset (Reset button on front panel of FPI)
- h) Automatic reset on current restoration.
- i) The characteristics of the FPIs shall include:
- j) Phase fault thresholds configurable from at least 100 to 800 A
- k) FPI shall be same make as that of RMU.

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3.11 Safety of people and internal classification

Any accidental overpressure inside the sealed chamber shall be limited by the opening of a pressure limiting device in the lower part of the enclosure. Gas will be released to the rear or the bottom of the switchboard away from the operator.

For internal arc classification (IAC), the RMU shall pass successfully all of the type testing relative to standard IEC 62271-200 (5 acceptance criteria):

- a) The materials used meet the constraints for which the RMU is designed.
- b) The thermal and mechanical forces that an internal arc can produce are perfectly absorbed by the enclosure.
- c) An operator situated in front, lateral and rear (A-FL 21kA – 1sec, downwards exhaust, for tank as well as cable compartment) of the RMU switchboard during an internal fault will not be exposed to the effects of arcing.
- d) The Internal Arc Type Test should have been carried out on minimum 3 function RMU
- e) Accidental overpressure due to an internal arc is limited by the opening of the safety valve, at the bottom of the metal enclosure.

3.12 Operating lever

An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch or earthing switch. All manual operations will be carried out on the front of the switchboard. The effort exerted on the lever by the operator should not be more than 250 N for the switch and 250 N for the circuit breaker.

3.13 Front plate

The front plate shall have an IP2X degree of protection. The front shall include a clear mimic diagram which indicates the different functions.

The position indicators shall give a true reflection of the position of the main contacts. They shall be clearly visible to the operator. Earth switch and Circuit breaker /isolator position indication should not be showing close status at the same time. The lever operating direction shall be clearly indicated in the mimic diagram.

The manufacturer's plate shall include the switchboard's main electrical characteristics.

3.14 Cable insulation testing

It must be possible to test the core or the sheath insulation of the network cables while the busbar remains energized at rated voltage. The phase by phase testing shall be carried out through a built-in facility or through the cable connectors.

In order to avoid any risk of bad reassembly, it shall not be necessary to dismantle any earthing bar to perform this operation

3.15 Finishing

- a) The device shall be fully designed for use in a hot, humid atmosphere and shall be low-maintenance. All metallic parts shall have rust protection.
- b) Two lifting rings shall be installed on the top of the switchboards for handling.

3.16 Type and routine tests

1. According to the composition of the switchboard, various type test certificates can be supplied:

- 1.1 Impulse withstand test,
- 1.2 Temperature-rise test,
- 1.3 Short-time withstand current test,
- 1.4 Mechanical operation test,
- 1.5 Checking of degree of protection,
- 1.6 Switch, circuit breaker, earthing switch making capacity.
- 1.7 Switch, circuit breaker breaking capacity.
- 1.8 Internal arc withstand
- 1.9 Checking of partial discharge on complete unit
 - a) In addition, for switches, test reports on rated breaking and making capacity shall be supplied.
 - b) For earthing switches, test reports on making capacity, short-time withstand current and peak short-circuit current shall be supplied. Manufacturer to declare the make of vacuum interrupter offered is same as used in type tests

2. The routine tests carried out by the contractor shall be backed by test reports signed by the factory's quality control department. They shall include the following:

1. Conformity with drawings and diagrams,
2. Measurement of closing and opening speeds,
3. Measurement of operating torque,
4. Checking of filling pressure,
5. Checking of gas-tightness,
6. Checking of partial discharges on individual components,
7. Dielectric testing and main circuit resistance measurement.

3.17 Quality

The contractor/supplier shall provide proof that he applies a quality procedure in compliance with the standard, namely:

1. Use of a quality manual approved and signed by a top management representative,

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2. Periodic updating of the manual so that it reflects the quality control procedures in effect,
3. ISO 9001 certification.

4. Transformer

1. 11KV/ 433-volt Volts distribution transformer shall be a part of packaged substation which will be housed in the enclosure.
 - a. The transformers shall be installed in hot, humid tropical atmosphere. All equipment accessories and wiring shall be provided with tropical finish to prevent fungus growth.
 - b. The transformers shall be capable of continuous operation of rated output under the operating conditions of voltage and frequency variations as per statutory limits governed by relevant Indian Standard and Indian Electricity Rules, 1956 / IEC with latest amendments in force.
 - c. Use of Prime Grade core, directly from reputed Manufacturers like Nippon / Posco/ AK steels ensures high endurance of core.
 - d. Fully automated core cutting line, that ensures uniform cutting of core resulting in low burr level and hence low core degradation ensures lower maintenance cost.
 - e. Boltless, Step lap core design carried out automatically on Hydraulic Platform that avoids multiple Handling thus ensuring low losses. Automated Foil Winding for LV coils that Make coil capable of withstanding higher thermal & mechanical stresses.
 1. This specification covers design, engineering, manufacture; shop testing, inspection, painting, packing, and supply of Distribution Transformer complete with all accessories for efficient and trouble-free operation of the proposed Substation.
 2. The design, manufacture and performance of equipment shall comply with all currently applicable statues, regulations and safety codes in the locality of Berhampur, Odisha. Nothing in this specification shall be construed to relieve the contractor of this responsibility. The Quality of Raw material, Manufacturing process & Design parameters should meet the requirement so as to ensure quality of transformer.
2. The equipment shall conform to the latest edition of applicable standards as follows. In case of conflict between applicable standards and this specification, this specification shall govern.
 - i. IS 1180, for Tests & tolerance on Guaranteed Particulars
 - ii. IS:3639 for Fittings and Accessories
 - iii. IS:2099 for Bushings > 1000 V
 - iv. IS:7421 for Bushings < 1000 V
 - v. IS:1271 for Electrical Insulation classified by Thermal stability

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Requirement: 11000/433 Volt ONAN Transformer double wound, Dyn11, core type with copper conductor. Oil immersed ONAN suitable for packaged substation housed in a enclosure with corrugated tank arrangement hermetically sealed.

3. **Voltage Ratio:** No load voltage 11000/433 volts within tolerance as stipulated in IS: 1180.
 - i. Insulating material shall be of proven design. The insulating materials shall be **class "A" for ONAN**
 - ii. **Rating:** The transformer shall have a continuous rating as specified at any of the specified tapping position and with the maximum temperature rise specified. The rated KVA shall be the product of the rated voltage in kV, the corresponding rated current and the phase factor 1.73. When the transformer is operated with the rated primary voltage applied to the terminals of the primary winding, the apparent power (kVA) at the terminals of the secondary winding, when carrying the rated secondary current differs from rated kVA by an amount corresponding to the regulation of the transformer and is the product of the actual secondary voltage, the rated secondary current and phase factor 1.73.
 - iii. **Temperature Rise:** The maximum temperature rise at the specified maximum continuous output shall not exceed 40°C by thermometer in the hottest portion of the oil or 45°C measured by resistance of winding above ambient temperature of 50°C. Adequate fan cooling is required during peak summer.
4. **Type of Load:** The transformer shall be suitable for carrying load within temperature rise indicated in the Indian Standard specification IS: 6600 'Guide for loading of oil immersed Transformer'.
5. **Overloads:** The transformers shall be suitable for carrying overload within temperature rise indicated in IS: 6600 'Guide for Loading of oil immersed Transformer'.
6. **Connections:** H.V. Delta and L.V Star connected with neutral brought out on the secondary side for connection to earth; Vector group DYn11 of IS: 1180.
7. **Tapping:** Each transformer shall be provided with Off circuit **Rotary type tap Switch** so as to provide for a voltage adjustment on H.V. from **+5% to -5%(In steps of 2.5%)** of rated voltage of 11000 volts in 4 equal steps (5 position) to obtain rated voltage of 433 volts on LV side.
8. **Transformer Losses:** as per level II of IS1180 – Level -2
9. **List of Fittings:**
 1. OTI with alarm & trip contact for oil type transformer
 2. WTI with alarm & trip contact.

5. LT SYSTEM:

a. INCOMER:

ACB 800A, 4P, 50kA, MDO Type, Microprocessor based release with O/L, E/F & S/C protection

b. OUTGOING:

630 Amp. 4 Pole Thermal Magnetic (Breaking capacity 50kA) type MCCB.

c. The design should comply for the following standards.

1. IEC-439-1, 1992 Low voltage Switch gear and Control gear assemblies Part-I, type tested and partially type tested assemblies.
2. IEC-947-1, 1998 Low voltage Switch gear and Control gear Part-I general rules.
3. IEC-1180-1, 1992 High voltage test techniques for low voltage equipment Part-I definition test and Procedure requirement
4. IEC-529, 1989 Degree of protection provided by enclosures (IP code)

d. EQUIPMENT SPECIFICATION:

Air circuit breaker (ACB)

General:

1. ACB shall comply with standards IS/IEC 60947-1 & 2.
2. ACB shall have a rated operational voltage of 415V AC, rated insulation voltage of 1000 volts AC, rated impulse voltage of 12kV.
3. ACB shall be of 3pole or 4pole (as per BOQ), air break, molded case design for longer life along with less maintenance requirement
4. ACB shall have a Ready to close mechanism preferably having a ready to close mechanical indication on front of ACB. All Fixed Manual ACBs ready to close indication contact which shall be used to give a single indication via indicating lamps on panel.
5. ACB shall comply with the environmental directives like RoHS and WEEE.

Performance:

1. ACB shall have the breaking performance $I_{cs} = I_{cu} = I_{cw} (1\text{sec}) = 50\text{kA}$
2. ACB shall have minimum Mechanical life of 20000 operations
3. The operating mechanism of ACB shall be of the Open/Closed/Open stored-energy spring type. The closing time shall be less than or equal to 70ms, and of fast opening type with break time of breaker should be <30ms to ensure higher life of distribution cables.

Accessories & Auxiliaries:

1. Shunt trip and closing coil (having common AC/DC supply upto 250V) shall be continuous rated. For Incomer ACBs delayed type under voltage release shall be used to avoid nuisance tripping during voltage surges.
2. ACBs shall have minimum 4 change-over auxiliary contacts, available to be used for indication and interlocking, rated at minimum 10A 240/380V 50 Hz and shall be wired on chassis/cradle. There should be facility to add one more set of 4 contacts if required
3. Pre wired Fault trip contact should be provided with Release as standard.

Interlocks:

The racking handle shall be stored on the air circuit breaker in such a manner as to be accessible without defeating the door interlocking.

Terminations:

All air circuit breaker shall be fully tropicalized as standard & suitable for terminating copper/aluminium bus bars. Both fixed & draw-out circuit breakers shall have single pole-pitch. ACBs shall be provided with both side terminal adaptor.

Protections:

1. Air circuit breaker shall be provided with micro-processor release, which should be self-powered type without the need of any auxiliary power supply during normal operation of the breaker.
2. The circuit breaker control unit shall measure the true r.m.s value of the current
3. Circuit breaker trip unit shall have a display for measurement of current, voltage and energy. It shall be possible to view last 10 trip cause on trip unit.
4. All trip units provided shall have thermal memory as standard
5. All trip units shall be EMC/EMI tested
6. The protection release shall have following protections as standard:
 - a. Adjustable over load current (I_r) settings from 40% to 100% of rating of ACB (I_n). Over load time setting (t_r) from 0.5s, 1s, 2s, 4s.....24s as field selectable curves.
 - b. Short circuit setting (I_{sd}) from 1.5 to 10 times of I_r setting, Short circuit time delay adjustable from 0 to 400 msec.
 - c. Instantaneous (I_i) protection with an adjustable pick-up and an OFF position.
 - d. Earth fault setting adjustable in absolute Ampere with time delay settings from 0 to 400ms.

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7. Separately powered, individual fault trip indication LEDs (For overload, short circuit, earth fault and trip unit failure) shall be available on the trip unit which shall function even if the display fails.
8. The trip unit shall have integral test facility to verify the healthiness and to avoid external calibration.
9. It shall be possible to change the protection settings on line and the circuit breaker need not be switched off while adjusting the settings.
10. All ACBs in main LT panel shall be provided with zone selective interlocking which helps in reducing the thermal and dynamic stress on installation during short circuit and ground faults. The releases shall be suitable to communicate between incomer breaker and outgoing breakers enabling zone selective interlocking. The manufacturer shall supply all equipment like ZSI module, power supply and wiring connectors to implement ZSI.
11. It shall be possible to view the percentage loading of three phases at once on trip unit via LEDs or LCD display to help the user in identifying the current load balancing of the network. This will help in preventing the deterioration of loads affected by load balancing by identification of the balancing related issue.
12. All 4 Pole ACBs shall have fully rated neutral equal to rating of the breaker & shall be protected against over-load faults with provisions for settings neutral unprotected, neutral protection at $0.5I_n$ and neutral protection at $1.0 I_n$ to ensure precise neutral protection.

MOULDED CASE CIRCUIT BREAKERS:

General

1. The circuit breakers shall comply with the requirement of IEC 60947 / IS 13947: 1993. MCCBs shall be suitable for nominal voltage of 3 phase 415 Volts AC 50 HZ supply.
2. The circuit breaker shall comply with the isolation function requirement of IEC 60 947-2 section 7.1.2 to be marked as suitable for isolation / disconnection to facilitate safety of operating personnel while the breaker is in use.
3. The circuit breaker shall provide class II insulation between the front cover and internal power circuits to avoid any accidental contact with the live main current carrying path with the front cover open.
4. The MCCBs shall be have double break type rotary contact mechanism for quick break operations.

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Sr. No.	DESCRIPTION	REQUIREMENT	
1	Type of MCCB	Fixed type Manually Operated	
2	Type of Releases	Thermal Magnetic Type	Microprocessor Type
3	Rating (A)	100, 160 , 250,400	630
4	Over Load Release setting	0.7-1 In	0.5-1 In
5	No. of Poles	Three	Three
6	Rated Operational Voltage	415V	415V
7	Rated ultimate short circuit breaking capacity (Icu)	36kA rms	36kA rms
8	Rated service short circuit breaking capacity (Ics)	100% of Icu	100% of Icu
9	Utilization Category	A	
10	Rated Insulation Voltage	690 V	
11	Rated Impulse withstand voltage	8 kVP	

Constructional features

1. The MCCBs shall be made of halogen free high strength heat resisting and flame retardant thermo setting insulating material.
2. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases.
3. MCCB shall comply with RoHS & WEEE norms.

Interconnecting bus bar

1. Bus bar shall be of high conductivity copper supported on insulators made of non-hygroscopic, non-inflammable material with tracking index equal to or more than that defined in BIS. The main bus bars shall have uniform current ratings throughout their length as specified in data sheet / job specification. The current rating of the neutral shall be half that of the phase busbars. Removable neutral links shall be provided on feeders to permit isolation of the neutral bus bar.
2. Only zinc passivated or cadmium plated high tensile strength steel bolts, nuts and double spring washers shall be used for all bus bar, joints and supports.

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3. The hot spot temperature of bus bars including joints at design ambient temperature shall not exceed 95°C for normal operating conditions. It must be recorded during type tests.
4. The current rating of the bus bars shall be as required for design ambient temperature at site conditions and for being inside the cubicle at fully loaded condition. The vendor shall suitably de-rate the nominal rating to suit the above condition.
5. Minimum clearance between live parts, between live parts / neutral to earth shall be 19mm. However clearances between terminals at components shall be as per applicable individual standard for components.
6. Interconnections between the main bus bars and individual units shall be made using vertical / horizontal copper bus bars of adequate rating.

Package Substation – Configuration

HV Side Options	Transformer Options	LV Side Options
2 Way RMU Comprising: Two ON load break SF 6 insulated switches and a VCB circuit breaker for transformer.	Hermetically sealed oil type (ONAN) transformer	Incomer – ACB 800A, 4P,50KA, MDO Type, Microprocessor based release with O/L ,E/F & S/C Protection Outgoing:- 1. 630 Amp. 4 Pole Thermal Magnetic (Breaking capacity 50KA) type MCCB 2. 250 Amp. 4 Pole Adjustable thermal (Breaking capacity 36 KA) type MCCB

VOLTAGE CONFIGURATIONS OF PACKAGE SUBSTATION: 11 kV / 433 V

TYPE TESTS of PSS

Only type tested quality PSS as per IEC 62271-202 shall be offered. Type test certificates mentioned in this clause shall be submitted along with offer for scrutiny.

Mandatory type test as per IEC 62271-202 should be submitted as per the attached list.

- a) tests to prove the temperature rise of the main components contained in a prefabricated substation
- b) tests to prove earthing circuits to be subjected to the rated peak and the rated short-time withstand currents
- c) functional tests to prove satisfactory operation of the assembly

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- d) tests to verify the degree of protection of HT/LT compartment and for transformer compartment.
- e) for prefabricated substations class IAC-A & B class for 21kA for 1 sec tests to assess the effects of arcing due to an internal fault.

Individual type tests of components as per corresponding IEC's shall be submitted over and above the above-mentioned type tests for PSS.

Approval from Local Distribution company / Electrical Inspectorate :

The Contractor shall prepare and submit all the relevant drawings as per the requirement of **Local Authority/ TPSODL/ Electrical Inspectorate** and obtained the Approvals and liasoning with the **Local Authority/ TPSODL/ Electrical Inspectorate for the commissioning of the sub-station in all respects shall be borne by the contractor.** No incidental expenses will be paid towards the same.

Statutory fees paid by the contractor will be reimbursed by the Bank on submission of authentic documents/receipts in the name of the Bank. Other Statutory fees will be reimbursed by the Bank on production of documents/receipts of such payment.

Diagram and Information:

Contractor shall submit for consultant's approval the shop / vendor drawing consisting of G.A.drawing, sectional elevation, single line diagram, bill of material etc. and design calculations indicating type, size, short circulating rating of the electrical components used, busbar size, internal wiring size, panels dimension, color, mounting details etc., The contractor shall submit manufacturer's catalogues of the electrical components installed in the panels.

Warranty:

The contractor shall stand guarantee for the performance of entire equipment and components for twelve (12) months from the date of commissioning or eighteen (18) months from the date of dispatch, which is earlier, as agreed up on and as reproduced in the purchase order within the tolerance specified or as permitted by the relevant standards for the equipment in his scope of supply. The Bank also reserves the right to use the rejected equipment or part thereof until the new equipment meeting the guaranteed performance is supplied by the contractor.

Spares:

The contractor shall quote for minimum spares required for two years safe operation of transformer along with the offer separately.

APPROVED MAKE LIST OF ELECTRICAL AND ALLIED ELECTRICAL MATERIALS		
SL. NO	MATERIAL DESCRIPTION	APPROVED MAKES
1	PVC CONDUIT (FR Grade, ISI Mark)	: PRECISION / AKG/BEC/AVON PLAST/GM/CLIPSAL
2	STEEL CONDUIT (ISI MARKED)	BEC/BHARAT/GUPTA/AKG/RMCON/STEEL KRAFTS
3	PVC FRLS COPPER WIRES (ISI MARK/Telephone Cables/ Co-axial TV Cable	: KEI / POLYCAB / ANCHOR / RR CABLE / HAVELLS/FINOLEX
4	MODULAR SWITCH / SOCKET /TV SOCKET /DATA SOCKETS/ ELECTRONICS REGULATOR/ AC STARTER SWITCH etc.	: LEGRAND (Myrius) / ABB (IVIE)/ SCHNEI- DER (ZENCELO)/WIPRO-NORTHWEST – ARTISA/MK-BLENZE PLUS
5	MCBs/ ELCB/RCBO/ISOLATOR	: LEGRAND / L & T / ABB /Siemens/Schneider/Hager
6	MCB DB/ INDUSTRIAL SOCKET OUTLET.	LEGRAND (Ekinox) / L & T (AU) / ABB (Itus)/Siemens- Betaguard/Schneider- Acti9
7	APFC RELAY	: L&T/BELUK/SIEMNS/EPCOS/ABB/SCHNEI DER/NEPTUNE
8	HV / MV XLPE INSULATED CABLE	: KEI / POLYCAB / RR CABLE / HAVELLS/FINOLEX/NICCO/UNIVERSAL/CC I
9	HT CABLE TERMINATION KIT	: RAYCHEM / M-SEAL/3M
10	PVC BATTEN/ANGLE HOLDER	ARIS- TO/ANTEX/PRAKASH/KINJAL/ANCHOR
11	GI CABLE TRAYS & RACEWAYS	: NIEDEX / PROFAB / JKR / CLASSIC / SHRUTI / PATNY
12	EXHAUST FAN/ CEILING FAN	: ALMONARD / HAVELLS / CROMPTON / ORIENT/BAJAJ/ATOMBERG
13	LED LIGHT FITTINGS	: PHILIPS / HAVELLS / WIPRO/CROMPTON/BAJAJ
14	ACB	: L & T (OMEGA)/ ABB (FORMULA) / SCHNEIDER (NW) /SIEMENS (3WL)
15	MCCBs	: L & T (D-Sine) / ABB (Formula) / SCHNEI- DER (NSX) /SIEMENS (3VA) /LEGRAND (DPX3)
16	CONTACTOR AND OVER LOAD RELAY	: L & T / ABB / SCHNEIDER /SIEMENS/C&S

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17	DIGITAL METERS	:	CONSERV (SCHNEIDER) / L&T / ABB/ SECURE/MECO/RISHAB/AE
18	CAPACITOR ALL PP / HEAVY DUTY MPP	:	SCHNEIDER / L&T / EP-COS/SIEMENS/MIHIR
19	CTs & PTs	:	KAPPA / KALPA / AE/SCHNIDER/L&T/GILBERT
20	CONTROL SWITCHES	:	KAYCEE/GEC/ALSTOM /L&T-SALZER/SCHNIDER/HPL
21	ELR / EARTH FALUT RELAY	:	ALSTOM / PROK DIVS / ER /SIEMENS/SCHNIDER/ABB
22	PROTECTVE RELAY	:	ALSTOM / PROK DIVS / ER /SIEMENS/SCHNIDER/ABB
23	PUSH BUTTONS	:	TECHNIC / ABB /SCHNEIDER / L&T/SCHNIDER
24	INDICATING LAMPS (LED)	:	TECHNIC / ABB /SCHNEIDER / L&T/SCHNIDER/BCH/EMCO/KAYPEE
25	LUGS / GLANDS	:	DOWELLS / JAISON/ COMET / BRACO
26	TERMINALS & CON- NERCTORS	:	ELMEX /CONNECTWELL/ESSEN-FINGER TOUCH PROOF OR AS EQUIVALENT.
27	FERRULES	:	MAYFAIR/Balaji Industries OR AS EQUIVALENT.
28	RAISING MAIN, BUS BAR TRUNKING, ATP-OFF BOXES	:	C&S/ SCHNEIDER /LEGRAND/ABB/L&T
29	BUS BAR SUPPORTS	:	C&S/ SCHNEIDER /LEGRAND/ABB/L&T
30	UPS / INVETERS	:	VERTIVE/NUMERIC/BPE/APC/ABB
31	BATTERY	:	AMRARAJA/EXIDE/AMCO
32	STABILIZER	:	DUBAS / EMERSON / POWERTRONIX/SERVO
33	Load Monitors / Controller	:	Ducati / Electrex / Enercon / CIRCUTOR
34	Control Cables	:	KEI / POLYCAB / RR CABLE / HAVELLS
35	Battery charger	:	AMERON/ EXIDE/AMCO/ARMARA RAJA
36	ATS/SPD	:	L & T / ABB / SCHNEIDER /SIEMENS/LEGRAND/HAGER
37	DAY Light/ OCCUPANCY Sensor	:	LEGRAND/SCHNEIDER/ABB/JONSHON CONTROL/HAGER/WIPRO/LUTRON
38	MV PANEL	:	TTA/CPRI FABRICATORS WITH PANEL CLEARED BY CPRI.
39	ANGLE IRON/CHANNEL IRON	:	SAIL ,TATA, JINDAL
40	LAN CABLE	:	PAN-DUIT/BELDEN/MOLEX/LEGRAND/EXTREME/SYSTIMAX(COMMSPACE)
41	NETWORK RACK	:	NETRACK/WQ/PANDUIT/RITTAL/EMERSON/VALRACK
42	GI PIPE	:	TATA/JINDAL/ZENITH/SURYA/SAIL

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43	CEILING ROSE	ANTEX/LEADER/EMPEROR/ANCHOR
44	WEATHER PROOF BOXES	HANSEL/LEGRAND/OBO BETTER-MAN/C&S
45	ELECTRIC INSULATION MAT	DOZZ/PADMINI/RAYCHEM/JYOTHI RUBBER UDYOG
46	TELEPHONE JACK	BELDEN/SYSTIMAX/PANDUIT/SIEMON
47	HDMI Cable	Crestron / Extron / Kramer / Beldan/ Lightware/AMX/Nt
48	HRC FUSES	L&T/siemens/Alstom/GE
49	FUSE SWITCH UNITS/DISCONNCTING SWITCH FINAL UNITS	L&T/siemens/Alstom/GE/Legrand/Merlin Gerin
50	DIESEL GENERATOR SET	Kirloskar/Mahindra/Jakson/ Caterpillar/ Volvo
51	LIFT/ELEVATOR	Kone/ Otis/ Johnson/ Mitsubishi/Schindler/ThyssenKrupp
52	All others items not Covered Above	As per approval of the project Architect & Bank

Volume –V
TECHNICAL SPECIFICATIONS
FOR
MECHANICAL WORKS

TECHNICAL SPECIFICATION FOR 160kVA, 3-PHASE DIESEL GENERATOR SET WITH AMF PANEL AND ALLIED ACCESSORIES

Scope of work:

The DG set capacity shall be 1 No 160kVA, 415V with engine and alternator with suitable coupling and both should be from same manufacturer preferably. It shall be mounted on a common base frame as per the recommendations of DG set engine manufacturer. The base frame shall be mounted with *anti-vibration* mounts or friction pads. The anti-vibration level of the Generator set shall be well within the permissible limits as advised by the DG manufacturer.

The DG set shall comprise of the following systems to make it complete in all respects:

1. Fuel oil system
 2. Cooling water system
 3. Starting system
 4. Lubrication system
 5. Exhaust system
 6. Governing system
 7. Diesel Engine
 8. Alternator
 9. Generator Panel
 10. Acoustic enclosure
- a) The equipment shall be capable of delivering continuously at the generator terminals a net output not less than **160kVA (128 kW at 0.8 PF)** when operating at site under ambient parameters and conditions.
- b) IP protection: IP – 53/ IP – 55 (certificate to be furnished along with the bid)
- c) The design parameters of the generator and excitation system shall be so chosen, that the set should be *absolutely stable while running at any load between no load and full load and also during starting of inductive load (motor/pump etc.)*.

1. Fuel Oil System

- a) The fuel oil system shall comprise of minimum fuel tank of capacity 380 litres diesel tank, with inlet & outlet arrangement with Drain plug & Air vents, filters, pipes, valves, etc. The inflow to the tank from the barrels shall be by a hand operated pump. The fuel oil tank shall be manufactured from MS sheet of suitable thickness with adequate stiffeners.
- b) Type of fuel shall be High Speed Diesel (HSD) as per IS:1460.
- c) The service tank shall be provided with inlet, outlet, excess fuel return, overflow, air vent and drain connections, oil level gauge, etc.
- d) Fuel consumption at 75% Rated load with Radiator fan: 27 Ltr./Hr. or less
- e) Fuel consumption at 100% Rated load with Radiator fan: 35 Ltr./Hr. or less

2. Cooling Water System

The cooling water system shall be of Liquid cooling type. This system shall be provided with temperature switch so that when the temperature of jacket water goes above the permissible limit, the engine shall stop and give an audio visual alarm.

3. *Starting System*

- a) The starting system shall consist of DC motor energized by 2 Nos 12V batteries conforming to relevant IS specifications with Low/High battery voltage and weak battery warning. The capacity of batteries shall be of **120 AH** SMF battery each to cater for minimum 4-5 consecutive starts.
- b) The battery charger for charging the starting batteries shall be in-built with the engine and panel with suitable electrical interlocks. While running it has to charge from engine & during idling the battery to be charged from the panel/mains supply.

4. *Lube Oil System*

- a) Lube oil system shall consist of an in-built sump provided in the engine, the engine driven gear pump, duplex filters and Lube oil cooler etc.
- b) A pressure regulator shall be mounted in the Lube oil pump to control Lube oil pressure. Filters and screens shall be provided in the L.O. system to remove foreign particles from circulation and prevent damage to bearing or mating surfaces. The L.O. system shall include L.O. pressure sensing device which shall cut off fuel supply to the engine as soon as the pressure falls below a pre-set value and shall give audio visual alarm. L.O. system shall be provided with pressure gauges and temperature gauges at inlet and outlet of L.O. Cooler.
- c) Lube oil should be of SAE, CH4/C14 15W40 grade.

5. *Exhaust System*

- a) The exhaust gas from the engine manifold shall be connected to the turbo charger through a flexible joint. Outlet from the turbo charger shall be connected to a residential silencer through another set of expansion joints. The exhaust pipe inside the DG plant shall be thermally insulated by means of lagging with 50 mm thick glass wool, covered with chicken mesh and cladding with 24 gauge Aluminium sheet.
- b) The intake air shall always be routed through a dry air filter by an air intake fan mounted suitably and the filter shall be mounted on engine. The turbo charger shall consist of a turbine wheel and a centrifugal compressor, separately encased but mounted on and rotating with a common shaft. The power to drive the turbine wheel shall be obtained from energy of engine exhaust gases. The charger shall be lubricated and cooled by engine lubricating oil. **The DG set shall be in compliance with Bharat III/Euro III Emission standards (latest norms).**
- c) The constituents of exhaust gas shall be well within permissible limit as per the local authorities like corporation, traffic police, state pollution board etc.

6. Governing System

- a) The governing shall be **Solid State Electronic type** with adjustable droop mechanism.
- b) An over speed trip mechanism shall be provided to automatically shut off the fuel and to stop the engine in case the set speed reaches about **110%** of the rated speed with audio alarm indication.

7. Diesel Engine

- i) The diesel engine shall be 6 cylinder or higher, inline, 4 stroke, 1500 rpm, 199 BHP or higher (continuous rating as per ISO 8528-1) single action with multi cylinders. The engine shall be coupled to 160kVA, 415V, 50Hz alternator and delivering the rated output.
- ii) Radiator cooled with coolant and ventilation suitable/required air flow for canopy.
- iii) The engine shall be turbo charged after liquid cooled for cooling and electrical starting arrangement with battery to start the engine.
- iv) The direction of rotation of engine shall be clearly marked on the set.
- v) Filter shall be dry type air filter with replaceable elements.
- vi) Engine shall be fitted with Electronic Govenner.
- vii) Instrument control panel shall be furnished for the engine shall also have accessories and gauges like indicators, filters and protection devices for the following faults or abnormalities:
 - a. High Engine water temperature warning/shutdown – water temperature gauge
 - b. Low Lube oil pressure warning/shutdown – Lube oil pressure gauge
 - c. Engine over speed indicator – Hour metre with rpm indicator
 - d. Battery charging and low battery indicator
 - e. Sensor failure indicator
 - f. Push button
- viii) The engine shall confirm to specification BS: 5514 and latest CPCB norms Compliance.

8. Alternator

- a) The generator shall be capable of delivering 160 KVA output (128 KW at 0.8 power factor) with the terminal voltage differing from the rated value of not more than $\pm 1\%$ and the frequency not more than $\pm 1\%$ in static conditions.
- b) Voltage rating shall be 415V, 3 phase (solidly grounded) and AC Ampere rating shall be 222A or higher.
- c) The generator stator and rotor windings shall have **class 'H' insulation** with **IP 23 protection** and meeting the temperature limitations set forth in IS: 4722.

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- d) The excitation system shall be provided with high speed, solid state automatic voltage regulator.
- e) Connection –Star
- f) Power factor – 0.8 lag
- g) Excitation – Brushless Self exciter

9. Generator Panel (Standard)

- a) The generator panel shall be of CRCA sheet steel of not less than 16/18 SWG thick, floor mounting, free standing, dust and water proof enclosed cubicle type.
- b) The panel shall be powder coated for a weather proof and long lasting finish.
- c) The panel shall be complete with fuse switch / circuit breaker, protective relays, instruments, switches, fuses, indicating lamps, annunciation windows etc. as specified. A gland plate shall be provided at the bottom / top of the panel for termination of incoming and outgoing cables.
- d) All equipments shall be so connected that the removal and replacement may be accomplished individually without disturbing other equipment.
- e) Control and meter selection switches shall have integral name plates. Name plate for all other devices shall be located below the respective devices and shall be in English language only.
- f) Instruments and devices mounted on the face of the control panel shall also be identified on the rear with instrument or device number.
- g) Fuse links shall be provided for isolation of individual circuit from the bus distributing other circuits.
- h) The terminal blocks shall be grouped as per circuit functions.
- i) A continuous 25 x 3 mm copper earthing bus shall be provided throughout the length of the panel and shall have terminal lugs at each side for connecting to the station grounding bus. Space heaters of adequate capacity shall be provided to prevent moisture condensation and shall be provided with a thermostat and ON / OFF switch.
- j) The panel shall be provided with door-operated incandescent lamp. It shall also be provided with switched socket of 5A rating.
- k) Micro-processor based Genset controllers shall be
- l) The indicating meters shall be of Digital flush mounted type.

Metering:

- a) Generator incoming panel shall be provided with the following meters and relays. 1000 amps incoming ACB (near DG set output) and at AMF panel:
 - i) Earth fault relay

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- ii) 1 No. (0-600V) Digital AC Voltmeter – 3 phase voltage
 - iii) 1 No. (0-250A) Digital AC Ammeter – 3 phase current
 - iv) 1 No. (0-150kW) Digital type meter – 3 phase power (kW)
 - v) 1 No. (0-200kVA) Digital type meter – 3 phase power (kVA)
 - vi) 1 No. 0.5 lag – 1 – 0.5lead digital p.f. meter
 - vii) 1 No. Digital kWh meter flush type
 - viii) 1 No. 16A DC ON/OFF double pole switch
 - ix) Battery charging arrangements consist of transformer, rectifier, resistance, D.C. Ammeter, voltmeter, selector switch off / trickle / boost.
 - x) 1 No. Auto/Manual/ Test selector switch
 - xi) 1 No. 45-55Hz Digital type frequency meter
 - xii) 3 Nos. push button for ACCEPT, RESET & Lamp set
 - xiii) 1 set of indication lamps for breaker ON/OFF indication
- b) 1 No. 250A TPN 36kA MCCB with all protective devices, connecting mains cable and DG set Cable as per CEIG / CEA norms will be in the scope of DG set vendor.
- i) 3 Nos. twin core resin cast CTs ratio 100/5-5A, 15VA Clause 1 for metering and 15VA, IP10 for protection
 - ii) Controller provided in DG set/ control panel shall have the following diagnostic features or annunciation shall be given for the following:
 - iii) Lube oil low pressure
 - iv) Engine over/under speed
 - v) High Engine temperature & High water temperature
 - vi) Control source failure
 - vii) Fuel level low or fuel usage alarm
 - viii) Engine starting failure
 - ix) Battery charge high/low/failure
 - x) Earth leakage trip
 - xi) Over current
 - xii) Over/under voltage
 - xiii) Over kW
 - xiv) Phase sequence/phase missing
 - xv) Mains under voltage
 - xvi) Earth fault trip
 - xvii) Over Crank protection
 - xviii) Genset Test Facility
 - xix) Mains frequency

10. Acoustic Enclosure

- a) Acoustic hood for housing the DG set to be mounted on a concrete/ platform. The acoustic enclosure shall be of suitable size as per norms prescribed by Central Pollution Control Board (CPCB). The guaranteed noise level shall be of **75 decibels at 1 m distance** or lesser value stipulated by CPCB.
- b) The enclosure shall be of totally weather, vermin and dust proof to enable the generator to operate at an ambient temperature of 48°C. The outer casing of the container

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shall be of sheet steel of suitable thickness. The total container shall be of powder coated.

- c) The overall dimensions of the acoustic enclosure (l x b x h) may please be indicated.

11. Earthing System

- a) The complete D.G set has to be earthed with 25 x 3 mm copper flat as per BOQ with duplicate earth connection separately for alternator and control panel.
- b) 2 Nos. of earth electrodes for body earth and 2 Nos. earth electrodes for neutral earth shall be provided by the Bank (**already mentioned separately in the tender BOQ, therefore shall not be covered under DG scope of work. Hence, contractor need not to be considered earthing item while quoting the price for DSITC of DG set**) as per IS-3043 with GI pipe ('B' Class) earth electrode. Interconnection of earth electrode, earthing of fuel oil tank, base frame etc. shall also be carried out as per relevant standards.

12. Approvals

- a) It is the responsibility of the contractor to get the approval from relevant authorities like CEIG, other statutory authorities from Odisha/ CEA.
- b) The contractor shall prepare necessary drawings for approval by Chief Electrical Inspector to Government, obtain approval for the same, arrange for the inspection by the Electrical Inspectorate Officials and obtain safety certificate from them for commissioning the installation (This building is fed by HT power supply).
- c) The fees payable to CEIG/CEA shall be borne by the contractor.

13. Cabling & Terminations

Power cable from alternator to control panel viz. 3 x 3.5 core 120 Sq.mm. PVC insulated XLPE armoured Aluminium cable shall be provided as per BOQ. All control cables between DG set and control panel are also in the scope of the DG set supplier. All end terminations to be carried out by crimping type aluminium / copper sockets.

14. Quantities

Payment will be made for the actual quantity of work executed viz. cabling, earthing, fuel line, annunciation line, etc. Bidders are instructed to quote rates for all measurable items like various size of cables, end terminations, piping valves, etc. which will be measured as per the finished installations as per pricing sheet enclosed.

15. Drawings and Manuals

The successful bidder shall submit the following GA drawings in three copies for approval by client.

- a. General arrangement of each equipment showing fixing dimensions, static weight
- b. Foundation drawing for DG set, if required
- c. Schematic control diagram for DG control panel

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- d. Terminal Board (TB) wiring diagram
- e. After approval of above drawings and after completing of erection, the contractor shall submit 'As-Built' drawings in two copies with one set of reproducible to the Owner (Bank).
- f. Two sets of operation and maintenance manuals for the DG sets and auxiliaries shall also be submitted to owner.

16. Packing:

The materials shall be properly packed before dispatch to avoid damage during transport, storage and handling to be ensured by the vendor/bidder. Bank is not responsible for any mishandling of equipment at site before handover.

17. Installation, Erection, Testing and Commissioning:

- a) The contractor/ vendor shall provide PCC type foundation with the ratio 4:2:1. The length and breadth of the foundation shall be 300mm more from the respective length and breadth of the DG set. The height of the foundation shall be 400mm i.e. 200mm below and 200mm above the ground level.
- b) The generator set, control panel, as well as the neutral of the DG set shall be effectively earthed. The contractor shall provide 4 Nos GI Chemical Earthing Pits, chamber cover etc. along with required GI flat of size 25mm x 3mm. Earth pits are placed minimum 8ft apart to ensure better earth value (less than 5 ohms).
- c) Power cabling and allied accessories viz. power cable, cable glands, cable end lugs, PVC numbering ferrules, tapes etc. for DG set shall be supplied and installed by the contractor as per the requirement at site.
- d) Residential silencer and the exhaust pipe up to silencer shall be provided by the contractor with the DG set.
- e) The DG set and control panel shall be tested at site in presence of the engineer-in-charge. Load for the testing shall be arranged accordingly by the contractor.

18. *To be submitted with the bid:*

- i) Manufacturer's catalogue
- ii) Copy of Alternator Type test report
- iii) Copy of Type approval certificate of the Engine
- iv) Copy of Type approval certificate of the DG set
- v) Copy of Conformity of Production (COP) certificate of Engine
- vi) Copy of Conformity of Production (COP) certificate of DG set

19. Spares:

The contractor shall advise for minimum spares required for up to 5 years for safe operation of the equipment.

20. Warranty:

18 months from the date of supply or 12 months from the date of commissioning whichever is earlier.

TECHNICAL SPECIFICATION FOR 160kVA, 3-PHASE DIESEL GENERATOR SET WITH AMF PANEL AND ALLIED ACCESSORIES (Details to be furnished by the bidder on award of work)

Sl. No.	Description	Specification
1.	Generator KVA Rating / Model No.	160kVA /
<u>Engine</u>		
2.	Make	
3.	Model No.	
4.	BHP Output	
5.	Cooling	
6.	Aspiration	
7.	No. of Cylinders	
8.	RPM	
9.	Compression ratio	
10.	Displacement (ltrs.)	
11.	Fuel oil	
12.	Fuel consumption at no load	
13.	Fuel consumption at 25% load	
14.	Fuel consumption at 50% load	
15.	Fuel consumption at 75% load	
16.	Fuel consumption at full load	
17.	Capacity of fuel tank (litres)	
18.	Governor	
19.	Starting system	

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20.	Lube oil specification	
21.	Lube oil sump capacity	
22.	Lube oil consumption (Ltrs per hour)	
23.	Coolant capacity	
24.	Lube oil change period (hrs.)	
25.	Emission compliance	
26.	Battery rating	
Sl. No.	Description	Specification
<u>Alternator</u>		
27.	Make and Model No.	
28.	Type	
29.	Voltage	
30.	Frequency	
31.	Phase	
32.	Rated current	
33.	Power factor	
34.	Enclosure	
35.	Voltage regulation	
36.	Class of Insulation	
<u>Control Panel</u>		
37.	Make	
38.	Type	
39.	Overall dimensions (L x B x H)	

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40.	Finish	
41.	Sheet metal size	
42.	Make and type of contactors / circuit breakers	
43.	Make and type of instruments	
44.	Make and type of switch fuse units	

45.	Other facilities incorporated	
<u>Generator set</u>		
46.	Noise level	
47.	Overall dimensions of the DG set	
48.	Overall canopy dimension	
49.	Approx. Total weight (Dry)	
50.	Type of coupling/bearing details	

TECHNICAL SPECIFICATION FOR SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF 13 PASSENGER LIFT

Scope of work: Design, supply, installation, testing and commissioning of 13 passenger Machine Room Less Lift.

The contractor shall assume full responsibility for the details of equipment selection. Erection and commissioning of the lift. The installation shall comply with all the safety codes and Lift Rules & Regulations (If any).

a) Excluded from the Scope of Lift Installation Work (However, all LIFT related civil works excluded in this scope has to be carried out by the contractor which is already mentioned under Civil works category):

The following items of work are excluded from the scope of Lift Installation Work

- i) Clear finished hoist way
- ii) Overhead including floor slab and the lift pit
- iii) Architraves for Lift Entrance
- iv) Hoisting hooks/ISMB/ISMC in overhead ceiling, as per Lift Supplier's Specification.

b) Included within the Scope of Lift Installation Work

- i) All works pertaining to the lift installation including supplying, fixing and painting of machine supporting beams, bearing plates, buffer support, channels, hoistway steel door frames at each landing, fascia plates, landing sills, metal counter weight guards, guides and brackets, pit ladder and other steel items and all foundations, pedestals required shall be within the scope of lift installation work. Scaffolding for lift erection and wooden posts for supporting the door and cutting of walls, floors ceilings, steel reinforcements or partitions together with any repairs made including those required for pit floor, grouting of all bolts, sills, steel members indicator and button boxes etc in position, and making good the damages including wiring and providing light points and socket outlet points in the hoistway and pit shall be within the scope of lift installation work.
- ii) Electrical Power Supply with isolating switch and 2 Nos earth continuity connections to the Controller of Machine Emergency and Test Panel(s) when the controller is mounted in the lift well.

Note: The contractor has to consider all above costs while quoting the rate for installation of LIFT.

2. CODES AND STANDARDS

Design of elevator components, their installation and operation shall meet with

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- i) IS-14665 (Part-2|Section-I) 2000 specifications for electric passengers and go elevators.
- ii) IS-14665 (Part-2/Section-I): 2000 code of practice for installation, operation maintenance of electric passenger and goods elevators.
- iii) IS-14665 (Part-1): 2000 outline dimensions of electric elevators.
- iv) IS-14665 (Part-3): 2000 for Safety Rules.
- v) IS-14665 (Part-4): 2000 for components of elevators
- vi) I.E. Rules, 1956, as amended upto 2005.

All codes and standards referred herein mean the latest and any work to alternative cc or practice shall be specifically stipulated by the Bidder citing the variations for acceptance by the Bank.

3. POWER SUPPLY

a) Necessary electric power supply connection required till the completion of erection of the equipment will have to be arranged for by the contractor at his own. However, the Bank may assist the contractor in obtaining such connection. Temporary wiring carried out for this temporary supply will be in conform to the requirements of the local power supply agency. The necessary connection charges for temporary supply as well as consumption charges if provided/arranged by Bank will have to be borne by the Contractor.

b) Permanent Electric Supply for the machines, lift car lights and fans and lights well shall be available from the main switches of lift control panel. Any wiring onward from these switches shall have to be carried out by the contractor at his cost. **2 Nos earthings required for the LIFT equipment shall be provided by the contractor at his own cost.**

c) Adequate Nos of light points and power outlet points with necessary local switches shall be provided for the lift well and pit (over all portion) by the contractor including making necessary wirings and earthings.

4. ABBREVIATION

Wherever the following abbreviations occur they shall be interpreted to read as follows

B.S.S.: British Standard Specification.

- a) ISS: Indian Standard Specification.
- b) I.E.E. Regulations: Regulation for the Electrical Equipments of Building issued by the Regulations Institution of Electrical Engineers, London.

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- q) I.E. Rules: Indian Electricity Rules in force at the time of installation
- d) A.C: Alternating Current
- e) K.W: Kilowatts
- ƒ) B.H.P: Brake Horse Power
- g) M.P.S.: Meter Per Second
- h) KG: Kilogram
- i) MRL: Machine Room Less

5. AMBIENT TEMPERATURE AND HUMIDITY CONDITION

The Lift with associated equipment shall be suitable for continuous use in an ambient temperature of 45⁰ centigrade and relative humidity of 100%, both not occurring simultaneously.

6. CONTRACT DRAWINGS

The successful bidder shall be required to submit the following drawings and other applicable drawings if any not mentioned here at appropriate stages for approval of the Architects/Bank:

- a) General arrangement drawing in plan and elevation.
- b) Plan, Cross sectional elevation and end view of the machinery wherever applicable including their weight, and various force, reactions acting on the floors, walls foundations.
- c) Drawing showing details of locations of fixtures for guides in the lift shaft.
- d) Foundation drawing of all plants including weight wherever applicable.
- e) Schematic Control Circuit Drawings.

On completion of the work, a complete set of 'As Built' drawings in triplicate shall be handed over to the Bank for record. Schematic wiring diagrams are also to be handed over to the Bank in triplicate at the time of handing over. Further, a copy of the detailed wiring diagram shall be framed and installed by the contractor in a location suggested by the Bank/Architect.

7. TECHNICAL PARTICULARS

The bidder shall furnish Technical particulars of the equipments offered in the proforma as attached so as to enable a critical technical analysis of their offer.

8. COMPLETION TESTS

A. Load Test

A contract load test by the LIFT OEM technical team under the presence of the Bank's representative shall be carried out before the lift is put into commission. During the test the brakes, limit switches, buffers and car safety devices shall be caused to function with the contract load in the lift. The lift shall be tested for accuracy of levels at all loads in either direction and for smooth vibration less travel. The lift shall be accepted upon satisfactory completion of the contract load test and after the same is certified by Statutory Authority/Lift Inspector and Banks representative.

B. Other Completion Tests

1. Insulation resistance tests to earth of the entire electrical equipment and wiring installation are to be carried out by means of a constant pressure of 500 volts testing megger set and the test result shall not be less than 1 mega ohm.
2. Result of continuity test of the conduit installation and any other metal work earth shall not be more than one ohm.
3. The temperature of motors and associated control equipment shall be checked after a continuous run of at least one hour duration to ensure U temperature rises are within the limit.
4. Test for speed shall be carried out and the speed shall not vary more than 10% of the specified speed under any conditions of load during ascending and descending.

9. FEES & LICENSES

- a) The Contractor shall submit requisite application forms with necessary fees to the State Lift Inspector/Authority for permission to erect and for operation after getting the requisite forms (to be provided by him) duly filled in and signed by the Bank. The contractor will liaison with the lift inspector including payment of all incidental charges, and arrange the provisional approval, inspection and issue of the license by the Lift Inspector regular use of the lifts.
- b) The contractor shall bring all his tools and tackles, testing apparatus at the time inspection of Government Inspector/Statutory Authority and he will be solely responsible getting the lift installation approved/passed by the lift inspector/Authority.
- c) Statutory fees paid by the contractor will be reimbursed by the Bank on submission of authentic documents/receipts in the name of the Bank.

10. MAINTENANCE

The contractor shall undertake comprehensive maintenance of the equipments installed under this contract for a minimum period of 12 months from the date of virtual completion of the work in all respects and acceptance of the complete installation. The maintenance dur-

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ing the above period shall be free of cost to the Bank and shall cover weekly inspection of the equipment, carrying on necessary adjustment, oiling, and greasing and replacement of parts, if necessary and attending to the breakdown calls immediately.

Note: After one year manufacturer's warranty, CAMC shall be provided by the OEM of Lift.

11. GUARANTEE

The lift installation shall carry warranty for a period of 12 months, within the purview of Defect Liability Period, from the date of virtual completion of work and handing over, against defective materials and workmanship. During the warranty period the contractor shall rectify, repair or replace defective parts and components free of cost to the Bank.

12. TRAINING OF BANK'S PERSONNEL

The contractor shall arrange a training session with the Bank's personnel of AO, Berhampur post erection and commissioning regarding the operation of the lift and all safety related features and familiarize the Bank's personnel with the regular operation and routine maintenance of the machinery and equipments.

13. TECHNICAL DATA

Technical Data Sheet is attached as Annexure-A.

14. SPECIFICATIONS FOR THE LIFT

i) Machinery

Shall be Gear less (MRL design) type located directly above the lift well. This shall be complete with motor, electromagnetic brakes, shaft, sheaves, all mounted on a single bed plate. Motor shall be specially designed for lift service with high starting torque, low starting current and low noise level. The machine will be provided with dust resistant. Machine should be latest gearless design as per relevant IS.

ii) Suspension Ropes/Belt and Sheaves

a) Round steel wire rope (galvanized) or coated steel belts can be allowed for suspension of the car and counterweight.

b) Steel wire ropes shall conform to IS 14665 (Part 4/Sec 8).

c) Coated steel belts (CSB) used shall comply with IS 15785:2007, ratio of sheave diameter to steel chord will remain 40:1 and minimum factor of safety on CSB breaking strength will be 12.

d) Deflector and overhead sheaves shall be of 30 ton ferromolybdenum casting or steel, with grease lubricated bearing supported on structural steel beams. Sheaves shall be provided with grooves to maintain constant traction and positioned as to obtain proper loading of car and counter weight ropes.

e) If two to one roping is employed, to ensure safety a guard shall be provided on the top of the car as per IS: 1860-1968.

iii) Brakes

a) General Provisions

1. The lift shall be provided with a braking system which operates automatically: In the event of loss of the mains power supply; and In the event of the loss of the supply to control circuits.
2. The braking system shall have an electro-mechanical brake but may, in addition, have other braking means (for e.g: electric).

b) Electro-mechanical brake

1. This brake on its own shall be capable of stopping the machine when the car is travelling downward at rated speed and with the rated load plus 25 percent. In these conditions the retardation of the car shall not exceed that resulting from 'the operation of the safety gear or stopping on the buffer. The electro- mechanical device will also prevent the elevator from moving when the car is at rest and no power is applied to the hoist machine.
2. All the mechanical components of the brake which take part in the application of the braking action on the drum or disc shall be installed in two sets. If one of the components fail to apply a sufficient braking effort to slow down the car, travelling downwards at rated speed and with rated load, the other component shall continue to work.
3. Any solenoid plunger is considered to be a mechanical part, whereas solenoid coil is not a mechanical part.
4. The component on which the brake operates shall be coupled to the traction sheave or drum by direct and positive mechanical means.
5. A continuous flow of current is required to hold off the brake when the lift is in normal use.
6. The interruption of this current shall be effected by at least two independent electrical devices, whether or not integral with those, which cause interruption of the current feeding the lift machine. If, whilst the lift is stationary, one of the contactors has not opened the main contacts, further movement of the car shall be prevented at least at the next change in the direction of motion.
7. Braking shall become effective without supplementary delay after opening of the brake release circuit.
8. Any machine fitted with a manual emergency operating device shall be capable of having the brake released by hand and require a constant effort to keep the brake open.
9. Band brakes shall not be used. Brake linings shall be incombustible.

iv) Overload Protection of Lift

In case of overloading the lift, an alarm bell fitted in the car will sound to alert the passengers that the lift has been overloaded & the door will stay open and overload sensor will prevent the lift from moving until the excess load is removed.

v) Automatic Rescue Device

This will enable to move the lift car to the nearest lower landing in case of lift stoppage in between landings due to power failure. The electronic controller along with necessary dry maintenance free batteries with battery charger shall be installed at a suitable location on the top landing floor which will continuously monitor the normal power supply into the main lift controller and activate the rescue operation within a few seconds of a power failure. It will bring the lift car to the nearest lower floor and open the doors automatically. Thereafter, the lift car shall remain parked there until normal power supply resumes.

vi) Guides & Fastening

1. Heavy duty steel tee guides as per IS 4666-1968 shall be provided for car and counter weight, the guide surface being machined and polished. These shall be continuous through the entire length of lift well and shall withstand without any deformation with a fully loaded car. The ends of the guides shall be tongued and grooved to provide smooth joints and connected with steel joint plates. The guide rails shall be securely fastened to Brackets or supported by approved heavy rail clamps. Guide brackets or supports shall be bolted or welded to the steel inserts provided in the hoistway.
2. Guide rail lubricators shall be provided in the car. The lubricators shall be able to evenly distribute the oil over the guide rails at adjustable feed rates.

vii) Lift Car

a) Size

To be quoted by the tenderer, according to the specified capacity and to be accommodated in the available lift well (approximate size has been mentioned in lift detail).

b) Car Frames

The car frame shall be made of structural steel of rigid construction to withstand without permanent deformation. Car shall be so mounted on the frame that minimum vibration and noise are transmitted to the passengers inside.

c) Car Platform

The car platform shall be of framed construction and shall be mounted on rubber isolating pads supported on the car frame. The flooring of the car shall be provided with 20 mm thick Granite of scratch resistance finish as approved by the Bank.

d) Car Body

The lift car enclosure shall have side, rear, front and ceiling of stainless steel. The enclosure including the door shall withstand deformation against a thrust of 35 kg applied normally at any point as per IS 4666- 1968. Ventilation opening shall also be as per above IS.

e) Car Roof

The roof shall be constructed to withstand the weight of 2 men. Access trap of ample dimension shall be provided in the roof of the car to provide for emergency exit.

f) Car Fixtures

Besides car operation panel and signals as specified elsewhere the following shall be provided:

1. Suitable sweep ceiling fan, recess mounted in ceiling, with grills.
2. Indirect LED lighting.
3. Battery operated automatic emergency light with rechargeable Dry maintenance free battery (2hours back-up) and battery charger.
4. One handset unit for intercom.
5. Stainless steel handrail on three sides.
6. Car Operation Panel Control Panel
7. The control panel should be installed near the hoisting equipment;
8. The control panel should be accessible from the landing for maintenance purposes;
9. Adequate safety measures should be provided to control unauthorized access;
10. Adequate illumination should be provided for the control panel for easy maintenance. Illumination should be available even when there is no power supply. Minimum of 50 Lux illuminations should be provided for the control panel;

Flush type car operation panel having the following fixtures, shall be provided the car as specified elsewhere as per IS 14665 (part 4JSec 9).

- i) Car Call Button corresponding to Landing Call.
- ii) Auto/Attendant Key Switch.
- iii) Fan Switch
- iv) Alarm Bell Switch for battery operated alarm bell situated in Ground Floor.
- v) Door open and close button.
- vi) Non-Stop Button.
- vii) Up and down button
- viii) Emergency stop button.
- ix) Independent switch for independent control of car
- x) Working areas in the Car or on the Car Roof
- xi) If maintenance/ inspection work on the machinery is to be carried out from inside the car or from the car roof, the following applies:
 - xii) Any kind of uncontrolled and unexpected car movement resulting from maintenance/inspection that can be dangerous to persons carrying out maintenance/ inspection work shall be prevented by a mechanical device and electrical device.
 - xiii) When the car is blocked against all movement it shall be possible to leave the working area easily and safely.

xiv) Any necessary devices for emergency operation and for dynamic tests (such as brake tests, traction tests, safety gear tests, buffer tests or tests of ascending car over speed protection means) shall be arranged so that those can be operated from outside of the well.

xv) Car and Hoistway Entrance, Door Operation and Interlocks The car and hoistway entrances should be centre opening & provided with centre opening automatic power operated stainless steel doors. Lift door entrance as specified in the technical specification to be provided with electronic door detectors, high speed door operator, sheave type two points hangers and tracks. Suitable posts for supporting the doors for entrance are to be provided by contractor. Clear opening as offered by the contractor is to be quoted. Door operation shall be positive acting and powered by AC motor rigidly connected to door. Operation shall simultaneously open the car and hoistway door and maintain the door fully opened or closed at each floor stop. Door operator shall be suitable for attendant/automatic operation and shall be provided with hydraulic cushion for smooth stop.

xvi) Full height infrared door safety is to be provided on each side. When the car door is V in its open position, the door safety ray will retreat thus assuring a substantially clear opening. Should these rays sense a person or object while the door is closing, the car and hoistway doors will return to the open position. Reversal of the doors may also be accomplished by pressing the door 'open' button in the car operating panel.

The following **interlocks** for the door shall be provided -

- a) Car shall not move until the hoist way door is mechanically locked in the closed position.
- b) Hoistway door cannot be opened from the landing side unless the car is on that particular floor.
- c) Car shall not move while the car door is open.

vii) Signal etc.

a) Digital car position indicator in car enclosure having stainless steel face and having easy to read digital position indicator and illuminated up and down arrows.

b) Hall Button with tell-tale lights at each landing with stainless steel face.

c) Digital Car Position Indicator in all floors having stainless steel face and easy to read digital position indicator.

viii) Fireman's Switch

Fireman's switch with glass to break for access shall be provided in lift lobby at ground floor as per requirement for firefighting.

ix) Levelling

The lift shall be incorporated with suitable floor levelling devices. Levelling accuracy ± 8.0 mm shall be achieved.

x) Counter Weight

Counter weight shall consist of cast iron weights housed in a rigid structural Steel frame work. Counter weight shall be equal to the weight of the car and 40% of the contract load or any other percent to promote smooth and economical operation.

xi) Lift Pit

1. A metal counter weight guard to the required height shall be provided at the bottom of the hoistway in the lift pit.
2. In lift pit a ladder, and a light point with switch and a 5A switch socket outlet shall be provided for each lift.

xii) Spring Buffers

1. These shall have a long stroke and be so designed that they will stop the car and counter weight from governor tripping speed at an average rate of retardation not exceeding gravity.
2. Blocking and supports if found necessary for the buffers shall be supplied within the scope of lift installation work.

xiii) Governor & Safety Devices

1. A mechanical safety device for stopping the lift in the event of slackening or fracture of any rope or failure of electricity and protecting the car from falling or exceeding admissible speed as per relevant Clause of B.S. 2655 and I.S. 4666-1968 actuated by a speed governor shall be mounted under the car platform and securely bolted to the frame. The governor shall be installed with the hoist machine and driven by governor rope suitably connected to the car and mounted on its own pulleys. The governor rope shall not be less than 8 mm in dia and shall be of steel in accordance with IS 4666-1968 and IS 2365-1963. The operation of Governor at over speed shall open a switch disconnecting the power from the lift and shall trip the safety mechanism which shall instantaneously engage the guide with sufficient force to stop the car from governor tripping speed, with full load in the car and bring the car to a smooth stop with an average rate of retardation within the limits in the code of practice for various loads. The governor shall be accurately adjusted to operate at tripping speed specified in the code of practice and sealed. The Governor jaws shall grip the rope in minimum time after the governor reaches tripping speed. The governor rope gripping devices shall be so designed that no appreciable damage or deformation to the rope results from the stopping action of the device. The pressure of the two jaws on the guide shall be equalized.
2. Governor tripping speed shall be within 100% to 125% of rated speed. Safety gears of the following types shall be used (a) Gradual Wedge Clamp type (b) Flexible guide Clamp type. The maximum stopping distances of lift cars with the contract load in the lift car and the minimum stopping distance with the attendant only in the lift car shall be as follows Maximum Minimum:

- a) Gradual Wedge Clamp type 2.13 mtrs 0.46 mtrs
- b) Flexible Guide Clamp type 0.53 mtrs 0.15 mtrs

xiv) Ventilation

The machinery spaces shall be suitably ventilated. The electric equipment of the machinery shall be protected as far as it is reasonably practicable from dirt, harmful fumes and humidity.

xv) Reverse Phase Relay

Shall be provided on the controller to protect the lift equipment against phase reversal, low voltage and phase failure.

xvi) Terminal Limit Switches and Ultimate Terminal Switches

1. Terminal switches shall stop the car automatically at terminal floors within the top and bottom permissible over travel. They shall act independently of the operating devices, the ultimate limit switches and the buffers. They shall be in accordance with clause 23 of ISI 4666-1968.
2. Ultimate terminal switches shall be provided in accordance with the statutory requirements and standing practices. When provided, these shall arrange to stop the car automatically within top and bottom clearances independently of the normal terminal switches but with the buffers operative, by disconnecting the motor from the supply and bring the brakes into operation in case of over run.
3. In the event of these switches operating due to over-travel it shall be possible to operate lift only after manually resetting the back-up limit switches, for the purpose, which shall be installed in an accessible location for easy manual resetting.

xvii) Controller

1. Microprocessor based controller for the machine shall be designed to give the required operation as specified and shall be securely mounted on substantial self-supporting steel frame designed for floor mounting.
2. To prevent access of Lizards, vermin's etc. the controller shall be enclosed and hinged vermin proof door shall be provided.
3. The switches handling power circuit shall be equipped with suitable contacts. The acceleration and speed control of lift shall be controlled by adjustable time relays.
4. All wiring shall be neatly, numbered, grouped and cleated. All leads except for control indicator circuits shall be provided with soldered lugs or suitable clamps and washers. Control & Indicator wires shall be brought to accessible clamps and washers or soldered terminals or studs. The wiring on the back of the panel shall be of the flame resisting type.
5. The controller shall automatically limit the current to that required for the specified requirements and shall prevent the electrical equipments from overload or excess current.
6. The controller shall be arranged to cut off the power, apply the brake and bring the car to rest upon failure of power or operation of any electrical safety device. Tropical insulation shall be provided throughout.
7. The controller shall be programmed to ensure smooth acceleration and deceleration, start and stop, floor leveling and re-leveling etc.

xviii) Auxiliary Switches

For use of maintenance personnel, the following switches shall be provided on top of lift car

a) Emergency stop switch.

b) Maintenance switch - The controlling circuitry shall be so arranged that in the event of the operation of this switch the car speed shall be less than the rated speed and car movement shall be possible only on application of continuous pressure on a button. It shall be positioned to prevent inadvertent operation.

xix) Travelling Cables

All multi core travelling cables employed for the car shall satisfy the requirements of IS 4287-1967. Trailing cables for lighting, fan and signal circuits (viz. intercom) shall be separate. Length shall be adequate to prevent any strain due to movement of the car.

xx) Lighting for Hoist way/Lift Well

Suitable light points shall be provided in the lift well. One socket outlet shall be provided in the liftwell for use of maintenance personnel at a level slightly above the ground floor landing. All the points shall be group controlled. Wiring shall be carried out in surface conduit, by the contractor.

xxi) Wiring

1. Except for the travelling cables, all wiring shall be carried out with FRLS PVC copper wires, drawn into PCV/M.S. conduit. PVC wires shall be 650/1100 volts grade. Conduit shall be heavy gauge welded and shall comply with IS Specification. 16 SWG conduits shall be run on the surface and all accessories used shall be of the inspection type with screwed ends. Travelling cables shall be Tough Rubber sheathed and shall comply with IS specification. They shall originate in the half way boxes in the lift well and shall terminate at the car distribution box. They shall be so hung that the correct size of loop is obtained.
2. All the above wiring shall be carried out by the contractor.

xxii) Earthing

1. 2 Nos G.I. earthings required for the LIFT equipment shall be provided by the contractor at his own cost conforming to IS 3043 and IEC 62561-7.
2. The contractor has to provide two separate and distinct earth wires, each not less than half of the largest current carrying conductor subject to a minimum no. 8 SWG hard drawn bare copper wire. The earth wire shall be bolted to the earth bus, through sockets. All contact faces and sockets shall be tinned.
3. Earth resistance shall be conforming to the above said IS and IEC standard.

xxiii) Operation

Automatic Simplex full collective operation with/without attendant control with self-leveling device.

xxiv) VVVF speed control

1. Variable Voltage Variable Frequency Speed Control Equipment with two way self levelling devices
2. Variable Voltage Motor with variable voltage variable frequency drive, Microprocessor based closedloop control with micro levelling.
 - i) The Lift shall include one static convertor (Silicon Controlled Rectifier) controlling set of compact design. The unit will be of self supported and self ventilated type and the rotating element will have a single continuous steel shaft. The Static Convertor (Silicon controlled rectifier) unit will be of high efficiency and low power consumption and will have sufficient capacity to handle the drive mechanism without overheating the peak load elevator service.
 - ii) The Static convertor unit (Silicon Controlled Rectifier) will be designed to suit for nominal power supply of 415V, 3 Ph, 50 Hz supply with variations as per IE Rules with microprocessor control to give smooth and trouble free operation of the lifts with closed loop control system.
 - iii) Protective device with HRC fuses and over load relays are to be supplied to protect the driving motor and the static converter against overloads, short circuit, Proper Phase Sequence (RYB), phase failure etc. Necessary HRC control fuses shall be provided for control circuit protection. The elevator motor and the static converter (Silicon Controlled Rectifier) unit shall be protected against overload and short circuit.
 - iv) The static converter and the controller shall be provided with suitable voltage regulator to take care of the voltage fluctuations occurring in the system from 360 to 450V, AC.

15. ERECTION AND COMMISSIONING

1. Erection of equipment shall be carried out in a workmanlike manner without causing any hindrance to the work of the other contractors.
2. All rotating equipment shall be mounted on suitable rubber/spring isolation mounts to minimize transmission of noise and vibrations.
3. Entire installation shall conform to the requirements of the Lift Inspector/Statutory Authority and it is the sole responsibility of contractor to obtain approval for the layout and equipment, General Arrangement drawing and necessary license for erection and operation of lifts.

16. LIST OF APPROVED MAKES/ BRANDS

Kone/ Otis/ Johnson/ Mitsubishi/ Schindler/ ThyssenKrupp

TECHNICAL PARAMETERS FOR TENDER FOR DESIGN, SUPPLY, INSTALLATION & COMMISSIONING OF 13 PASSENGER LIFT**Technical Parameters for Lifts**

S. No	Item	Requirements as per Tender
A)	General Specifications:	
a)	General:-	Passenger Lift (P1)
1.1	Type	Passenger - P1
1.2	Number of Lifts	01 No.
1.3	Capacity	884kgs (13 passengers)
1.4	Speed	1.0 mps
1.5	Machine Type	PMSM Gearless MRL
1.6	Number of Landings	3 on same side: 3 stops & 3 openings
1.7	Hoistway Size available	2400 mm (D) x 1875 mm (W)
1.8	Travel	12mts (viz. Up to 2 nd floor (as the building is G+2))
1.8.1	Overhead in mm	6750
1.8.2	Pit Depth in mm	1600
		(Hoist way size, Travel distance, overhead & pit depth shall be measured by the bidders actual as per site and shall be confirmed)
	Machine Room	
1.10	Machine room location	Located in shaft on top of guide rails
1.11	Control	CLOSED LOOP AC VVVF
1.12	Operation	Simplex Full collective
	Car	
1.13	Car Enclosure	All Car panels in Stainless Steel Scratch Resistant Finish of Moon rock/ Linanen
1.14	Car Ceiling	Stainless Steel False ceiling with pressure blowers and LED Lights /down lighters of 50watt illuminations.
1.15	Car Floor	Granite flooring of minimum 20 mm thick inside car of approved design a quality to be provided.
1.16	Car and Landing Doors (WxH)	Landing doors/Car Panel at all floors in Stainless Steel of Honey comb/Moon rock/linanen. Automatic Center opening power operated with 900mm (Wide) x 2100mm (internal Height).
1.17	Car Size (WxDxH)	1600 mm (Wide) x 1350 mm (Deep) x 2300 (High) Minimum Clear Car height below false ceiling to be 2200 mm.
1.18	Sill	Aluminium
1.19	Car Operating Panel	Stainless Steel Hairline finish Car Operating Panel inside car with floor destination buttons along with door open / close, emergency alarm, press and speak type intercom & attendant switch to be provided along with 16 segment LED / Dot Matrix Dynamic Car Direction display & Digital position indicators.
1.20	Car Interior Load beyond	Additional car interior weight not required

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flooring weight

B) PARAMETERS OF THE LIFT

Machine

- | | | |
|-----|---|--|
| 1.1 | Power Supply | 415V/220V, 50 Hz |
| 1.2 | Acceptable Voltage Fluctuation | +10 to -10% |
| 1.3 | Rate of Acceleration/Deceleration
M/s ² | 0.6-1.5 |
| 1.4 | Stopping Accuracy | ± 3 mm to ± 5 mm |
| | Leveling Accuracy | ± 3 mm to ± 5 mm |
| 1.5 | Door Drive | Direct drive doors with PM motor and closed loop VVVF door control |
| 1.6 | Car panel & Door panel thickness | At least 1.5 mm |

FIXTURES / SIGNALS INSIDE CAR

Stainless steel Car operating panel with following buttons and indications.

- | | | |
|------|---|--|
| 1.10 | Door open/ Door Close | Door open and Door Close buttons with Symbol markings. |
| 1.11 | ARD operation
Audio / Visual indication in car | To be provided |
| 1.12 | Emergency Alarm Button | Emergency Alarm button with Bell symbol & the same should be at a distinct distance from the call buttons. Emergency Alarm button to be located along with Door open and Close Buttons at a height of 900±10 mm from floor level. Yellow pictogram to be provided. Alarm sound shall be siren type audible from at least 50 meters from the ground floor landing |
| 1.13 | Auto Light/Fan Cutoff | Ventilation fan ON/OFF switch with auto switch off feature after 120 seconds of Lift at idle condition. |
| 1.14 | Attendant Operation | Two position Key operated Attendant switch for With/without attendant operation. |
| 1.15 | Push buttons | LED Illuminated tactile braille buttons of micro motion type corresponding to the floors served. The push buttons to be of robust SS Vandal Resistant type. |
| 1.16 | Intercom & provision for EPABX | Two way Built in Press and speak type with 1 Master and 1 slave units in Security room. Additionally wiring provision for connecting Building EPABX with car. |
| 1.17 | Car Display | 16 segment_LED/Dot Matrix Car Direction display & Digital position indicators located at a conspicuous height above Car door.
Bidder to provide inputs on Car displays as quoted |

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1.18	Emergency Light	Emergency light with rechargeable Sealed Maintenance free battery with Backup.
1.19	Emergency Alarm	Alarm with Rechargeable Sealed Maintenance Free batteries.
1.20	Over load warning	Audio/Visual Overload warning indicator to be provided.
1.21	Voice Announcement	Floor Position Voice Announcement.
1.22	Home landing	To be provided
	Landing Indicators	
1.22	Hall Buttons	Hairline Stainless steel faceplate with LED glow micro stroke push tactile Braille buttons. To be located at a conspicuous height as per existing cutouts and layout – No modifications in cutout is desired and existing cutout has to be fully covered with new fixtures and faceplates
1.23	No. of Risers per Lift	Two landing button with position indicator in all floor excluding Ground and Top floor, where single button will come.
1.24	Car Chime	Chime on car
	Provision of Handicap Friendly features	
1.26	Hand Rails	SS hand rail on rare side only
1.27	Braille Marking Buttons on Car operating panel and landing push buttons	As mentioned above
1.29	Voice Announcement	As mentioned above
1.30	Infra-red door protection device	Multi beam infrared protection device so as to reverse the closing door in case of slight obstruction in the door way.
1.31	Car operating panel & Landing signalization	Operating push buttons should be with BRAILLE.
	SAFETY FEATURES & OTHER INCLUSIONS	
1.31	Fire Man Switch	Fire man's switch shall be for the lift at Ground floor level. The Lift to have fireman mode.
1.32	Door Protection	Multi beam infrared protection device so as to reverse the closing door in case of slight obstruction in the doorway.
1.33	Phase Reversal	Automatic Phase reversal device
1.34	Over Load Device	Overload non-start and overload protection device.
1.35	Buffers	Spring buffers
1.36	Safety Governor	Electro-Mechanical type Safety governors for Car.

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1.37	Safety Instructions	Do's & Don'ts with emergency contact Numbers engraved on a SS Face plate displayed in the car
1.38	Over travel protection	Terminal and final limit switches to be provided.
1.39	Controller / Drive / Motor Protection	<p>Trip Device for Over current, Under Voltage and Over voltage than the rated capacity. + 10%</p> <ul style="list-style-type: none"> · Motor overload / over torque · Instantaneous over current · Ground fault · Under voltage · Over voltage – 3 phase · Output & Input phase loss · Phase reversal · Output short circuit · Over speed · Spikes & Surges
1.40	ARD (Automatic Rescue Device)	ARD to be provided.
1.41	Fire Rating of doors	Landing doors to have 2 hour fire resistance rating. Certificates to be provided from the OEM.
1.42	Intercom connection	Car and security cabin at the gate
1.43	CCTV, Fire Detector, Music, PA - Cable Provision.	Provision of suitable cables along the travelling cable for CCTV, Fire detector to be provided. PER CLIENTS NEED
1.44	One car blower	To be provided
1.45	Fascia Plates & Sill angles	Full height Fascia Plates and Sill angles to be provided. Apron of min. height 750 mm to be provided at car side.
1.46	Pit Ladder	MS Pit ladder to be provided and securely fastened inside the pit.
1.47	No Correction Run	System memory should be retained in the event of power failure or disturbance. Lifts should not go in to correction mode or correction run to the lowest floor / highest floor to update its position & memory.
1.48	Safe Landing Feature	If a car has stopped between floors due to some equipment malfunction, the controller checks the cause, and if it is considered safe to move the car, the car will move to the nearest floor at low speed and the doors will open.
1.49	Ascending Car Overspeed Protection Device	To be provided
1.50	Unintended Car Movement Protection Device	To be provided
1.51	Safety	Counterweight derailment device or displacement switches to be provided.
1.52	Counter Weights	Metallic /Concrete filler weights to be provided.

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- | | | |
|------|--|--|
| 1.53 | Major Components Service Life | <ul style="list-style-type: none">· Ropes / Belts :- 8 years· Over speed governor:- 20 years· Traction machine / motor:- 20 years· Door operator:- 20 years· Safety gear / block :- 20 years· Travelling cables:- 20 years· Inverter Drive:- 20 years· Buffer:- 20 years· Controller & circuits:- 20 years |
| 1.54 | Feature List | Standard included & options – to be provided |
| 1.55 | Car top / Machine room/pit – rotating / moving equipment full guarding ; rope guards ; car top rails provision | To be provided |
| 1.56 | Electrical Safety Switch in case of removable Hand Winding Device | To be Provided |

C) Free Comprehensive Maintenance

One Year Free Comprehensive Maintenance post successful Installation and commissioning of Lift in satisfactory operating condition.

Volume –VI

**TECHNICAL SPECIFICATIONS
FOR
FIREFIGHTING WORKS**

TECHNICAL SPECIFICATIONS FOR SUPPLY AND ERECTION OF FIREFIGHTING SYSTEM FOR NEW PROPOSED BUILDING OF ADMINISTRATIVE OFFICE BERHAMPUR ODISHA

SECTION – I: FIRE FIGHTING SYSTEM

1. GENERAL INSTRUCTIONS
2. SCOPE
3. APOPLICABLE CODES
4. APPROVAL BY LCOAL FIRE SERIVE
5. COORDINATION
6. FIRE FIGHTING PUMPS
7. DIESEL FIRE PUMP
8. PIPING WORK
9. VALVES & ACCESSORIES
10. EXTERNAL YARD HYDRAANTS
11. INTERNAL DYDRAANTS (LANDING VALVE)
12. FIRST-AID HOSE REEL EQUIPMENT
13. FIRE HOSE DELVIERY COUPLING, BRANCH PIPE AND NOZZLES
14. FIRE SERVICE INLET AND FIRE SERVICE CONNECTION
15. HOSE PIPES
16. ORIFICE PLATE
17. PORTABLE FIRE EXTINGUISHER
18. SPRINKLER SYSTEM
19. TESTING
20. COMMISSIONING

1.0 GENERAL INSTRUCTIONS

1. Fire suppression works specified in the tender have to be executed in accordance with:
 - a) The rules and regulations of Local Fire Authority as per the statutory regulations applicable for obtaining the occupation/No objection certificate from the Local Development / Fire Authority.
 - b) Applicable norms laid down by the relevant sections of latest editions of National Building Code 2016 (NBC 2016) and all relevant codes of latest Bureau of Indian Standards (B.I.S.) and CPWD general specifications for electrical works Part – 5 (Wet riser and sprinkler system) shall be followed as applicable.
 - c) The codes of the National Fire Protection Association of USA (N.F.P.A.) shall use as a general guide for good engineering practice, design and workmanship norms
2. All materials used in the works shall have Bureau of Indian Standards valid certification

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stamped, ISI marked or cast on the material in an acceptable and approved by EIC, as specified hereinafter.

3. It is the contractor's responsibility to ensure the competence of design to meet the above requirements.
4. Drawings issued with the tenders are schematic and indicate the concept. Contractor shall make his shop drawings on basis of Architectural and Interior design drawings issued by the Engineer-in- Charge. Work will be executed only as per approved shop drawings.
5. Contractors shall furnish detailed shop drawings, design calculations for submission and approval of the Local Fire Authority and for Insurance Companies as may be required by the SBI.

2.0 SCOPE

2.1 Work under this sub-head consists of furnishing all Labour, Materials, equipment and accessories necessary and required to completely install the Fire Fighting equipment etc.

2.2 Without restricting to the generality of the foregoing the work of Fire Fighting System shall include the followings:

- a) Providing MS black steel pressure pipeline main including Valves, Fire Hydrants, Excavation for Pipes, laying of pipes, painting of pipe and Making Connection to supply system.
- b) GI Pipe, Mains Laterals, Branches, Valves Hangers and Appurtenances.
- c) Hose Reels, Rubberized fabric lined hose pipes, Hose cabinets & Landing Valves.
- d) Portable Fire Extinguishers.
- e) Fire Fighting Pumps.

3.0" BIS CODES TO BE FOLLOWED AS REFERENCE "FOR SUPPLY, INSTALLATION, TESTING AND COMMISSIONING (SITC) OF WATER BASED FIXED FIRE PROTECTION SYSTEM ARRANGEMENTS LIKE FIRE PUMPS (ELECTRIC & DIESEL), SPRINKLER SYSTEMS

Design Confirmation: Generally, works to be carried out as per BIS standard and applicable and National Building Code of India (NBC), some of the BIS codes are listed below:

- a) IS: 15105: Design, installation, and maintenance of fixed automatic sprinkler fire extinguishing systems.
- b) IS: 884-1995: Specification for first Aid Hose Reel for Fire Fighting.
- c) IS: 901-1988: Specification for couplings, double male and double female, instantaneous Pattern, for firefighting purposes (revised).
- d) IS: 902-1992: Specification for suction hose couplings for firefighting purposes (revised).
- e) IS: 903-1993: Specification for fire hose delivery couplings, branch. Pipe, nozzle and nozzle Spanner (revised).
- f) IS: 904-1983: Specification for two-way and three-way suction collecting heads for firefighting Purposes (revised).

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- g) IS: 905-1980: Specification for delivery breaching, dividing and collecting, instantaneous Pattern, for firefighting purposes (revised).
- h) IS: 906-1992: Specification for branch with revolving head for firefighting purposes (revised).
- i) IS: 907-1984: Specification for suction strainers, cylindrical and hose types for firefighting Purposes (revised).
- j) IS: 908-1975: Specification for fire hydrant, stand post type (revised).
- k) IS: 909-1992: Specification for underground fire hydrant, sluice valve type 30 (revised).
- l) IS: 910-1980: Specification for combined key for hydrant, hydrant cover and valve.
- m) IS: 936-1966: Specification for underground fire hydrant, double-valve type (revised).
- n) IS: 937 -1981: Specification for washers for water fittings for firefighting purposes (revised).
- o) IS: 1641-1988: Code of practice for fire safety of buildings (general): General principles and fire grading.
- p) IS: 1642-1989: Code of practice for fire safety of buildings (general): Materials and details of Construction.
- q) IS: 1646-1982: Code of practice for fire safety of buildings (general): Electrical installation.
- r) IS: 2871-1983: Specification for branch pipe, universal, for firefighting purposes.
- s) IS: 3582-1991: Specification for basket strainers for firefighting purposes (cylindrical type).
- t) IS: 3844-1989: Code of practice for installation of internal fire hydrants in i multi-storey buildings.
- u) IS: 5290-1993: Specification for landing valves.
- v) IS: 1239: Providing, fixing, testing and commissioning of Above Ground M.S. ERW Black C Class Heavy duty pipes (up to 150 mm dia.) and
- w) IS: 3589: providing, fixing, testing and commissioning of Above Ground M.S. ERW Black C Class Heavy duty pipes (up to 200 mm dia. And above)

3.1 LIST OF APPROVED MAKES FOR FIRE FIGHTING WORKS

All materials to be used in the work shall conform to relevant Indian Standard Specifications and wherever available ISI marked materials will be used. Besides below mentioned make, equivalent approved make (EAM) may also be used. The Vendor shall also obtain prior approval from SBI for the 'Make' and 'Rating' of any other major item not mentioned above/below.

S. No.	MATERIAL	MAKES
1.	Pumps	Kirloskar, Lubi, Wilo (Mather & Patt), KSB or EAM
2.	Electric motor	Lubi, Kirloskar, Wilo, KSB or EAM
3.	Diesel Engine	Lubi, Kirloskar, Wilo, KSB or EAM
4.	Battery	Exide /Amron / Bosch or equivalent Only

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5.	M.S. Pipe	Jindal Hisar, Tata, Surya, (ISI Marked)
6.	Gate Valves	Shah Bhogilal / KBL / Upadhya/ Kalpana/ Kartar/Zoloto/Audco /Sant or equivalent
7.	Non- Return Valves	Shah Bhogilal / KBL / Upadhya/ Kalpana/ Kartar/Zoloto/Audco /Sant or equivalent
8.	Sluice Valve	Shah Bhogilal / KBL / Upadhya/ Kalpana/ Kartar/Zoloto/Audco / Sant or equivalent
9.	CI Non-Return Valve	Shah Bhogilal / Sant/ Zoloto/ Advance / Upadhaya, Kartar & Kalpana / Sant
10.	CI Butterfly valves	Shah Bhogilal / KBL / Upadhya/ Kalpana/ Kartar/Zoloto/Audco or equivalent
11.	Hydrant valve	Shah Bhogilal, GEI (Ghosh engg), Newage, Safex or equivalent
12.	Y Type Strainer	Leader, Prime, Kartar, Hammer, Kalpana, Worth or equivalent
13.	Basket type Strainer	Leader, Prime, Kartar, Hammer, Kalpana, Worth or equivalent
14.	Pressure switch	Infosys, donfos, Switcher or equivalent
15.	Pressure Gauge	H.Guru , Fiebig, Warree , Danfos or equivalent
16.	Starter, Switches	L & T, Siemens or equivalent
17.	Pump Panel Components	L & T, Siemens, Schneider, and ABB or equivalent only
18.	Flow switch	Honeywell, System Sensor, Potter or equivalent
19.	Annunciation Panel	AGNI, RAVEL, System Sensor, Honeywell or equivalent
20.	Cables	Incab, Gloster, CCI, Finolex, Polycab (ISI Marked)
21.	Fire Hose	Shah Bhogilal , Newage , Jayshree, CRC, Priyanka, BRG
22.	SS Branch Pipe & Nozzle	Shah Bhogilal, NewAge, GEI or equivalent
23.	Hose Reel Drum	AAAG Shah Bhogilal, Newage, or equivalent
24.	Rubber Hose	Dunlop, Deep Jyoti, Jyoti, & Padmini, or equivalent
25.	SS Ball Valve	Audco, Leader, Sant, & Zoloto or equivalent
26.	CS Ball Valve	Audco, Leader, Sant & Zoloto or equivalent
27.	Fire Brigade Inlet	AAAG (Shah Bhogilal), Newage, GEI (Ghosh engg), & New age or equivalent
28.	Hose Box	Fabricated as per standard
29.	Pipe Fittings	Bharat Forge / Tube Products / M.S. Fittings / VS Brand / (E.A.M)
30.	Quartzoid Bulb Type Sprinkler	HD, TYCO or equivalent (UL – Listed)
31.	Paint (as per IS: Fire Red)	Asian Pain, Nerolec, Burger or equivalent
32.	Anticorrosive Tap	Pipekot, IWL, Rustech or equivalent

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33.	Pipe Fittings	As per Standard
34.	Fire seal	Sealz, alstroflam, abacus or equivalent
35.	HDPE Tank	Sintex/polycon/plasto/supreme or equivalent.
36.	RCC Pipes	ISI Marked

NOTES:

- a) Details of the items under this Schedule shall be read in conjunction with the corresponding Specifications, Drawings, and other Tender Documents.
- b) The work shall be carried out as per approved drawings, Specifications and the description of the items in this Schedule and/or Engineer's instructions. Drawings enclosed with these documents are only for providing some preliminary of the work involved.
- c) Items of work provided in this Schedule but not covered in the Specifications shall be executed strictly as per instructions of the Bank's Engineer.
- d) Unless specifically mentioned otherwise in the Contract, the Bidders shall quote for the finished items and shall provide for the complete cost towards power, fuel, tools, tackles, equipment, Constructional Plant, Temporary Work, labour, materials, levies, taxes, transport, layout, repairs, rectification, maintenance till handing over, supervisions, overheads, profits and all incidental items not specifically mentioned but reasonably implied and necessary to complete the work according to the contract.
- e) The Quantities of the various items mentioned in the Schedule of Items are approximate and may vary or may be deleted altogether. The Vendor, in his own interest, should get an indication of the probable extent of the work to be executed under any particular item in this Schedule before undertaking any preliminary and enabling work or purchasing bought out components related to the work.
- f) Rates shall be quoted both in figures and in words in clear legible writing. No overwriting is allowed. All scoring and cancellations should be countersigned by the Bidders. In case of illegibility, the rates written in word will be considered final. All entries shall be in English language.
- g) Engineer's decision shall be final and binding on the Vendor regarding clarification of items in this Schedule with respect to the other sections of the Contract.

4.0 APPROVAL BY LOCAL FIRE SERVICE

- a) It shall be the responsibility of the contractor to get the approval in stages from the Local fire Service as required. This shall be without any liability to the Engineer-in-charge.
- b) On successful completion of work, the contractor shall prepare as built drawings which have been so approved by the Fire Service incorporating all changes that might have been affected during execution of the work.
- c) The contractor shall also bring to the notice of the Engineer-in-charge any deviations from Local Fire Service/Building Bye Laws Norms and requirements in the systems that he shall install as well as architectural features that will affect approval

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from the Fire Service. No extra charges shall be paid on account of interaction with the Fire Service.

5.0 COORDINATION

The Contractor shall be required to coordinate his activities with all other services such as Air Conditioning, Electrical and Civil (Interiors) etc.

6.0 FIRE FIGHTING PUMPS

- a) This section covers the general requirement of water pumps for main fire pump (Sprinkle and Hydrant), Jockey (pressurization) pump and Terrace pump. CAPACITY: The discharge and head of the pumps shall be as mentioned in Bill of Quantities.
- b) Type: The pump shall be centrifugal type direct driven with a 3 phase, 415 V $\pm 10\%$, 50 Hz, A.C. Motor. The standby fire pump shall be driven by diesel engine. The pumps may be either of horizontal split casing (HSC) type with operating speed not exceeding 1500 rpm, or solid casing with operating speed not exceeding 3000 rpm, as specified in the tender documents.
- c) Rating: The main fire pump and terrace pump shall be suitable for continuous operation in the system. The jockey pump shall be suitable for intermittent operation to build up pressure in the system on account of leakage. The head and discharge requirements shall be as specified in the Tender documents. The head shall be suitable for the system and shall take into consideration the pressure drops across the various components in the water circuit as well as the frictional losses.
- d) Pump shall be capable of discharging not less than 150 percent of the rated discharge at a head of not less than 65 percent with the rated head. The shut off head shall not exceed 120 percent of the rated head.
- e) Material and Construction
 - i.) The Centrifugal pumps shall conform to IS 1520.
 - ii.) The Pump casing shall be of heavy section close grained cast iron and designed to withstand 1.5 times the working pressure. The casing shall be provided with shaft seal arrangement as well as flanges for suction and delivery pipe connections as required.
 - iii.) The impeller shall be of Bronze or Gunmetal. This shall be shrouded type with machined collars. Wear rings, where fitted to the impeller, shall be of the same material as the impeller. The impeller surface shall be smooth finished for minimum frictional loss. The impeller shall be secured to the shaft by a key.
 - iv.) The shaft shall be of stainless steel and shall be accurately machined. The shaft shall be balanced to avoid vibrations at any speed within the operating range of the pump.
 - v.) The shaft sleeve shall be of Gunmetal.
 - vi.) The bearings shall be ball or roller type suitable for the duty involved. These shall be grease lubricated and shall be provided with grease nipples/cups. The

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bearings shall be effectively sealed against leakage of lubricant or entry of dust or water.

- vii.) The shaft seal shall be mechanical type, so as to allow minimum leakage. A drip well shall be provided beneath the seal.
- viii.) The pumps shall be directly coupled with motor /diesel engine shaft through a flexible coupling protected by a coupling guard.
- ix.) The pump and motor / diesel engine shall be mounted on a common base plate fabricated from mild steel section. The base plate shall have rigid, flat and true surfaces to receive the pump and motor/diesel engine mounting feet. The Pump will be perfectly aligned with motor/engine so as to avoid any vibration during operation.

7.0 Accessories: Each pump shall be provided with the following accessories: -

- i.) Butterfly / Sluice valves on suction and discharge (if positive suction is not provided butterfly valve at suction is not to be provided).
- ii.) Reducers, as may be required to match the sizes of the connected pipe work.
- iii.) Non-return valve at the discharge.
- iv.) Pressure gauge at discharge side between pump and non-return valve.

8.0 Installation

- a) The pump and motor/engine assembly shall be mounted and arranged for ease of maintenance and to prevent transmission of vibration and noise to the building structure or to the pipe work.
- b) The pump and motor / engine assembly shall be installed on suitable RCC foundation. The Length and Width of the foundation shall be such that 100 mm. space is left all around the base frame. The height of foundation shall be so decided that the total weight of foundation block is 1.5 times the operating weight of the pump assembly. The foundation shall be isolated from the floor by vibration isolating pads. Angle iron frame of size 35 mm x 35 mm x 3 mm shall be provided on the top edges of the foundation.
- c) More than one pump and motor assembly shall not be installed on a single base or cement concrete block.
- d) The suction / discharge pipes shall be independently supported, and their weight shall not be transferred to the pump. It should be possible to disconnect any pump for repairs without disturbing the connecting pipeline.
- e) A minimum clearance of 1 m. around the main pumps shall be provided. For jockey pump- clearance of 75 cm. shall be adequate.
- f) Sufficient space is to be left in front for the radiator of diesel engine for free discharge of hot air. Arrangement of discharging hot air to outside the pump house shall be Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

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provided so that hot air does not stagnate in the pump house.

9.0 Air Vessel For Fire Pumps

- a) Air vessel shall be fabricated out of 8 mm thick MS sheet & the end shall be dished and suitable supporting legs, air vessel shall be provided with a 100mm dia flanged connection from pump, one 25mm dia drain with valve, one gunmetal water level gauge and 25mm sockets for pressure switches. The vessel shall be 250mmx1200mm dia high and tested at 25 Kg/cm² pressure before installation.
- b) The fire pumps shall operate on drop pressure in the mains automatically or manually.
- c) (The ratings will be adjusted finally at the time of commissioning as per site requirement and final setting shall be kept as per approval of Engineer-in-Charge).

10.0 Operating Conditions for The Fire Pumps

Fire Service Pump	Nos.	Cut in Pressure	Cut Out Pressure	Remarks
Jockey pump	Two	Automatic	Automatic	To auto start and auto stop on pressure switch on air vessel to stop.
Main pump(Hydrant)	One	Automatic	Push manual button	To auto start on pressure switch on air vessel and manual off.
Diesel Fire Pump	One	Automatic	Push manual button	To auto start on pressure switch on air vessel and manual off.
Sprinkler Pump	One	Automatic	Push manual button	To auto start on pressure switch on air vessel and manual off.

11.0 DIESEL FIRE PUMP

- a) **Scope:** This section covers the details of requirements of the standby fire pump, operated by a diesel engine.
- b) **General:** The diesel pump set shall be suitable for automatic and manual operation complete with necessary automatic starting gear, for starting on wet battery system and shall be complete with all accessories. Both engine and pump shall be assembled on a common bed plate, fabricated from mild steel channel.
- c) **Drive:** The pump shall be only direct driven by means of a hollow set coupling. Coupling guard shall also be provided.

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- d) The speed shall be 1500 RPM.
- e) Diesel Engine Environmental conditions: - The engine shall be suitable to operate under the conditions of environment at site.
- f) Engine Rating: The engine shall be multi cylinder/vertical 4 stroke cycle, water cooled, developing suitable HP at the opening speed specified to drive the fire pump. Continuous capacity available for the load shall be exclusive of the power requirement of auxiliaries of the diesel engine, and after correction of altitude, ambient temperature and humidity for specified environment conditions. The engine rating shall be suitable to drive the pump at 150 percent of its rated discharge with at least 65 percent of rated head. The engine shall have 10% overload capacity for one hour in any period of 12 Hours continuous run.
- g) The engine shall be suitable for cold starting for which suitable headers shall be provided in lubricating oil.
- h) The engine shall develop full load within 15 seconds from the receipt of signal to start. The diesel engine shall conform to BS 649/IS 10002, amended up to date.
- i) **Engine Accessories:** The engine shall be complete with the following accessories: -
- i) Fly wheel dynamically balanced.
 - ii) Direct a coupling for pump and coupling guard.
 - iii) Radiator with hoses, fan, water pump, drive arrangement and guard.
 - iv) Air cleaner dry type.
 - v) Fuel service tank with necessary pipe work.
 - vi) Pump for lubricating oil and lub. oil filter.
 - vii) Elect. starting battery (12 V / 24V with 2 Nos. Battery).
 - viii) Exhaust silencer with necessary pipe work.
 - ix) Governor.
 - x) Instrument panel housing all the gauges, including Tachometer, hour meter and starting switch with key (for manual starting).
 - xi) Necessary safety controls.
 - xii) Winterization arrangement.
 - xiii) Hand operated semi rotary pump for filling the service tank
- j) **Cooling System-** The Engine shall be radiator water cooled. The radiator assembly shall be mounted on the engine. The radiator fan shall be driven by the engine as its auxiliary with multiple fan belts. When half the belts are broken, the remaining belts shall be capable of driving the fan. Cooling water shall be circulated by means of an auxiliary pump of suitable capacity driven by the engine in a closed circuit.
- k) **Fuel System:** The fuel shall be gravity fed from the engine fuel storage tank to the engine driven fuel pump. The engine fuel storage tank shall be mounted adjacent to the engine itself suitably wall mounted on bracket. The fuel filter shall be suitable located to permit easy services.

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- l) All fuel tubing in the engine shall be with copper and fuel piping from day oil tank to engine shall be MS C Class pipe with Reinforced flexible hose connection. Plastic tubing shall not be permitted.
- m) The fuel tank shall be welded Steel Construction (3mm Thick) and of 200 Ltrs. capacity or of capacity sufficient to allow the engine to run on full load for at least 8 hours. The tank shall be complete with necessary supports, level indicator (Protected against mechanical injury) inlet, outlet, overflow connection and drain plug and piping to the engine fuel tank. The outlet shall be so located as to avoid entry of any sediment into the fuel line to the engine.
- n) Tank shall be provided with epoxy coat from inside and outside with one coat of Red oxide primer and two or more Coats of Synthetic enamel paint of approved shade.
- o) **Lubricating Oil System-** Forced feed Lub. Oil system shall be employed for positive lubrication. Necessary Lub. oil filters shall be provided, located suitably for convenient servicing.
- p) **Starting system:** The starting system shall comprise necessary batteries 12V / 24V volts starter motor of adequate capacity and axle type gear to match with the toothed ring on the flywheel. By metallic relay protection to protect starting motor from excessively long cranking runs suitably integrated with engine protection system shall be included within the scope of the work.
- q) **The battery** capacity shall be suitable for meeting the needs of the starting system but shall not be less than 180AH. The battery capacity shall be adequate for 10 consecutive starts without recharging with cold engine under full compression.
- r) Three attempt starting facility shall be provided if engine fails to start after third attempt, the engine shall be locked out and suitable audio-visual alarm shall be given to indicate engine failure.
- s) The scope shall cover all cabling, terminals, initial charging etc.
- t) **Exhaust system:** The exhaust system shall be complete with residential type silencer suitable for outdoor installation, and silencer piping including bends and accessories needed to be taken out of the building as per statutory requirement. The Contractors are advised to see the drawing and site to assess the length and size of exhaust pipe required. The total backpressure shall not exceed the engine manufacturer's recommendation. The exhaust piping shall be suitably insulated with 50 mm thick glass wool & 1 mm thick Al. sheet cladding.
- u) **Engine shut down mechanism** – This shall be manually operated and shall return automatically to the starting position after use.
- v) **Governing System** – The engine shall be provided with an adjustable governor to control the engine speed within 5% of its rated speed under all conditions of load up to full load. The governor shall be set to maintain rated pump speed at maximum pump load.
- w) An over speed shutdown device to shut down the engine at a speed approximately 20% above rated engine speed with manual reset, so that the automatic engine controller will indicate an over speed signal until the device is manually reset to normal operating position.

- x) **Engine Instrumentation:** Engine instrumentation shall include the following: -
- i.) Lub. oil pressure gauge.
 - ii.) Lub. oil temperature gauge
 - iii.) Water temperature gauge
 - iv.) Tachometer
 - v.) Hour meter
 - vi.) The instrumentation panel shall be suitably mounted on the engine.
- y) **Engine Protection Devices –** The following engine protection and automatic shut-down facilities shall be provided: -
- i.) Low lub. oil pressure
 - ii.) High cooling water temp
 - iii.) High lub. Oil temperature
 - iv.) Over speed shut down

12. Pipe work

All pipelines with fittings and accessories required shall be provided for fuel oil, lub. oil and exhaust systems. The fuel tubing to the engine shall be MS C – class pipe with flexible hose connections wherever required.

13.0 Anti Vibration Mounting

Suitable anti-vibration mounting duly approved by Engineer-in-charge shall be employed for mounting the unit so as to minimize transmission of vibration to the structure. The isolation efficiency achievable shall be clearly indicated.

14.0 Battery Charger

Necessary float and boost charger shall be incorporated in the control section of the power and control panel, to keep the battery under trim condition. Voltmeter to indicate the state of charge of the batteries shall be provided.

15. PIPING WORK

15.1 Pipes shall be of the following materials.

- a) Pipes shall be GI (C class) conforming to IS: 1239 for sizes up to 150 mm.
- b) Welded black steel pipe, Class 2 conforming to IS: 3589 for sizes greater than 150 mm. These pipes shall be factory rolled and fabricated from Min. 6 mm thick MS Sheet. Cadmium plated steel nuts / bolts / washers shall be used.

15.2 Pipe Joints

- a) Electric welding joints shall be provided in the GI pipe works. Flanged joints shall be provided for connection to valves, pumps, air vessels etc. and also on straight lengths at suitable points to facilitate erection and subsequent maintenance.
- b) MS Flange shall be in accordance with Table 17 of IS: 6392 I.e. Plate flanges for welding and Flange
- c) Thickness shall be as under. Gasket thickness shall not be less than 3 mm.

Pipe Dia	Flanged Thickness
200 mm	24 mm
150 mm	22 mm
100 mm	20 mm
180 mm	20 mm
65 mm and 50 mm	18 mm
40 mm and below	16 mm

- d) All hardware items such as Nuts, Bolts, and Washers shall be of appropriate size. Washers shall be used on both side of the Bolt.

15.3 Installation of Pipes

- a) The installation work shall be carried out in accordance with the detailed drawings prepared by the contractor and approved by the Engineer-In-Charge.
- b) In Pipe above Ground level expansion loops or joints shall be provided to take care of expansion / contraction of pipes.
- c) Tee of connections shall be through equal and reducing tees, otherwise ferrules welded to the main pipe shall be used. Drilling and Tapping of the walls of the main pipe shall not be resort to.
- d) Open end of piping shall be blocked as soon as the pipe is installed to avoid the entrance of foreign matter.
- e) Piping installation shall be supported on or suspended from structure adequately. The contractor shall provide clamps, hangers etc. as per detailed given below: -
 - i.) Split pipe support clamps with rubber lining for vertical, horizontal and roof hanging.
 - ii.) Clevis hangers for horizontal support to adjust wiring height.
 - iii.) Sprinkler hangers for horizontal supports for pipes from 15-150 mm dia.
 - iv.) Fasteners and fully threaded rods shall be used for installing the pipe supports. The size of the pipe support and installation shall be in accordance with manufacturers recommendations.
 - v.) For pipes of size 100 mm and above with the prior approval of the Engineer-in-charge, U clamps with dash fasteners may be used for supporting horizontal pipe from ceiling.
 - vi.) Pipe supports in Pump house shall be floor mounted and of Mild steel / G.I.

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Spacing of pipe support shall not be more than that specified below: -

Pipe Size (mm)	Spacing (M)
20 to 25	2.00
32 to 125	2.50
150 and above	3.00

- f) Extra support shall be provided at the bends and heavy fittings like valves to avoid undue stress on the pipes.
- g) Anti-vibration pads, Springs and Liners of resilient and non-deteriorating material shall be provided at each support so as to prevent transmission of vibration through the supports.
- h) Pipe sleeves of diameters larger than the pipes by least 50 mm shall be provided wherever pipes pass through walls and annular spaces shall be filled with felt and finished with retaining rings.
- i) Vertical riser shall be parallel to walls in column lines and shall be straight and in Plumb. Riser passing from floor to floor shall be supported at each floor by clamps etc. as per the para 5.
- j) The space in the floor cut-outs around the pipe works shall be closed using cement concrete 1:2:4 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.
- k) Riser shall have suitable support at the lowest point.
- l) Where mild steel pipes are to be buried under ground the same shall be treated with anticorrosive protection before laying. The top of the pipes shall be not less than 100 cms. Below the ground level. Where this is not practicable, permission of the Engineer-In-Charge shall be obtained for buying the pipes at lesser depth.
- m) Masonry or C.C. blocks shall be provided for supporting the pipes at interval as per detail given above. After the pipes have been laid, the trench shall be refilled with excavated soil in layers of 20 cm and rammed and any extra soil shall be removed from the site of work by the contractor.
- n) Underground pipe shall be laid at least 2 m away from the face of the building preferably along with roads and foot paths. As far as possible laying of pipes under road, pavement and large open spaces shall be avoided. Pipes shall not be laid under building and where unavoidable, these shall be laid in masonry trenches with removable covers.
- o) For laying of external pipes, excavation up to a depth of 1.25 m or more is to be carried out. This may cause hindrance in execution of other building works. External pipes shall therefore be laid in a phased manner in coordination with other agencies. The pipes shall be tested, and earth filled back before excavation for next phase is taken up. Equipment for testing etc. should be available in advance before start of underground pipe laying work.

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- p) 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. If the valves shall be 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 valves belowground.
- q) Pipe over ground shall be painted in red colour shade no. 536 of IS: 5. Suitable identification shall be provided to indicate the run of underground wherever the route of underground pipe cannot be ascertained from the location of yard hydrant / isolating valves.
- r) It shall be made sure that proper noiseless circulation is achieved in the system if proper circulation is not achieved due to air bound connections, the contractor shall rectify the defective connections. He shall bear all the expenses for carrying out the above rectification including the tarring - up and re - finishing of floors, walls etc. as required.

16.0 Pressure Testing

- a) All piping shall be tested to hydrostatic test pressure of at least one and half times of maximum operating pressure, but not less than 10 kg/cm² for a period of 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.
- b) Piping repaired subsequent to the above pressure test shall be re-tested in the same manner.
- c) System may be tested in sections and such sections shall be securely capped.
- d) Pressure gauges may be capped off during pressure testing of the installation.
- e) Complete Flushing out Test of Sprinklers installation shall be carried out to clean the sprinkler pipes for foreign materials before fixing the sprinkler heads to avoid obstruction in the sprinklers
- f) The Contractor shall provide all materials, tools, equipment, instruments, services and labour required to perform the test, and shall ensure that the plant room and other areas are cleaned up and spill over water is removed.
- g) The Engineer-in-charge shall be notified well in advance by the contractor of his intention to test a section of piping and all testing's shall be witnessed by the Engineer-in-charge or his authorized representative.

17.0 Anti-Corrosive Protection on Under Ground Pipe

Corrosion protection tape shall be wrapped on M.S. Pipes to be buried in ground. This corrosion protection tape shall comprise of coal tar/asphalt component supported on fabric of organic or inorganic fiber and minimum 4 mm. thick and conform to requirement of IS:10221 - code of practice for coating and wrapping of underground mildsteel 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 inside after the pipeline is installed. The tape 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.

18.0 Pipe Measurement: Measurements of plumbing work shall be on following basis: -

- a) Piping shall be measured along the center line of installed pipes including all pipe fittings and accessories but excluding valves and other items for which quantities are specifically indicated in the schedule of work. No separate payment shall be made for fittings and accessories.
- b) The rate for piping work shall include all wastage allowances, flanges pipe supports, hangers, excavation, refilling, testing, nuts, vibration isolators, and suspension where specified or required, and any other item required to complete the piping installation. None of these items will be separately measured and paid.

19. VALVES & ACCESSORIES

- a) **Sluice Valves:** Sluice valve conforming to IS: 14846 shall be provided. Valves shall be suitable to with- stand the pressure in the system and rating shall be PN 16. Valves shall be right-handed (i.e., handle or key shall be rotated clockwise to close the valve), the direction of opening and closing shall be marked and an open/shunt indicator fitted. The material of valves shall be as under: Body: Cast iron Disc: Stainless steel Seat: Nitrile rubber O-ring: Nitrile
- b) **Butterfly Valves:** Butterfly valve conforming to IS: 13095 shall be provided. Butterfly valve shall be suitable to with- stand the pressure in the system and rating shall be PN 16. Valves shall be right-handed (i.e., handle or key shall be rotated clockwise to close the valve), the direction of opening and closing shall be marked, and an open/shunt indicator fitted. The material of valves shall be as under: Body: Cast iron Disc: Stainless steel Seat: Nitrile rubber O-ring: Nitrile
- c) **Non-Return Valve:** Non-return valves shall be swing check type in horizontal run and lift check type in vertical run of pipes. They shall conform to IS 5312. They shall be suitable to with-stand the pressure in the system and rating shall be PN 16. Body: Cast iron Disc: Stainless steel Seat: Nitrile rubber O-ring: Nitrile
- d) **Air Release Valve:** Air release valves shall be provided at all high points in the piping system for venting. Valves shall be of the double float type, with G.M. body, vulcanite balls, rubber sealing, etc. Air valves shall be of the sizes specified and shall be associated with an equal size forged ball valve.
- e) **Full Way Ball Valve:** The Ball Valve shall be made from forged brass. The valve shall be internally threaded to receive pipe connections. The Ball shall be made from brass and machined to perfect round shape and subsequently chrome plated. The seat of the valve body bonnet gasket and gland packing shall be of Teflon. The handle shall be of chrome plated steel with PVC jacket. The handle shall also indicate the direction of 'open' and 'closed' situations. The gap between the ball and the teflon

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packing shall be sealed to prevent water seeping. The handle shall also be provided with a lug to keep the movement of the ball valve within 90 degree.

- f) **Strainer:** Strainers shall be preferably of the approved type with fabricated steel bodies. Strainers shall be fabricated by minimum 1.6 mm thick stainless-steel sheet with 3 mm dia. perforation holes. Strainers shall be provided with flanges or threaded sockets as required. They shall be designed so as to enable blowing out accumulated dirt and facilitate removal and replacement of screen without disconnection of the main pipe.
- g) **Pressure Gauges:** Pressure gauges shall be of 150mm dia. dial and of appropriate range and be complete with shut off gauge valve etc. duly calibrated before installation. Care shall be taken to protect pressure gauges during pressure testing.
- h) **Flexible Connection for Pumps:** All suction and delivery lines shall be provided with double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump. Length of the connector shall be as per manufacturer's details.

20. EXTERNAL YARD HYDRANTS

- a) For fighting fire from outside the building, yard hydrants are provided around the building. For connecting yard hydrants, a ring of pipe shall be laid underground around the building at a minimum distance of 2 m. from the face of the building.
- b) Yard hydrants shall be located at a minimum distance of 2 m but not more than 15 m from the building face. The yard hydrants shall be accessible and should normally be provided near boundary wall/along road. While locating yard hydrants it should be ensured that same don't become hindrance in vehicular movement or entrance to the building. Yard hydrants should be located around the building in such a way that it should be possible to fight fire on any face of the building from the nearest hydrant. A distance of 45 m from hydrant to hydrant will be adequate.
- c) Yard hydrant will include the following accessories.
 - i.) connection from ring main with 80 mm dia MS Pipe
 - ii.) 63 mm dia single head landing valve -- 1 No.
 - iii.) Butterfly / Sluice valve 80 mm dia. -- 1 No.
 - iv.) Hose pipe 63 mm dia 15 m long with male and female
 - v.) coupling at both ends.-- 2 Nos.
 - vi.) Branch pipe 63 mm dia with 20 mm (nominal internal diameter) nozzle and suitable for instantaneous connection. -- 1 No.
 - vii.) All above components shall be housed in a 900x600x600 mm size MS Cabinet made from 2 mm thick MS sheet with glass door of thickness 6 mm. The cabinet shall be painted with red color shade no. 536 as per IS: 5.
 - viii.) A brick pedestal with brick wall with plaster shall also be constructed for supporting the FHC box. All surfaces shall be plastered with 1:4 ratio (1 cement: 4 fine sand) mortar.
 - ix.) Sample of one installation to be approved before proceeding the execution.

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21.0 INTERNAL HYDRANTS (LANDING VALVE)

- a) Landing valves are provided in the system for connection of hose pipes for discharging water for firefighting by fire brigade or trained personnel.
- b) The Landing valve shall be as per IS: 5290
- c) The Landing valve are of single head outlet types
- a) Material of construction: Body, outlet, and cap etc.--Gunmetal, Spindle--Brass, Hand wheel--C.I.
- b) The water discharge shall be not less than 900 LPM for single head valves at 7 Kg/cm² pressure.
- c) Installation: The landing valve shall be fitted to a T connection of the riser at the landing in such a way that the valve is in the centre of the internal hydrant opening and at a height of 1 m. from floor level.
- d) The valve base shall be vertical and the valve facing outside. There should be no hindrance in the operation of the handle.
- e) All the components shall be housed in a 900x600x600 mm size 14 Gauge SS Cabinet made from 2 mm thick sheet with glass door of thickness 6mm.

22.0 FIRST-AID HOSE REEL EQUIPMENT

- a) First Aid hose reel is meant for delivering small quantity of water in early stage of fire and can be operated even by untrained personnel, and thus provides a most effective firefighting facility. It consists of length of 20 mm (nominal internal) diameter hose tubing wound around a reel with water inlet pipe, stop valve and shut off nozzle. The entire assembly is mounted on a wall bracket and can swing 180 degrees. The water inlet is connected to the riser pipe by means of 40 mm socket and valve. The hose tube can be pulled out easily for the purpose of discharge of water on fire.
 - b) First aid hose reel shall be as per IS-884. The coupling, branch pipe and nozzle shall be as per IS: 8090
 - c) Material of construction: - Hub and sides-Mild steel, Wall Bracket-Mild steel, Hose tube (20 mm) -Thermoplastic (Textile reinforced) type- 2 as per IS: 12585, (Nominal internal dia), Nozzle with branch pipe – Brass Stop valve (Ball valve) - Gun metal
 - d) Normally MS construction is used. Other material may be used in areas having corrosive atmosphere.
 - e) The water flow rate shall be not less than 24 lpm and the range of jet shall be not less than 6 m.
 - f) Installation: First aid hose reels are installed with internal hydrant. First aid hose reel shall be installed in SS cabinet made from 14 mm thick sheet with glass door of size 900x600x600 mm. The size of the cabinet shall be such that there is no obstruction in swinging the hose reel. The location of cabinet shall be such that there is no obstruction in swinging the hose reel and does not form obstruction to passage / egress.
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cape route.

- g) The length of hose tube shall be such that the nozzle of the hose can be taken in to every room and within a range of 6 m from any part of the room.
- h) There shall be no obstruction in swinging the hose reel and should be installed above landing valve where provided.
- i) The inlet valve shall be at 900 mm above floor level.
- j) Hose reel bracket should be firmly grouted on the wall with the help of rawlbolts.

23. FIRE HOSE DELIVERY COUPLING, BRANCH PIPE AND NOZZLES: -

- a) These are important accessories used for firefighting operations.
- b) Material of construction: Gun metal
- c) Delivery hose coupling's
- d) The 63 mm dia. delivery house couplings consist of male half coupling and female half coupling. Grooves are provided on outer side on both coupling for binding hose pipes with wires. In female couplings spring loaded cam tooth is provided for holding male half coupling in position. Male half coupling and female half coupling are provided on both the sides (i.e. on one side male and on the other side female) of hose pipes. Two or more pipes can be joined together with the help of these couplings instantaneously.

24.0 Branch pipe and Nozzle

- a) Branch pipes with nozzle are mounted and the end of hose pipe. Branch pipe is properly finished and free from sharp edges. During operation a fire man has to hold the branch pipe. One end of branch pipe is fixed with hose coupling and the other end is threaded to fit the nozzle.
- b) Nozzle is tapered pipe with one end threaded internally which is fixed on branch pipe. The size of another end i.e. Nozzle shall be 20 mm (nominal internal diameter)

25.0 FIRE SERVICE INLET AND FIRE SERVICE CONNECTION

- a) These are provided for connection of fire service hose pipes for either directly pressurizing the system with their pumps or filling water in the tank from a distance. In the first case non return valve with butterfly valve shall be provided for holding water pressure. Fire service inlet shall be provided with each wet riser / down comer and the ring main. The arrangement has been shown in Fig. 5. These are fixed to 150 mm dia pipe and located in MS Box made of 2 mm thick mild steel sheet with open able glass cover.
- b) These shall be as per IS: 904.
- c) Material of construction: Gunmetal

26.0 HOSE PIPES

- a) Hose pipes shall be rubber lined woven jacketed and 63 mm in diameter. They shall conform to Type A (Re-inforced rubber lined) of IS: 636. They shall be flexible and capable of being rolled. Length of hose pipe will be 15 m.
- b) The hose pipe shall be complete with male and female coupling at the ends as per detailed given in 13.3.
- c) Besides keeping hose pipe with internal hydrant and yard hydrant, spare hose pipes along with branch pipe shall be kept in fire control room / pump room.

27.0 ORIFICE PLATE

- a) The pressure in a Fire Fighting system varies from point to point. The pressure will be maximum in the pump house and minimum at the farthest hydrant at TOP level. To reduce pressure to operating pressure at every internal /external hydrant, orifice plates are provided before connection of landing valve between the flanges of landing valve and pipe flange

b) Table for selection of orifice plate

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Table 33 Orifice Plates for Medium Grade Pipes as per IS 1239 for Pipe Sizes 80 mm, 100 mm, 150 mm and 200 mm (Clause 13.6.3)

Pressure Loss P_{r0} (Bar)	Diameter of Orifice Pipe Sizes				Orifice K Factor
	80 mm (2)	100 mm (3)	150 mm (4)	200 mm (5)	
(1)					(6)
35.00	41.90	-	-	-	845
30.00	43.00	-	-	-	913
25.00	44.80	-	-	-	1000
20.00	46.40	-	-	-	1118
15.00	48.90	56.20	-	-	1291
10.00	52.30	57.60	-	-	1581
9.00	53.20	59.00	-	-	1667
8.00	54.10	60.40	-	-	1768
7.00	55.30	62.00	-	-	1890
6.00	56.60	63.90	-	-	2041
5.00	58.20	66.50	-	-	2236
4.00	59.80	69.70	-	-	2500
3.00	62.00	74.20	82.30	-	2887
2.00	65.00	81.10	95.80	-	3536
1.00	-	82.20	97.10	105.70	5000
0.90	-	83.30	99.30	108.10	5270
0.80	-	84.40	101.70	111.10	5590
0.70	-	85.70	104.00	113.90	5976
0.60	-	87.00	106.80	117.70	6455
0.50	-	-	110.10	122.20	7071
0.40	-	-	115.10	129.10	7906
0.30	-	-	120.60	137.70	9129
0.20	-	-	-	152.60	11180
0.10	-	-	-	165.80	15810

NOTE — The pressure loss produced by the orifice plate is the net loss across the orifice, not the pressure difference of the flange. The K factor should be marked on the plate.

28.0 SPRINKLER SYSTEM

Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

28.1 System Design

- a) Automatic sprinkler system shall be provided for all areas as per requirement with permitted exceptions e.g., electrical switch rooms, power transformers and D.G. rooms, Panel rooms, Electrical rooms, CNS Equipment rooms, UPS and Battery rooms as identified and as shown in drawings.
- b) Sprinkler heads shall be provided at appropriate spacing to cover max 12 sqmtr. per Sprinkler head or as per specific requirements to meet the approval of the authority having jurisdiction. The spacing shall also be in conformity with the drawings and properly coordinated with Electrical Fixtures, Ventilation Ducts and Grills and other services along the ceiling.
- c) Types of sprinklers to be used shall be as given in specifications, BOQ and approved by the Engineer-in-charge.
- d) Spacing below Sprinkler Heads: - Clear minimum space of 0.5 m shall be maintained below the deflector of sprinkler head.
- e) **Location of Sprinkler in relation to Building Structure: -**
 - i.) Ceiling Sprinklers Deflector shall not be less than 150 mm and more than 300mm below the ceiling.
 - ii.) Side wall sprinkler deflector shall not be less than 100 mm. and not more than 150 mm. below the ceiling.
 - iii.) If depth of a beam in an area is less than 450 mm. distance at (i) and (ii) shall be maintained and provision of beam shall not be considered. If the depth of a beam in an area is more than 450 mm, then the beam shall be regarded as a boundary.
- f) Concealed Spaces: Spaces between roofs and ceiling more than 0.8 m deep shall be sprinkler protected as follows: -
 - i.) Sprinkler heads shall be provided considering the space as any other area in the building.
 - ii.) Sprinkler heads may be connected individually with the range/distribution pipes below, which shall be sized by taking the room and concealed space sprinklers cumulatively.
 - iii.) Sprinkler heads may be connected with independent range/distribution pipes connected with common feed pipe. The common feed pipes shall be not less than 65 mm. dia.
 - iv.) Obstruction below Sprinklers: Sprinklers shall be fitted under the following types of obstruction which are either More than 0.8 m. wide and less than 150 mm. from the adjacent walls or partitions, or more than 1 m. wide.
- g) Sprinkler Heads: Sprinkler heads shall be quartz bulb with bulb, valve assembly yoke and the deflector.
- h) Types: Conventional Pattern
- i) The sprinklers shall be designed to produce a spherical type of discharge with a portion of water being thrown upwards to the ceiling side of wall extras. The sprinklers shall be suitable for erection in upright position or pendant position.
- j) Spray Pattern: The spray type sprinkler shall produce a hemispherical discharge be-

low the plane of the deflector.

- k) Ceiling (flush) Pattern: These shall be designed for use with concealed pipe work, these shall be installed pendant with plate or base flush to the ceiling with spray head below the ceiling.
- l) Side Wall Sprinklers: These shall be designed for installation along with the walls of room close to the ceiling. The discharge pattern shall be similar to one quarter of sphere with a small proportion discharging on the wall behind the sprinklers.

28.2 Construction

- a) **Bulb:** - Bulb shall be made of corrosion-free material strong enough to withstand any water pressure likely to occur in the system. The bulb shall shatter when the temperature of the surrounding air reaches a predetermined level.
- b) **Valve assembly:** - Water passage of the sprinkler shall be controlling assembly of flexible construction. The valve assembly shall be held in position by the quartzoid bulb. The assembly be stable and shall withstand pressure surges or external vibration without displacement.
- c) **Yoke:** - The yoke shall be made of high-quality gun metal. The arms of yoke shall be so designed as to avoid interference with discharge of water from the deflector. The sprinkler body shall be coated with an approved anti corrosive treatment if the same is to use in corrosive conditions.
- d) **Deflection:** The deflector shall be suitable for either upright or pendent erection. The deflector shall be designed to give an even distribution of water over the area protected by each sprinkler.
- e) **Colour Code:** The following colour code shall be adopted for classification of sprinkler according to nomination temperature ratings. Sprinkler Temperature Rating Colour of the Bulb 68 deg.C Red 79 deg C, Yellow.
- f) **Size of sprinkler Orifices:** The sprinklers shall be of 15mm nominal bore size.

28.3 Alarm Valve & Automatic Water Motor Gong Valve

- a) The alarm valve & water motor gong valve is to be provided on all the Sprinkler main delivery pipes or Installation Control Valves (ICV) as per approval of authority having jurisdiction.
- b) The Installation Control valve (ICV) shall be double seated clapper type check valve. The Body and cover shall be made from Cast Iron to IS: 210 Grade FG 200. The seat and seat clamp shall be made from bronze to IS: 318, LTB II grade. The sealing to the seat shall be neoprene gasket. The hinges pin and ball shall be from stainless steel. It shall be vertically mounted, and the direction of water travel shall be indicated on the surface.
- c) A By-pass check valve shall be fitted to adjust minor and slow variations in water pressure for balancing so as to avoid any false alarm.
- d) The valve shall also be provided with a Test Control Box. The Box shall house a lever to test and operate the ICV. A brass strainer shall also be provided at the point of

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water supply to the Alarm gong. A Retarding Chamber shall also be provided. The Chamber shall be able to balance the water pressure in case of water line surges.

- e) Each Installation Control Valve (ICV) shall have two sets of pressure Gauges with brass ball valve type shut off.
- f) A Water Motor Alarm shall also be provided. This shall be mechanically operated by discharge of water through an impeller. The drive bearing shall be weather resistant. A strainer shall be provided online before the nozzle. The Gong piece shall be constructed from bronze to IS 318, 2 TB II Grade, and base of cast iron. The motor Housing, Rotor and Housing Cover shall be pressure die cast aluminum.
- g) A brass automatic ball drop valve with the retard chamber shall also be provided.
- h) Inspection Test Valves: Inspection and testing of the sprinkler system shall be done by providing an assembly consisting of gunmetal valves, gunmetal sight glass, bye-pass valve.
- i) Flow Switches: The Flow Switches are to be provided on the Sprinkler System pipes for each zone, complete with all necessary wiring up to monitor modules as per instructions of the engineer in charge.
- j) pressure switches: Pressure switches shall be differential type for operation of all pumps and for the various duties and settings required. Pressure switches shall be for heavy duty operation and of approved make. All pressure switches shall be factory calibrated.
- k) Annunciation Panel: Electrically operated alarm shall be provided for indication of operation of sprinkler in an area. Water flow switches shall be installed in main distribution pipes which shall be wired to sprinkler annunciation panel. In the event of operation of a sprinkler, the flow switch will operate and give signal to the annunciation panel to indicate operation of sprinkler in the area. This will initiate an electrically operated alarm. The system shall be independent of fire alarm system.

28.4 Construction details

- a) The Panel shall be fabricated out of not less than 1.6 mm thick MS sheet and powder coated after 7 tank treatment process and shall be totally enclosed dust damp and vermin proof. Suitable knockout shall be provided for entry of cables. The panel shall be designed such that the equipment for power supply battery charging are housed in independent compartments. Sealed maintenance free batteries shall also be accommodated inside the panel.
- b) Indicating lamps control switches, buttons and fuses shall be suitably located in the front and properly labeled.
- c) The indicating lamps shall be LED type of following colours. The flow switch operation conditions shall be indicated by twin lamps.
 - a) Red to indicate flow switch operation. Amber to indicate fault condition. Green to indicate healthy conditions. The test buttons to test the indication lamps shall be provided.
 - b) The panel shall be solid state type or microprocessor type as indicated in the tender.
 - c) The primary function of the panel shall be to respond automatically to the operation Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

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of one or more flow switches to give alarm and to indicate area/areas where the device has activated. The operation of one or more flow switches shall result in simultaneous alarm given by the following: -

- i.) External alarm hooter (s)
- ii.) A visible indication on panel.
- iii.) Audible alarm on panel itself (common for all zones)
- iv.) The panel shall indicate the fault within the system and immediate fault warning shall be given by an audible and visible signal on the panel in case of open circuit, short circuit and earth fault in cable between flow switch and annunciation panel.
- v.) The panel shall be complete with mimic diagram for the areas covered by different flow switches. The layout of mimic diagram shall be got approved by the Engineer-In-Charge.
- vi.) Battery backup with trickle cum boost charger shall be provided for operation of the system. Indication of mains failure and low battery voltage shall be provided. The batteries shall be sealed maintenance free. The capacity of the battery shall be 12 Volt 2 Nos 24 AH each. All standard accessories shall be provided.

28.5 Installation of Sprinkler System

- a) The installation shall be carried out as per Chapter 8 and 18. Following additional points are to be taken care for sprinkler installations.
- b) For fixing sprinkler heads, 15 mm dia M.S. Socket is to be welded to range pipes at the locations as per drawings. Dead plug shall be fixed in the socket.
- c) If sprinkler head is to be provided away from range pipe, M.S. pipe nipple of suitable size be used to extend the sprinkler head and socket is welded at desired locations.
- d) Joints for Sprinkler pipes: DI fittings up to 50mm diameter shall be threaded joints using Teflon Tape or equivalent bonding tape on the threads. Joints for pipe and fittings above 50mm diameter shall be welded joints.
- e) After completion of work in sections, pressure rating of entire pipe work shall be carried out for 24 hours.
- f) After completion of entire work, pressure rating of entire pipe work shall be carried out for 24 Hours at a pressure of 7.5 kg/cm². The drop of pressure up to 0.5 kg/cm² shall be accepted.
- g) The lines shall be flushed before completion of building work so that any foreign matter which might have entered the system is taken out. The pressurization pump (Jockey pump) be operated and valve open at different locations.
- h) During occupation of the building, sprinkler heads shall be provided in place of dead plugs. Teflon tape shall be used on threaded portion. The sprinkler heads shall be properly tightened in the socket.

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- i) When all sprinklers' heads are installed, pressure is built up in the system by pressurization pump slowly and in case no leak is found, desired pressure is developed and maintained. In case any leak is detected, the same shall be attended before pressurizing the system further.

28.6 TESTING

28.6.1 Initial Testing

- a) During laying of pipes, the same shall be subjected to 10 kg/cm² hydraulic pressure for a period of 24 hours, in sections.
- b) After completion of the work all valves/ fittings shall be installed in position and entire system shall be tested for
- c) 24 hours at a pressure of 10 kg/ cm². The drop of pressure up to 0.5 kg/cm² shall be accepted.

28.6.2 Final Testing

- a) After completion, all operation checks as per Para 2.4.1.14 shall be carried out for automatic operation of the systems. For this purpose, landing valves may be opened at different locations. The exercise shall be repeated couple of times to ensure trouble free operation of the system
- b) 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 to 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.

28.6.3 Inspection By Local Fire Officer

After completion of the work and testing to the entire satisfaction of Engineer-in Charge, the installation shall be offered for inspection by Chief Fire Officer or his representative. Testing as desired by the Fire Officer shall be carried out. The contractor will extend all help including manpower during testing. The observation of Chief Fire Officer which are a part of agreement shall be attended by the contractor. Nothing extra is to be paid for testing as above.

29.0 COMMISSIONING

- a) Flushing the System: - Before commissioning, the entire system shall be flushed to ensure that any earth/ foreign matters which might have entered during installation are taken out. For this, pump may be operated, and valves opened at different locations.
- b) As soon as the work is complete, the system shall be commissioned and made available for use. Requirement of firefighting installations is equally important during occupation of the building. If the building is to be occupied in part, firefighting system of building completed shall be commissioned by isolating the system of under construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

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tion portion of the building.

- c) The firefighting system shall be maintained and manned from the very first day of its commissioning.
- d) Any defects noticed during the warranty period shall be promptly attended by the contractor and availability of the system at all times is to be ensured.

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30.0 TECHNICAL DATA (TO BE FILLED BY BIDDERS):

30.10 Diesel Engine Driven Fire Pump:

Description	Hydrant/Sprinkler
Quantity	
Make	
Model	
Fluid Handled	
Type	
Suction	
Delivery	
Impeller Type	
Coupling	
Base Plate with Foundation Bolt	
No. of Stage	
Flow Rate (m ³ /hr)	
Total Head (m)	
Speed of Pump (rpm)	
Efficiency at rated duty point	
Material of construction (MOC)	
Casing material	
Impeller material	
Shaft material	
Shaft sleeve	
Casing Ring	
Impeller Ring	

30.11 Engine for Diesel Pump:

Description	Hydrant/Sprinkler
Quantity	
Make Model	
Horsepower	
Engine	
RPM	
Engine over speed	
setting Operating Cycle	
Number of Cylinder	
Accessories	
Dynamically balanced fly wheel	
Flexible coupling and coupling guard	
Electrical standing equipment and starting system	
Governor	
Fuel pump and water pump	
Lubricating oil pump	
Fuel, Air and Lubrication Oil Filter	
Instrument and Protection Device complete as	

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per Engine Model	
Lubricating oil pressure	
High Cooling Water Temperature	
High Lubricating Temperature	
Engine Cooling and Oil System	
Capacity of Diesel Tank	
Detail of Batteries	
Battery Charger	
Other necessary accessories as per Model No in order to make the Diesel Engine Functional	

30.12 Electrical Motor Driven Main Fire Pumps:

Description	Hydrant/Sprinkler
Quantity	
Make	
Model	
Fluid Handled	
Type	
Suction	
Delivery	
Impeller Type	
Coupling	
Base Plate with Foundation Bolt	
No. of Stage	
Flow Rate (m ³ /hr)	
Total Head (m)	
Speed of Pump (rpm)	
Efficiency at rated duty point	
Material of construction (MOC)	
Casing material	
Impeller material	
Shaft material	
Shaft sleeve	
Casing Ring	
Impeller Ring	

30.13 Electric Motor for Main Fire Pumps:

Description	Hydrant/Sprinkler
Make	
Model	
Type of Motor	
Horsepower	
Voltage (V)	
Full Load Amps – A	

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Speed of Motor	
Enclosure	
Mounting	
Class of Insulation	
Ambient Temperature/Temp in Degree	
Starting Temperature as % of full temp	
Efficiency at 100% load efficiency at 75% load	
Type of rotating movement	
Coupling	
Type of lubrication	
Frequency	
Make and type of starter	

30.14 Electrical Motor Driven Jockey Pumps:

Description	Jockey Pump
Quantity	
Make	
Model	
Fluid Handled	
Type	
Suction	
Delivery	
Impeller Type	
Coupling	
Base Plate with Foundation Bolt	
No. of Stage	
Flow Rate (m ³ /hr)	
Total Head (m)	
Speed of Pump (rpm)	
Efficiency at rated duty point	
Material of construction (MOC)	
Casing material	
Impeller material	
Shaft material	
Shaft sleeve	
Casing Ring	
Impeller Ring	

30.15 Electric Motor for Jockey Pumps:

Description	Jockey Pump
Make	
Model	
Type of Motor	
Horsepower	

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Voltage (V)	
Full Load Amps – A	
Speed of Motor	
Enclosure	
Mounting	
Class of Insulation	
Ambient Temperature/Temp in Degree	
Starting Temperature as % of full temp	
Efficiency at 100% load efficiency at 75% load	
Type of rotating movement	
Coupling	
Type of lubrication	
Frequency	
Make and type of starter	

30.16 Electrical Motor Driven Terrace Pumps:

Description	Jockey Pump
Quantity	
Make	
Model	
Fluid Handled	
Type	
Suction	
Delivery	
Impeller Type	
Coupling	
Base Plate with Foundation Bolt	
No. of Stage	

30.17 Electric Motor for Terrace Pumps:

Description	Jockey Pump
Make	
Model	
Type of Motor	
Horsepower	
Voltage (V)	
Full Load Amps – A	
Speed of Motor	
Enclosure	
Mounting	
Class of Insulation	
Ambient Temperature/Temp in Degree	
Starting Temperature as % of full temp	
Efficiency at 100% load efficiency at 75% load	

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Type of rotating movement	
Coupling	
Type of lubrication	
Frequency	
Make and type of starter	

31.0 PRECAUTIONS AND INSPECTION DETAILS

- a) The surface to be painted is to be prepared as per specification. No dust, grease of loosely adhering particles to be present.
- b) All equipments for application i.e., compressors, nozzles, hoses etc. to function properly. Bushes to be clean and free from contamination.
- c) In case solvent wiping is done with a swab, care to be taken that the localized grease or oil spot is removed effectively and a thin layer of the same is not spread over a large area. The same swab not to be used again.
- d) The painter and helper to be provided with protective clothing rubber glove, face mask, eye shields etc. to protect them against solvent vapors and over sprays. Contact with the skin to be avoided and suitable barrier cream to be used to protect against vascular action.
- e) The container drums to be rolled on a wooden plank for 10-15 minutes before opening. The contents must be stirred well to get complete dispersion of pigments. Consistency to be checked and adjusted for application, if necessary.
- f) Base and catalyst are to be mixed thoroughly in the given proportion only and more quantity not to be mixed keeping in mind the limited pot life of the mixture.
- g) Recommended intervals in between the coats are to be given to get the desired inter coat adhesion.
- h) All painting programmed are to be well planned giving the allowance for inclement weather and unfavorable atmosphere conditions.
- i) All other safety precaution is to be taken in compliance with regular painting practice.
- j) Adequate ventilation is to be provided in case painting is carried out in confined space. Also, in order to ensure that solvent is not retained in the container during curing reaction, the ventilation to be continued for 4-6 hours after the painting is over.
- k) Care must be taken to see the coatings, by whatever method, is applied, and produces a continuous, uniform film.
- l) They should be following the instructions given by the paint manufacturer before application of paint.
- m) The thickness of the paint coating may be measured using paint inspection gauge. This instrument gives the individual thickness of each coat of the paint.

**A. GENERAL REQUIREMENTS AND MINIMUM TECHNICAL SPECIFICATIONS OF
AUTOMATIC FIRE DETECTION & ALARM SYSTEM (AFD&AS) FOR NEW PRO-
POSED BUILDING OF ADMINISTRATIVE OFFICE BERHAMPUR**

DEFINITION OF TERMS & TERMINOLOGIES

1. **Bank/Purchaser** shall mean the client on whose behalf this tender is issued and his authorized representative.
2. **Fire Engineers** shall mean Fire Engineer / Fire Officer appointed by Bank for the project.
3. **Bidder** shall mean party who quotes against this enquiry.
4. **Contractor** shall mean the successful `BIDDER' whose bid has been accepted by the Bank and on whom Purchase/Work Order will be placed.
5. **PROJECT** shall mean the project specified in tender.
6. **SITE** shall mean the actual place of work as detailed in specification / tender
7. **SPECIFICATIONS** shall mean collectively all the terms and stipulations contained in those portions of contract as general and special conditions, amendments, deletions, revisions as made in agreement or written agreements made pertaining to method of work.
8. **Month** shall mean Calendar month.
9. **Plant/Equipment** and **Works** shall mean respectively the goods to be supplied and services to be provided by the contractor.
10. **Contract/Work Order** shall mean the order specifying works and associated specifications to be executed by "Bank and Contractor".
11. **Contract Period** shall mean the period during which "Bank" and "Contractor" shall execute the entire contract as agreed.
12. **Guarantee Period** / **Defect Liability Period** shall mean period during which the plant / equipment and installations shall give same and trouble-free performance as guaranteed by contractor.
13. **Fire Engineer's Instructions** shall mean instruction oral or written, drawings, direction, explanations issued by Consultant / Fire Engineer / Architects on behalf of the Bank from time to time during period of contract. (All 'oral' instructions shall be authenticated by written instructions immediately.)
14. **Performance Tests** shall mean all tests to be carried out by contractor as per specifications prior to installation being taken over by Bank under guarantee.
15. **Commissioning** shall mean integrated activity of carrying out performance tests, initial and trial operations of system.
16. **Drawings** shall mean all drawings furnished by Fire Engineer / Bank for basis of proposal or for carrying out works, from time to time; all drawing submitted by vendor provided such drawings are acceptable to Fire Engineer/Bank.
17. **UR** means quote unit rate.
18. **Acknowledge** - To confirm that a message or signal has been received, such as by the pressing of a button or the selection of a software command.
19. **Alert Tone** - An attention getting signal to alert occupants of the pending transmission of a voice message.

20. **Ceiling** - The upper surface of a space, regardless of height. Areas with a suspended ceiling have two ceilings, one visible from the floor and one above the suspended ceiling.
21. **Ceiling Height** - The height from the continuous floor of a room to the continuous ceiling of a room or space.
22. **Circuit** - Assembly of fire alarm components supplied from the same control equipment and protected against over current by the same protective device(s) or current limitation arrangements.
23. **Circulation Area** - Area (including a stairway) used mainly as a means of access between a room and an exit from the building or compartment.
24. **Combination / Multifunction Detector** – A device that either responds to more than one of the fire phenomena or employs more than one operating principle to sense one of these phenomena. Typical examples are a combination of a heat detector with a smoke detector or a combination of rate-of-rise and fixed-temperature heat detector.
25. **Commissioning** - Process by which it is determined that the installed system meets the defined requirements.
26. **Detector** - A device suitable for connection to a circuit that has a sensor that responds to a physical stimulus such as heat or smoke or flame.
27. **Display** - The visual representation of output data, other than printed copy.
28. **Electrical Conductivity Heat Detector** – A line-type or spot-type sensing element in which resistance varies as a function of temperature.
29. **Evacuation Signal**- Distinctive signal intended to be recognized by the occupants as requiring evacuation of the building.
30. **Exit Plan** - A plan for the emergency evacuation of the premises.
31. **False Alarm** - Alarm of fire that is, false, because the fire reported does not and did not exist. This false alarm may arise by malicious, mistaken, or accidental intent.
32. **Fault Signal** - A distinctive audible and visual signal indicating occurrence of a fault within the system (for example, breaks in electric circuit, short circuit, or fault in power supply).
33. **Fire Alarm Control and Indicating Equipment** - Equipment through which fire detectors may be supplied with power and which:
 - a) is used to accept a detection signal and actuate a fire alarm signal.
 - b) is able to pass on the fire detection signal, through the fire alarm routing equipment, to the firefighting organization or to automatic extinguishers.
 - c) is used to automatically monitor the correct functioning of the system; and
 - d) is used to indicate or display the location of fire / alarm activation device.
- 34) **Fire Alarm Signal** - A signal initiated by a fire alarm-initiating device, such as a manual fire alarm box, automatic fire detector, water flow switch, or other device in which activation is indicative of the presence of a fire or fire signature.
- 35) **Fire Alarm System** - A combination of components for giving an audible and visible / or other perceptible alarm of fire. The system may also initiate other ancillary action.

- 36) **Fixed Temperature Detector** - A device that responds when its operating element becomes heated to a predetermined level.
- 37) **Floor** - Area contained on each story of the building.
- 38) **Heat Detector** - A fire detector that detects either abnormally high temperature or rate of temperature rise, or both.
- 39) **Ionization Smoke Detection** - The principle of using a small amount of radioactive material to ionize the air between two differentially charged electrodes to sense the presence of smoke particles. Smoke particles entering the ionization volume decrease the conductance of the air by reducing ion mobility. The reduced conductance signal is processed and used to convey an alarm condition when it meets preset criteria.
- 40) **Maintenance** - Repair service, including periodic inspections and tests, required to always keep the fire alarm system and its component parts in an operative condition, and the replacement of the system or its components when they become undependable or inoperable for any reason.
- 41) **Manual Call Point** - A manually operated device used to initiate an alarm signal it can be manual alarm system or part of automatic alarm system.
- 42) **Mimic Panel** - A panel in which the floor/area plans of the premises are projected to reduced scale to enable easy identification of the sector/zone.
- 43) **Multi-Sensor Fire Detector** - Fire detector that monitors more than one physical and/or chemical phenomenon associated with fire. Typical examples are a combination of a heat and smoke detector or combination of heat and gas detectors.
- 44) **Photoelectric Light Obscuration Smoke Detection** - The principle of using a light source and a photosensitive sensor onto which the principal portion of the source emissions is focused. When smoke particles enter the **light** path, some of the light is scattered and some is absorbed, thereby reducing the light reaching the receiving sensor. The light reduction signal is processed and used to convey an alarm condition when it meets preset criteria.
- 45) **Photoelectric Light-Scattering Smoke Detection** - The principle of using a light source and a photosensitive sensor arranged so that the rays from the light source do not normally fall onto the photosensitive sensor. When smoke particles enter the light path, some of the light is scattered by reflection and refraction onto the sensor. The light signal is processed and used to convey an alarm condition when it meets preset criteria.
- 46) **Smooth Ceiling** - A ceiling surface uninterrupted by continuous projections, such as solid joists, beams, or ducts, extending more than 100 mm below the ceiling surface.
- 47) **Standby Supply** - Power supply, commonly from a rechargeable battery, which is automatically connected to the fire alarm system when the normal power supply fails.
- 48) **Trouble Signal** - A signal initiated by the fire alarm system or device indicative of a fault in a monitored circuit or component.
- 49) **Zone** - Area or space that has a group of automatic and/or non-automatic fire detection devices for which there is a separate common display in the control and indicating equipment.
- 50) **Product Literatures:**

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- a) Applicant shall furnish as a part of bid, documents establishing the applicant's ability to execute the work.
- b) The applicant shall also submit documentary evidence in the form of literature, drawing & data on the AFD&AS Product offered.
- c) Evaluation will be done on the basis of the documents submitted along with the bid without any further reference to the applicant.

GENERAL:

The purpose of a fire detection and alarm system is to detect fire at the earliest practicable moment and to give an alarm so that appropriate action can be taken (e.g., evacuation of occupants, triggering of extinguishing processes etc.). An alarm system may be activated by automatic detection devices or by manual operation of manual call points.

The general principles given below are a guide to design and construction of fire detection and alarm systems. A fire detection and alarm system should:

- a) Detect quickly enough to fulfill its intended functions.
- b) Reliably transmit the detection signal.
- c) Translate this signal into a clear alarm indication that will attract the attention of the user in an immediate unmistakable way and indicate the location of fire and initiate operation of ancillary service, such as fire extinguishing system etc.
- d) Remain intensive to phenomena other than those which its function is to detect and
- e) Signal immediately and clearly any supervised fault that might jeopardize the correct performance of the system.

1. SCOPE OF WORK:

- 1.1 The work under this section shall consist of furnishing all labor, material, equipment, and appliances necessary and required to completely install automatic and manual fire detection and alarm system facility as required by the drawings and specified here in after or given in the schedule of qualities.
- 1.2 Without restricting to the generally of the foregoing the fire Detection & Alarm System shall include the following: -
 - a) Optical Detectors, Rate of Rise cum Fixed Temperatures Heat Detectors, Fixed temperature heat detectors, Manual call points, Electronic Hooters/Sounders, Response Indicators, and Accessories as specified.
 - b) Metallic conduits (rigid/flexible), PVC insulated copper conductor cables, armored cables, glands, tees, bends, special fittings, junction boxes etc. as specified.
 - c) Main Fire Alarm Control panels, local control panels (floor panels), batteries, and battery chargers etc. as specified.

2. GENERAL REQUIREMENTS:

- 2.1 All material shall be of the best quality confirming to Specifications and subject to the approval of the Bank Fire Officer.
- 2.2 All conduit pipes/cables shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner or as advised by the Fire Officer

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- 2.3 All conduits, cables, junction boxes etc. shall be securely fixed to brick/RCC walls and ceilings by suitable clamps at regular intervals. Only approved type of anchor fasteners shall be used.
- 2.4 Control panels shall be so located that they are easily accessible for operations, repairs, and maintenance.
- 2.5 Detectors shall be provided at appropriate spacing as given in IS: 2189:2008. The spacing shall also be in conformity with the drawings and properly coordinating with electrical fixtures, air conditioning ducts / grills, beams, and other ceiling services. Contractor shall submit detailed layout drawings to Fire Engineers/Consultants in charge for approval before commencement of work.

3. **SMOKE DETECTORS:**

3.1 **OPTICAL TYPE:**

Optical smoke Detectors shall contain an emitter, a solid-state light emitting diode (LED) which, with its associated lens system, shall produce a hollow circular beam of light. A silicon photocell shall be positioned in the central dark area of the hollow beam, so that in the absence of smoke no light is received. When smoke enters the chamber a combination of reflection and deflection from smoke particles shall cause light from the beam to impinge on the photocell. The detector shall be listed with UL/FM approved.

4.0 **HEAT DETECTORS:**

- 4.1 The heat detectors shall be combined rate of rise cum Fixed temperature, Re-settable type preferably operating on twin thermistor principle where one thermistor is exposed and is therefore in good thermal contact with the surrounding air and responds quickly to changes in air temperature and the other is thermally insulated from the surrounding and responds less quickly resulting in electrical imbalance. One fixed temperature setting the detector shall operate at 60°C. The sensitivity of the detector shall be as per the requirements of IS: 2175 for grade I Heat Detectors. The detectors shall be UL/FM listed approved.

5.0 **MANUAL CALL POINT:**

- 5.1 Each manual call point unit shall comprise of a push button of reputed make enclosed in an M.S./Cast Aluminum Box with provision for cable or conduit coupling/gland from top. The manual push button shall have the words prescribed in clear bold letters on facial window. "**In case of Fire Break Glass,**" installation of the manual push button shall be as per IS: 2189. The push button shall not be shrouded and the same shall be projecting out of the surface of the M.S. Box.

6.0 **ELECTRONIC HOOTER (SOUNDER):**

The dual tone electronic hooter shall be provided so that it gives discontinuous/intermittent audible alarm automatically whenever the automatic/manual detector operates and is distinct from the background noise in every part of the premises. The mode of the alarm sounders shall be quite distinct from any other sounder to be heard. All hooters shall produce a similar sound and shall maintain the same during their operation. Hooter shall be complete with electronic oscillation, magnetic coil

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(sound coil) and accessories ready for mounting (fixing) and confirming to IS: 2189-2008.

6.1 Sounder cum Strobe:

The Sounder Cum Strobe shall confirm to the relevant standards having the following features.

- i.) The Sounder Cum Strobe Shall have audibility level of 85dB.
- ii.) The Sounder Cum Strobe shall have 4 Candela setting 15/30/75/110cd flashing capacity at 1HZ for Visual indications.
- iii.) The Sounder Cum strobe shall be working on NAC.
- iv.) The sounder shall have two audible tone settings.

7.0 REMOTE RESPONSE INDICATOR:

The remote Response indicator shall consist of a steady glowing LED similar to the one provided at the base of the detector. This LED shall be mounted within a M.S. box of 16 SWG and connected in parallel to the built-in indicator of the detector by a 2-core cable. The response indicator shall come "ON" as soon as the detector actuates. The M.S. enclosure shall be painted externally and internally in synthetic enamel paint of approved shade. The LED shall be so provided that it is visible from the side also. This should be suitable for both surfaces and recess wall or ceiling mounting. It shall be Dual LED Indicator and operates 12V DC.

8.0 MICROPROCESSOR BASED CONTROL PANEL:

Good quality design and with latest technology for fire alarm control panels. This microprocessor based conventional Fire Alarm Control panel, is designed to be used for Commercial bank's building. The model should be a user friendly 4 or more zone standalone control panel with inbuilt USB and optional Ethernet & GSM module.

8.1 Panel Features:

- a) As per IS -15908: 2011 Standard.
- b) Switched Mode Power Supply.
- c) Modular Construction, Serviceable.
- d) Battery polarity & deep discharge protection.
- e) 16 X 2 Dot Matrix LCD Display.
- f) Event log with Real Time Clock (150 events).
- g) Standby battery backup with built in charging.
- h) Fire / Fault status in unambiguous colored LED indication.
- i) System ON, Mains ON & Standby ON status indication.
- j) Low Battery visual warning with audible tone.
- k) Relay output for actuators, for Fire and Fault.
- l) Zone wise one man Walk Test Facility.
- m) Zone wise Isolation facility with loop voltage cut off.

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- n) USB Interface for PC Connectivity.
- o) Compatible to all type of Conventional Detectors.
- p) Optional Ethernet and GSM (SMS) facility.
- q) Includes centralized monitoring facility through Ethernet port.

8.2 GSM Features:

- a) Quad Band GSM/GPRS: 850 / 900 / 1800 / 1900 MHZ.
- b) GSM based SMS Notification includes location details.
- c) Contact wise Event Configurable.
- d) Maximum 15 mobile contacts can be configured via Software.
- e) Separate Fire and Fault message.
- f) 15 Mobile numbers for each event type.
- g) GSM Signal Strength indicator.

8.3 Ethernet Features:

- a) 10/100M high speed, automatically adapts to any TCP/IP interface.
- b) Ready-to-use TCP/IP firmware for fast integration.
- c) Easy configuration with Web browser, serial console, Telnet console or Windows utility.
- d) Low power consumption.

8.4 PC Features:

- a) Monitoring the status of Fire Alarm System
- b) Audible & Visual alerts for Zone wise Fire & fault.
- c) Multiple FACP shall be monitored and controlled from single Desktop with static IP.
- d) User friendly PC software.
- e) Shall supports USB, LAN & WAN connectivity

8.5 Electrical Specification:

- a) **Primary Power:** -120 / 220VAC + 10% -15%, 60 / 50 Hz. 60W
- b) **Standby Power:** - 24VDC (2 Nos. of 12V, 7Ah Sealed Lead acid battery).
- c) Quiescent current: - 60mA (without Ethernet), 102mA (with Ethernet), 128mA (Ethernet & GSM)
- d) **Operating Condition:** - Operating Temperature - 0 - 49° C/32-120° F.
- e) Storage Temperature - 0° to 60 ° C
- f) Relative Humidity - 93 ± 2% RH (non- condensing) at 32 ±2° C/90 ±3° F.
- g) **Notification Appliance Circuits:** - Class B wiring
- h) Operating Nominal Voltage: 24VDC, Current for NACs: 0.6 Amps
- i) End-Of-Line Resistor: 4K7, 1/2 watt

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j) **Charging Circuit: -**

k) Charging Voltage - 28.0V, $\pm 2\%$, Charging Current - 0.5 A (Max.)

l) **Common Relays: -** Type: Form C, No of Relays: 2, Relay Contact Rating: 2Amps @ 30 VDC, 0.5Amps @125VAC. Power Factor: 1.0

m) **Initiating Device Circuits (Zone Circuit): -**

n) All zones are Class B wiring, Normal Operating Voltage: 14- 21 VDC, Alarm Current: 15 - 35mA, Short Circuit Current: 42mA Maximum

o) Loop resistance: 50 ohms Maximum, End-Of-Line Resistor: 4.7K, 1/2watt, stands by Current: 6.8mA, (2.4mA for Detectors).

8.6 Mechanical Specification:

a) Dimensions: (350W X 250H X 100D)

b) Color: Red / White

c) Construction: 18 Gauge (1.22mm) CRCA sheet with powder-coated finish

d) IP Rating: IP50

e) Cable Entry: 16x ϕ 19mm Knockout on top of the cabinet

8.7 Compatible Devices:

a) Photoelectric Smoke detector with base.

b) Heat detector with base.

c) Photoelectric & Heat detector with base.

d) Conventional Manual Call Point.

e) Conventional Sounder.

9.0 ELECTRONIC CABLES, WIRING & CONDUITING:

9.1 All wires / cables to be used for the system shall confirm to the following as specified in BOQ.

a) PVC insulated copper conductor cables confirming to and marked IS: 694: 1990 having minimum 1.5mm² cross-sectional areas or as specified in BOQ. If stranded at least 0.5mm² cross-sectional should be used.

b) Armored PVC / Rubber insulated cables confirming to and marked IS: 1554 (Part – I) 1988.

9.2 Joints in the cables shall necessarily be avoided. Where joints are unavoidable for qualified reasons all visible areas of the junction boxes shall be painted signal red.

9.3 The maximum number of wires that can be drawn in conduit shall be governed by the CPWD Specification for internal electrical works (Part-I).

9.4 Insulation on cable should not be lesser than one Mega Ohm when tested with a 500 Volts Megger for any section of the wiring.

10.0 INSTRUCTION MANUAL:

10.1 The record engineering drawings and operating instructions shall be supplied by the installers on completion of the installation. Drawings shall clearly indicate, for maintenance Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

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nance and record purposes, the position of various items of the equipment's, junction boxes, sizes and routes of all cables and wires and such other relevant details. If so desired by the user, circuit diagrams of fire alarm system and its components should also be supplied. These drawings and operating instructions shall be kept up – to – date and be available for convenient reference and shall be available for convenient reference and should be in the control room.

- 10.2 The installer shall supply the user with a logbook. The logbook shall be maintained for recording details, including causes of all the alarms (genuine, practice, test or false), faults, service tests and routine inspections, servicing/repairs, etc, as and when done. Periods of disconnection/in operation should also be shown.

MINIMUM TECHNICAL SPECIFICATION FOR CONVENTIONAL AUTOMATIC FIRE DETECTION AND ALARM SYSTEM (AFD&AS)

Technical Specification for Fire Alarm System		
S.NO .	Technical Specifications	Compliance Yes / No
1	2/4/8 zone Main Control Panel as per latest IS specifications (IS: 2189 & IS: 15908) with inbuilt GSM (with facility to dial at least 5 telephone no's each and voice message of at least 20 seconds) zone indicator and back-up. UL listed panel will be preferable.	
2	The panel must be TCP/IP enabled and CMS compatible with IP module to connect online to a central station for alerts, manual alarm (MCP), reset facility (optional), event logs (min. 500 logs)	
3	Provision for INBUILT AUTO DIALER. With option to remotely change the numbers in the auto dialer from central site/ Administrator.	
4	Test report by the Regional Electronic Test Development Centers or BIS certification is mandatory for Electronic fire alarm System	
5	On activation it should initiate Audio alarm (The sound characteristic of the alarm should be continuous and similar throughout the protected premises) as well as visual signal on sector/zonal panel of the control panel	
6	On fault i.e., open / short condition, buzzer must sound and indicator lamp (LED) glows. This audible alarm should be distinct from the Fire Alarm. Trouble reminder	
7	Panel should be compatible with all type of standard conventional detectors (min. 20 in each zone). Alarm activation by Flame detectors, Ionization Smoke Detector (ISD), Optical Smoke Detector (OSD), Heat Detector and other compatible sensors with provision of Response Indicator (RI), Manual Call Point with break glass arrangement (MCP) etc. All the smoke detectors shall conform to latest IS specifications and shall be compatible with conventional fire alarm system/panel	
8	All the wiring should be done using Fireproof Armored wiring/cables	
9	The control panel should have inbuilt keypad, Test facility, ON - OFF indicators, acknowledge button, where required cancel/reset/isolation button, related fuses. There must also be an option to connect External Keypad for large branches.	
10	The panel must be 16 SWG - Powder coated. Cable glands should be provided, Suitable locking arrangement through Key / Screws Space for placing the inbuilt back up batteries	

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11	Panel should have LED/LCD display for status of the system. All LED can be checked at once with Lamp test button.	
12	Sounder should be silenced by Acknowledge /Silence button.	
13	Fire / open / short / lamp test / reset / alarm / evacuate facility / zone isolation display	
14	Indication for mains on, battery on, system on, charging on, fire status, silence, battery low	
15	The system should have provision to Reset the complete system from Control Panel.	
16	The Panel should be easy to operate. Auto dialer should be easy to operate for updating the contact numbers	
17	Panel should have the feature of Master reset of settings and should be password protected.	
18	Built-in power supply arrangement with AC/DC ON, system ON visual indicators and auto switch over to internal back up in case of external power supply/ MAINS failure with auto switch over. The system must have Deep Discharge Protection. The power backup must be rechargeable, sealed, maintenance free. Min. 24 Volts, 7 Ah.	
19	Zone isolation facility in case of continuous fault. Auto Isolation with self- activation on removable of fault. Manual Isolation and Manual disable through keypad.	
20	The system should be provided inbuilt with SMPS with spike/Transient reduction circuit, to avoid any False alarming in case of transient/abrupt Voltage fluctuations. Power consumption of less than 200 mA idle current and 1 –2 Amps on full activation.	
21	Aux. Relay for Triggering External Devices. Separate Relays for Fire & Fault. Compatible with external relay card for connecting external devices. Air Conditioning turn-off relays and facilities for connecting Auto dialer, mot. sirens etc.	
22	Built-in Digital Ammeter (Battery Current), Digital Voltmeter (Main voltage & Battery Voltage)	

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Technical Specification for STANDALONE AUTO DIALERS		
S.NO.	Technical Specifications	Compliance Yes / No
1	Standalone Auto Dialer must be compatible with GSM/ PSTN connection of various leading Service Providers.	
2	It should work with all types of existing alarm having port for connecting the auto dialer	
3	Standalone Auto dialers may be required for Currency Chests/selected high risk branches.	
4	Minimum 10 telephone numbers - non-volatile memory such that settings are saved	
5	Minimum 2 messages of 15-20 seconds duration, storage and recording facility.	
6	Call override and line take over facility.	
7	User friendly easy programming and simple operation.	
8	No false activation due to voltage fluctuation etc.	
9	Facility to cut off message delivery using a number code/master key.	
10	Message should be repeated at least twice before dialing the 2nd number. In case number not responded, facility to re-dial the number after completing the cycle.	
11	Should have message recording facility at local end (Branch end).	
12	In-built GSM auto-dialer should have the ability to generate SMS alerts in addition to auto-dialing the pre-fed numbers.	
13	Provide signal strength and status indication on display screen.	

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Technical Specification for WIRING & SENSORS			
S.NO.	ITEM	Technical Specifications	Compliance Yes / No
1.	Multi Sensor Detector	1. Capable of Heat & Smoke - multi criteria sensor	
		2. low power consumption	
		3. LED detector status indicator	
		4. Programmable sensitivity	
		5. CERTIFICATIONS – UL/ LPCB/FM (As per IS 11360)	
2.	Optical Smoke Detector	1. Wide operating voltage 8 to 30VDC	
		2. Low power consumption Light Scattering or obscuration	
		3. LED detector status indicator. LED flashes in normal, illuminates in alarm & quite in fault	
		4. Apollo 65 and its equivalent other makes as listed below.	
		5. CERTIFICATIONS - UL /LPCB/FM (As per IS 11360)	
3	Heat Detector	1. Wide operating voltage 8 to 30VDC	
		2. Rate of Rise cum fixed temperature type.	
		3. Backward compatible with Series 100 Detector range of bases	
		4. LED detector status indicator	
		5. Programmable sensitivity	
		6. Range of detectors bases available	
		5. CERTIFICATIONS - UL / LPCB (As per IS 11360)	
4	Manual Call point	1. Anti-Tamper facility.	
		2. Resettable type Manual Call Point	
		3. Enhanced aesthetics with front cover facility	
		4. Fully approved to the latest standards.	
		5. CERTIFICATIONS - UL / LPCB	

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S.NO.	ITEM	Technical Specifications	Compliance Yes / No
5	Response Indicator	1. Fabricated from either spun aluminum or molded PVC or MS 16 SWG	
		2. LED INDICATION	
		3. As per IS 2189-2008 or equivalent as per prevalent trade and practice, acceptable to the Bank.	
6	Electronic Hooter	1. High sound output, low current consumption.	
		2. Range 500 to 1000 Hz. Sound level between 75 dB - 120 dB.	
		3. Min. 6 Watt (Dual tone) of Min 65 db output	
		4. Low profile, Surface, and Waterproof mounting options.	
		5. Fabricated from either spun aluminum or molded PVC.	
		6. CERTIFICATIONS - UL / LPCB/ ERTL/ BIS	
7	Battery	1. 2X 12V 7Ah Rechargeable battery	
		2. Eco-Friendly	
		3. Ready-to-use, Low-self discharge, Maintenance Free	
8	ARMOURED CABLES	1. 2 core 1.5 sq mm armored cable	
		2. Armored & PVC Sheathed Cables Conforming to IS: 1554 (Part -I) 1976 or latest.	
		3. Fire Retardant Low Smoke	
		4. MAKE: Finolex/ Plaza/ Polycab/ Rr Cable/Havells Or Eq.	
9	CONDUIT	1. FOR MS CONDUIT PIPE - SIZE 25MM (IS-9537)	
		2. PVC PIPE (ISI MARK) - SIZE 25 MM	

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BEAM DETECTOR:		
ITEM	Technical Specifications	Compliance Yes / No
a) Operating Range	5 to 120 m	
b) Operating Voltage Range	12 to 36V DC \pm 10%	
c) Operating Controller Current (with 1 or 2 Receivers)	14mA (constant)	
d) Operating Transmitter Current	8mA (per Transmitter)	
e) Power Down Reset Time	>20 Seconds	
f) Fire and Fault Relay Contracts	VFCO 2A @ 30 Volts DC resistive	
g) Operating Temp. (non-condensing): EN54	-10°C to 55°C	
h) Optical Wavelength	850nm	
i) Led Indicators: Control Unit	Red=Fire Amber=Fault Green=System OK	
j) Receiver	Red=Fire Alignment LEDs for single persons alignment	
k) IP Rating	IP54	
l) Relative Humidity (non-condensing)	93%	
m) Housing Material (Transmitter /Receiver /Controller)	UL94 V2 PC	

Certified that:

- a) We have understood the technical specifications thoroughly and are acceptable to us.
- b) If the work order in whole or part is placed with us, we would be able to supply the above mentioned equipment to the office of State Bank of India, AO Berhampur.
- c) Our company/firm already has an office in. Region with adequate infrastructure and technical manpower, which will remain functional till the end of warranty and AMC period.
- d) We understand that the specifications being offered by us as above are applicable to throughout the Circle Bhubaneswar.

Signature with Seal, PLACE:/DATE:

A. REQUIREMENTS FOR DETECTION ZONES THAT CONTAIN NON-ADDRESSABLE AUTOMATIC DETECTION SYSTEM ARE GIVEN BELOW:

- a) Automatic fire detection and alarm system consists of fire detectors and manual call points connected by appropriate cables to sector/zonal panels which in term are connected to control and indicating equipment (C and I). The equipment and cables of automatic fire detection and alarm system should be independent of any other system or cables and should not be shared with any other system.
- b) If the requirement of detectors in any area is less than 20, division into zones/sectors may not be necessary. Similarly, sectorization may not be necessary if the number of zones is not very large and in case of bigger premises, the premises may be divided into wings and each wing may have sectors/zones.
- c) Size of the conventional panels is normally referred by number of zones. Each zone can be connected with the conventional detectors not exceeding 20.
- d) The floor area of a single zone shall not exceed 2000 m².
- e) If the total area of a building is less than 300 m², a zone can cover more than one floor.
- f) If the total area of a building is more than 300 m², each zone shall be restricted to a single floor.
- g) The search distance, that is, the distance that has to be travelled by anyone responding to a fire alarm signal after entry to the zone in order for the location of the fire to be determined visually, shall not exceed 30 m.
- h) Automatic fire detectors within any enclosed stairwell lift well or other enclosed shaft-like structures shall be considered as a separate zone.
- i) If manual call points are located on the landings of an enclosed staircase, such points at each level shall be incorporated within the zone that serves the adjacent accommodation on that level.
- j) The detectors and manual call points within sectors / zones shall be wired to the control and indicating equipment.
- k) The entire electrical installation pertaining to the entire fire alarm system as described above shall be independent of other systems.
- l) When a signal of fire is given, it is necessary that there shall be no confusion about the zone from which it is received.
- m) In larger premises, the fire alarm system shall be so designed and arranged that it is fully compatible with the emergency procedures and provides at some central or convenient point, or points, an indication of the zone from which an alarm has originated.
- n) If the requirement of detectors or call points is less than 20 in any area, division of the area into zones is not necessary. Similarly, sectorization is not necessary if the number of zones is not very large.

- o) The zoning arrangement for systems in multiple occupations shall take into account the fact that all the premises may not be occupied at the same time. No zone shall include areas is more than one occupancy.
- p) Remote indicator lamps outside doors of rooms, cabins, etc., within a zone may be useful, if doors are likely to be locked.

B. THE FOLLOWING GUIDELINES TO BE FOLLOWED FOR THE INSTALLATION OF AUTOMATIC FIRE DETECTION & ALARM SYSTEM:

- a) The **entire area of the premises including record/stationery room & onsite ATM/E-Corner / CDM enclosure should be covered** with the detectors as per its requirement.
- b) The **equipment's and cables of Automatic Fire Detection & Alarm system (AFD&AS) should be independent of any other system** or cables and should not be shared with any other system.
- c) The electric **connection shall be provided to the system before the main switch through MCB and UPS.**
- d) The **control panel of the system should be installed near the entry/exit** of the Branch / office. The control panel may be fixed on the wall at the height of 1.2 meter, it should be easily approachable, and a key of the control panel may also be tagged with panel.
- e) If the detectors are providing under/over the false ceiling, the **armored cable / wire should be clipped / hooked with the roof. The armored cable / wire should not be laid out over the false ceiling at any cost.**
- f) **Circuits for the detectors and the manual call points (MCP) shall be different. MCP shall be fixed at a height of 1.4 mete above the floor level,** at easily accessible, well illuminated, and conspicuous positions, which are free of obstructions. It shall be located preferably near entry /exit / staircases.
- g) At the time of installation and prior to commissioning, **every detector should be allotted an identification number** (permanent marker) proceeded by alphabetic initials. For example, Z1/SDI/8 means zone -1, Ionization detector, 8th detector or Z2/SDO/5 means zone-2, optical detector, 5th detector or Z3/DHT/4 means zone- 3, heat detector and 4th detector.
- h) Under the flat ceilings and ceiling height up 4/5 meter, the **spacing between the detectors should not be more than 5 to 7 meter** in a protected area.
- i) Detectors shall not mount within **50cm of any walls, partitions, or obstructions.**
- j) Detectors shall not be mounted within **01meter of any air inlet or a forced ventilation** system.
- k) Detectors should always be mounted on the ceiling only and shall be placed on the protected side of the premises on the ceiling **1.5 meter from any door, window, or any opening** in the wall partitions.
- l) Detector sitting shall be such that a **clear space of 50cm is maintained below** each detector.

- m) Auto dialer should be **programmed with minimum 4/5 mobile numbers among the branch functionary including branch manager and must be armed 24x7hrs** with the fire alarm panel. The power supply of Auto dialer shall be given from fire control panel only.
- n) After installation of the system, a **demonstration regarding mode of operation of the system should be conducted in the branch / office before the branch functionary**. The function of automatic fire detection & alarm system along with auto dialer should be known to the users and the nearby fire station mobile number/phone number may also be connected with system. The fire station should also be informed regarding the function of captioned system in case of any emergency.

C. TERMS AND CONDITIONS FOR NEW INSTALLATION

1. You shall, under no circumstances, be allowed any enhancement of rates for **12-Months with effect from ----- to -----**. The rates accepted are all inclusive, final, rates and no extra or additional charges other than the ones quoted in the respective tenders shall be allowed. It is also made clear that you completely indemnify the Bank against such dues and / or any claims made by any statutory authority subsequently, and to settle all such claims shall remain your responsibility.
2. **Warranty / Guarantee** shall be a comprehensive one, of free replacement of any failed components in the system, including insulator or conductor failure in the cables. Except in cases of misuse, relocation, accidents or sabotage and replacement of batteries (**beyond their warranty**) for the battery back-up. *The warranty shall also entail free, on-site, preventive maintenance of the system* at quarterly intervals as per maintenance schedule given separately. There shall be no let or relief on this account. A proper record of all such maintenance work duly authenticated by the Branch shall be kept by you and a copy of the same shall be submitted to the Fire Officer for his record.
3. The system should have an inherent likability to an auto-dialer system and a power shut down switch through MCB.
4. The batteries shall be covered by a separate warranty, which in no case shall be less than the one issued by the concerned manufacturer. **Notwithstanding any-other provision the replacement of Batteries after expiry of their own warranty shall be paid for by the Bank.**
5. This work order pertains to all aspects of Supply, Installation, on-site Testing and Commissioning of the whole system and includes the cost of all the accessories required.
6. The system should be installed in conformity with IS: 2189-2008 and various codes of practices listed therein.
7. All cables/wires, detectors should be properly anchored. The wiring for the system should be so spaced as to not cause any electrical interference in the data cables, this aspect shall be tested and confirmed by the contractor during the progress of the work. Whenever the data cables have to be crossed as far as possible the pattern of the other electrical wiring shall be followed.
8. The battery back-up pack should be powered by long life sealed, maintenance free batteries as specified above, which are chargeable and are constantly fed with charging current through the panel.

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9. The panel must be weather, vermin and water- proof and conform to the specifications laid down by IS: 2189-2008. The relevant test certificate must be enclosed.
10. *A detailed schematic diagram of the whole system and cabling / wiring shall have to be handed over to the branch for its record.*
11. The cabling / wiring should be tagged with color coded, and which shall remain uniform throughout the Branch for the ease of subsequent identification and maintenance work, the marking shall be a band of fire red color paint on the cable at one meter spacing, it shall also be an aid to measuring the length of cable used.
12. This deposit shall be held in the form of Demand Draft (DD)/BG for the like amount, for the period of warranty plus AMC of 03 years minimum from the date of commissioning of the system, at the P&E Deptt, at LHO, Bhubaneswar. The amount shall stand released to the contractor at the end of the said term, if no bar is placed on such release, in writing, by the monitoring authority of the contract **on the grounds of proven deficiencies, inability or unwillingness in fulfilling the contractual obligations. In case of any serious deficiency by the contractor in fulfilling the contractual obligations, the Bank shall have the right to forfeit the said deposit either fully or partly, as it deems reasonable.**
13. During the currency of the **warranty and annual maintenance contract, any number of fault complaints shall have to be attended-to, free of charge. It is to be noted well that any such complaint must be attended within the timeframe laid down i.e., within 24 hrs. Failure on this score may invite penal action.**
14. The initial maintenance during the warranty period of the system as well as the battery (which is covered by its separate warranty) will be free of charge and shall include free replacement of any / all failed components / spares, with regular quarterly visits to carry out maintenance of the system, as per the enclosed schedule and scope of work.
15. You shall have to ensure that the system does not remain non-functional for more than 24 working hours from the time of reporting of fault in urban Area and 48 working hrs. in non-urban area. Deviations on this score shall invite penal actions / deduction as listed.
16. The Branch shall extend all co-operations to facilitate the smooth execution of this contract. Any work which is not in the scope of this contract i.e., work required for concealing the cables etc. if deemed necessary by the Branch, may be arranged by the Branch at its own cost. Any difficulty faced by the contractor in execution of this contract shall be brought to the notice of the Fire Officer without any delay.
17. The PVC insulated armored cable should conform to I.S.:1554-1976 Part-I.
18. A sample of all the components to be used should be provided by the contractor to the P&E Deptt. LHO, Bhubaneswar as well as kept at the sight for comparison/verification.
19. The Bank shall be at liberty to change the method and specification of the work within the limits of the rates quoted.
20. In partial modification under the head relevant clause of EOI Settlement of Dispute, the court of jurisdiction will be Bhubaneswar.
21. You shall have to co-ordinate and co-operate with the other people who are working at the site.

22. You shall make necessary arrangements to acquire insurance cover against fire, damage, accidents, injury to workman etc. The acceptance of this work-order by the contractor shall automatically indemnify the Bank against any claim pertaining to or arising out of the said work.
23. In case, the approved series detectors are not available, detectors of comparable quality with UL/BS/CE/FM certification should be provided at a cost which shall be negotiated at that point of time.
24. The drawings, survey reports and other documents created for this project by the vendors shall become Bank's property on submission to the Bank and the vendor shall no right or claim on them save for the purpose of reference for the project work.

25. Initial Installation Inspection Tests

- a) After installation, a visual inspection of all the detectors should be made to make sure that they are properly sited. Each detector should be inspected to ensure that it is properly mounted and connected.
- b) Restorable heat detectors and restorable elements of combination detectors should be tested by a heat source, such as a hair dryer, or a shielded heat lamp until it responds, making sure that the sensing element is not damaged. After each heat test, the detector should be reset. Precautions should be taken to avoid damage of the non-restorable fixed temperature element of a combination rate of rise/fixed temperature detector.
- c) Non-resettable fixed temperature heat detectors which are not to be heat-tested should be tested mechanically or electrically for fire alarm function.
- d) Heat detectors with replaceable fusible alloy element should be tested first by removing the element to see whether contact operate properly and then reinserting them in proper position.
- e) In periodic testing, heat detectors should be visually examined for damage or other conditions (such as heavy coats of paints, etc) likely to interfere with the correct operation.
- f) Each smoke detector should be tested to initiate an alarm at its installed location with smoke or other approved aerosol which demonstrates that the smoke can enter the chamber and initiate an alarm.
- g) In order, to ensure that each smoke detector is within its sensitivity range, it should be tested using either:
- a) A calibrated test method, or
 - b) A manufacturer's/supplier's approved calibrated sensitivity test instrument, or approved control equipment arranged for the purpose, or other approved calibrated sensitivity test method.
- h) Detectors found to have sensitivity outside the approved range should be replaced.

*NOTE - Detector sensitivity **cannot be tested** or measured using any spray/smoke producing device that administers an unmeasured concentration of aerosols / smoke into the detector.*

INSTALLATION CERTIFICATE

1. It is certified that the Automatic Fire Detection & Alarm system (AFD&AS) installed inBranch (Code No.....), under Region....., Administrative Office
2. The system is installed as per State Bank of India, Local Head Office, tendering terms & conditions. All the items of the system are as per invoice No.dated have been installed in the branch and physically verified by the Bank Official / Branch Manager and working satisfactorily.
3. The control panel of the AFD&AS is directly connected main electrical supply through MCB; auto dialer is fitted with the working SIM, and important 05 telephone numbers are programmed.
4. **All zones area of coverage marked, and every detector allotted an identification number** (permanent marker) proceeded by alphabetic initials. For example, Z1/SDI/8 means zone -1, Ionization detector, 8th detector or Z2/SDO/5 means zone-2, optical detector, 5th detector or Z3/DHT/4 means zone- 3, heat detector and 4th detector.
5. *It is also certified that the power supply to the AFD&AS has been connected through the branch UPS system for secondary power back up.*
6. Working and mode of operation of the AFD&AS has been explained to the following staff members by Sri of M/S., including the Branch Manager, Accountant, System Room in charge, Cash Officer, Guard (If posted) etc.

S. NO.	Name	Designation	Signatures
1.		BM	
2.			

Signature

(NAME.....)

M/S.....

Countersigned by
Branch Manager (With Seal)

D. TERMS & CONDITIONS FOR COMPREHENSIVE MAINTENANCE DURING DEFECT LIABILITY PERIOD, MAINTENANCE SCHEDULE AND SCOPE OF WORK FOR AUTOMATIC FIRE DETECTION & ALARM SYSTEM'S (AFD&AS):

1. The vendor will have the maintenance bills endorsed by the respective Branch Head along with visit reports and submit to the Fire Officer for their verification and scrutiny. The bills of all the branches will be centrally paid by the respective Regional Office.

2. SCOPE OF WORK:

- a) Checking and testing the general operating state of panel(s) in normal and during power supply failure and removal of any defect if found.
- b) Checking and testing the operational, readiness, during mains supply/failure and testing of battery for charged condition.
- c) Performance checks of external hooters, visual alarm (s) of panel(s), manual call point's station, and response indicator(s).
- d) Cleaning and testing of each and every detector at all floors. Cleaning and testing of the detectors should be done so that the detectors should be cleaned **once in every quarter**. The test should be carried out by means of giving minimum smoke to the smoke detectors. For heat detectors minimum temperature should be applied.
- e) Servicing and testing of manual call points for each Zone.
- f) Performance checks of all Smoke/Heat detectors.
- g) Performance check of open & short circuit conditions resulting in a faulty alarm indicating in the panel.
- h) Checking / testing of main control panel, and all the hooters along with testing of all the repeat functions of fire signal and fault signal on various floors of the building and ensuring the same to be in proper working condition.
- i) Ensuring that the required power supply (AC/DC) always exists in the system.
- j) Wherever there is confined space in the location of the system (viz. MCP, LCP'S & Junction boxes) these areas shall be kept free from all foreign materials.
- k) While opening the detector from the base, the signal "open" should be shown simultaneously in Local Control Panel & Main Control Panel.
- l) If there is any short circuit in detector line, the signal should be shown simultaneously in Local Control Panel & main control panel. If any defects are noticed during the periodical maintenance service, these will be rectified immediately and will also be brought to the notice of the Bank for rectification.
- m) Checking up all the wirings.
- n) Lamp(s) testing to be carried out of all panel(s).
- o) Logbook/Security Register should be maintained and the date & working of the system will be recorded. Any incident of fire or fault shall be recorded by our personnel and we shall fill up the remarks column after job has been attended by the vendor.

Construction of G+2 storied building for AO & RBO at Ambapua, Berhampur, Odisha.

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This will ensure that over a period of years, complete feedback is available. These entries will be countersigned by the vendor or/and by the department.

- p) Any defects found while carrying out maintenance/testing of the system should be immediately brought to the notice of the concerned Branch Manager or person deputed for this purpose. The vendor will ensure that it replaces defective/damaged part (s) only after obtaining concurrence from the Branch Manager. The Branch Manager will invariably keep the Controller as well as the Fire Officer informed.
- q) During the term of this agreement, the vendor shall maintain the equipment in good working condition. On receipt of information from the branches/offices the vendor shall respond *within 48 Hours*.
3. Three copies of visit report will be prepared after testing/maintenance of the system by the authorized technician of the company. The Branch Manager / Authorized officials will be stamped and countersign all reports after satisfying themselves that the system is fully functional.
- a) **One copy will be handed over to the branch,**
b) **Second copy to be retained by the vendor,**
c) **Third copy shall be sent to Fire Officer, P&E Department at Local Head Office, Bhubaneswar.**
4. The vendor or its employees undertaking the work to maintain total and complete secrecy and assure not to communicate or allow to be communicated to any person or divulge in any matter / information relating to the ideas, concepts, know-how, techniques, data, facts, figures, and all information what so ever concerning, relating to the bank and its affairs to which the employees have the access.
5. The repairs / servicing of the system / equipment's shall be done as per the guidelines of the respective manuals of the manufacturers.
6. The spare parts used for the repair / servicing of the whole detection system shall be of the original make of the plant & system. Any damage caused to the plant / system due to the use of spurious parts etc. shall be recovered from the Vendor if at all used as recommended by the vendor or its representatives. In case the spare parts / components / accessories are supplied for any repair / servicing of the system / equipment, they shall be got checked by the Branch Manager and after his satisfaction / approval, the spare parts should be used for repair / replacement / servicing.
7. All the works under the AMC to be attended by Qualified Technical / Engineer by the vendor.
8. All disputes arising out of or connected with this contract shall be deemed to have arisen in Bhubaneswar City only, under the jurisdiction of the courts of Bhubaneswar.
9. In case the Fire Alarm system requires major repairs, the vendor shall provide a replacement before taking the defective system for repairs. If any part of the system requires to be changed, rates applied shall be as per Bank's Approved rates.
10. AMC / SERVICING SLIP: Vendors / Firms must maintain a record in their book of records wherein schedule for AMC Visit as mentioned below and accordingly performed the work of Servicing / Maintenance within the due date and paste a service slip / tag (Bin Card inside transparent plastic cover) at the Fire Alarm Control Panel body, as sample

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given below and ensure service / maintenance slip should be with good quality of adhesive if pasted on the body.

ANNUAL MAINTENANCE CONTRACT (AMC) SLIP			
Vendor / Firm Address:			
Model/Make			
Zone		Two / Four / Six / Eight	
Auto Dialer		Available / Not Available	
Date of New Supply/Installation			
DETAILS OF VISIT UNDER AMC		Remarks	Signature
First AMC Visit Date			
Second AMC Visit Date			
Third AMC Visit Date			
Fourth AMC Visit Date			
ON CALL VISIT DETAILS			
First Visit Date			
Second Visit Date			
Third Visit Date			
ZONE MARKING	AREA COVERED		
ZONE NO-1			
ZONE NO-2			
ZONE NO-3			
ZONE NO-4			

Manual of Operation of the Control Panel for the occupants to be also pasted at there, in case of Bin-card may be available on backside.

B. GENERAL REQUIREMENTS AND MINIMUM TECHNICAL SPECIFICATIONS OF PUBLIC ADDRESS SYSTEM (PAS) FOR NEW PROPOSED BUILDING OF ADMINISTRATIVE OFFICE BERHAMPUR

1. DEFINITION OF TERMS & TERMINOLOGIES

- i.) **Bank / Purchaser** shall mean the client on whose behalf this tender is issued and his authorized representative.
- ii.) **Fire Engineers** shall mean Fire Engineer / Fire Officer appointed by Bank for the project.
- iii.) **Bidder** shall mean party who quotes against this enquiry.
- iv.) **Contractor** shall mean the successful 'BIDDER' whose bid has been accepted by the Bank and on whom Purchase/Work Order will be placed.
- v.) **PROJECT** shall mean the project specified in tender.
- vi.) **SITE** shall mean the actual place of work as detailed in specification / tender
- vii.) **Month** shall mean Calendar month.
- viii.) **Plant/Equipment and Works** shall mean respectively the goods to be supplied and services to be provided by the contractor.
- ix.) **Contract/Work Order** shall mean the order specifying works and associated specifications to be executed by "Bank and Contractor."
- x.) **Contract Period** shall mean the period during which "Bank" and "Contractor" shall execute the entire contract as agreed.
- xi.) **Guarantee Period / Defect Liability Period** shall mean period during which the plant / equipment and installations shall give same and trouble-free performance as guaranteed by contractor.
- xii.) **Fire Engineer's Instructions** shall mean instruction oral or written, drawings, direction, explanations issued by Consultant / Fire Engineer / Architects on behalf of the Bank from time to time during period of contract. (All 'oral' instructions shall be authenticated by written instructions immediately.)
- xiii.) **Performance Tests** shall mean all tests to be carried out by contractor as per specifications prior to installation being taken over by Bank under guarantee.
- xiv.) **Commissioning** shall mean integrated activity of carrying out performance tests, initial and trial operations of system.
- xv.) **Drawings** shall mean all drawings furnished by Fire Engineer / Bank for basis of proposal or for carrying out works, from time to time; all drawing submitted by vendor provided such drawings are acceptable to Fire Engineer/Bank.
- xvi.) **UR** means quote unit rate.
- xvii.) **Circulation Area** - Area (including a stairway) used mainly as a means of access between a room and an exit from the building or compartment.
- xviii.) **Floor** - Area contained on every floor of the building.
- xix.) **Applicant** - means "Vendor" willing to apply Expression of Interest (EOI).
- xx.) **SITC**- means Selection-Installation-Testing-Commissioning of the said system.
- xxi.) **AMC**- means Annual Maintenance Contract of the said system.

1.1 AMPLIFYING SYSTEM: That part of the installation which comprises of preamplifiers, mixers, equalizers, and power amplifier.

1.2 PRE-AMPLIFIER: The part of the amplifying system, & essentially a voltage amplifier, suitable for operation with input source such as from microphone, tape player, etc. The output from such an amplifier is connected to a mixer or another amplifier operating at a higher input level.

1.3 POWER AMPLIFIER: The part of the amplifying system intended to amplify the signal derived from pre-amplifier, mixer and equalizer to a level capable of driving load, that is, loudspeaker.

1.4 MIXER: A mixer is a device used to mix two or more input signals from microphones as well as from input sources like cassette tape players, electronic Morgan, etc. The mixer also has inbuilt pre-amplifier so that mixer can be connected to another amplifier operating at higher input level.

1.5 MIXER CONSOLES: When large number of microphone inputs are required, these cannot be handled by mixing stage provided in the amplifier. For such applications audio mixing consoles should be provided. Normally a) audio mixing consoles are for 8, 12 and 18 inputs. Audio mixing consoles should provide following minimum facilities: b) 3 Band equalizers for 'Bass', 'Mid' and 'Treble' cut and booster controls for each channel. Sensitivity control for each channel to adjust the input, thus preventing overloading of each channel. c) Overload indicator LED for each channel. d) Facility for program. e) Facility for stage monitoring (fold back).

1.6 EQUALIZER: An equalizer is a circuit to perform equalization which is a technique employed in transmitting, recording or amplifying program material by which selected frequencies are compensated to obtain a desired overall frequency response. The term is also applied to the matching of sound systems to room acoustics using filter.

1.7 LOUDSPEAKER CLUSTER: A combination of direct radiator type LF driver and HF driver (direct radiator or compression type) with frequency divider network. These are generally used for high quality installation.

1.8 CIRCUIT PLANS AND OPERATING INSTRUCTIONS: Complete block and schematic diagrams for the equipment installed should be prepared and made available along with the circuit diagrams for each of the equipment, at the place where the central equipment is located. The layout and sizes of the wiring and cabling should also be indicated. The loudspeaker load connected to each output line and the 'particulars of the line transformers should be indicated. The operating instructions should also be made available which, among others, should also indicate the rating of the fuses.

1.9 POWER SUPPLY: Local electricity authorities should be contacted for providing the electric power supply mains near the proposed location of the central equipment. The installation should be normally operated from 240 volts, single phase, 50 Hz AC mains supply and preferably capable of operation from 12- 14 V storage battery.

1.10 INSTALLATION OF LOUDSPEAKERS, MICROPHONES AND WIRING: These items should be installed at appropriate time after other arrangements like decoration, seating, etc, are completed. This will minimize the risk of damage or loss. Necessary supports and structures for the loudspeakers may be erected after the information mentioned above has been obtained. The wiring for the loudspeakers and microphones may be laid just sufficiently in advance of the appropriate time for completing the installation so that preliminary tests that may be necessary to decide on the type and position of loudspeaker could be made after an acoustic survey. Normally the installations comprise the following principal items of equipment:

- i.) Source of Input Signals - One or more microphones, cassette player or any other sound recording and reproducing equipment.
- ii.) Amplifying Equipment System-One or more amplifiers; and
- iii.) Loudspeakers.

1.11 AMPLIFYING SYSTEM/EQUIPMENT: The rated output power of the amplifying equipment should be sufficient to work the loudspeaker load connected to the output line.

The amplifier which may have sensitivity sufficient to operate only from the highest input voltage likely to be met with has to be supplemented with pre-amplifier for use with sources of lower voltage. Either integrated amplifier having facility for accepting input signal from various sources mentioned in above or a separate mixer and booster combination can be used. The output transformers of the amplifiers should have impedance tapings of 4, 8 and 16 ohms to enable operation with loudspeakers of these standard impedances. When specified, the transformer should be provided with 70 to 100 volts constant voltage tapping. High power amplifiers should be capable of withstanding short-term overload, etc. Also incorporate safeguards against excessive voltage or current rise in case of open circuit conditions or short. Circuit conditions respectively, in the output circuit. The frequency response of the amplifiers used for high quality reproduction should be within plus-minus 3 dB from 75 to 10 000 Hz. For general purpose, the response should -be within +3 dB from 100 to 7 500 Hz. The amplifying system may be provided with tone controls. For high quality reproduction, there should be provision for both bass and treble controls.

1.12 LOUDSPEAKER-LINE-MATCHING TRANSFORMERS: In certain indoor installations, a large number of loudspeakers of different type connected to the output of the amplifying system through loudspeaker line-matching transformers may be required. These transformers should have at least the minimum frequency characteristics required of the public address system. The power handling capacity of the transformer used with a loudspeaker should not be less than the power to be absorbed by the speaker. These should have several taps on primary and/or secondary to give multiple turns ratio. These transformers enable the loudspeakers, through the selection of proper turns ratio, to take an input of the determined value of audio from the amplifier, care being taken at the same time not to overload the loudspeaker. Where the constant voltage output line from the amplifier is used, the total wattage of loudspeaker load should not exceed the rated power of the amplifier.

xxii.)

1.13 PRODUCT LITERATURE:

Applicant shall furnish Product Literature as a part of bid documents establishing the applicant's ability to supply the material as per Bank's approved specifications. The applicant shall also submit documentary evidence in the form of literature, drawing, & data on the product offered. Evaluation will be done on the basis of the documents submitted along with the bid without any further reference to the applicant.

1.2 TECHNICAL SPECIFICATIONS OF PUBLIC ADDRESS SYSTEM (INDOOR USE):

- a) The installation and use of amplifying systems for public and private functions have been greatly on the increase in the past few years. While in some instances such installations are done by professional engineers, more often than not, installation by non-professional people show inadequate attention to essential details and under such circumstances, even the best pieces of Public Address equipment do not give their optimum performance. This code has been prepared with a view to act, as a guide for indoor installations (permanent as well as temporary) taking into consideration the practical limitations and requirements which are normally met with
- b) The installation of sound distribution system in closed auditoria and other enclosures calls for careful choice of equipment, positioning of the various units of the system and many other precautions to be taken in order to obtain the optimum performance from such a system. As is well known, the acoustics of the hall or enclosure itself plays a significant role in the ultimate effect of the installation. These aspects are tak-

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en into consideration while preparing this code. However, it is also recommended that for large scale installations, advice of a competent and qualified sound engineer should be sought. Such an engineer should be able to assist in preparing an initial statement of the exact requirements of the equipment to meet a particular situation and later on confirm that the installation offered is likely to meet the needs of such a situation. This code covers the preliminary steps to be taken, design consideration, choice of equipment and installation practices including installations of column loud-speakers.

- c) Since most of the public address installations work from electric mains supply, the need for safety precautions is obvious. Consideration has, therefore, been given in this code to the best practices of earthing and other steps to prevent electrical shocks from accidental contact. Besides, a nomogram for easy determination of audio power required in the specified enclosure has also been included. Unless specified otherwise, the requirements or characteristics of amplifier, specified in this standard are based on the methods of measurements specified in IS 9302 (Part 2): 1979 'Characteristics and methods of measurements for sound system equipment: Part 2 Amplifiers'. Installation of outdoor public address systems, though having many features in common with indoor systems, varies from the latter mainly on the question of effect of the acoustics of the hall or enclosure itself, and to cover it, a separate code of ~practice, namely, IS 1882: 1961 'Code of practice for outdoor installation of public address systems', has been prepared. Wherever a reference to any Indian Standard appears in this code, it shall be taken as a reference to the latest version of the standard.
- d) All quantities and dimensions appearing in this standard have been given in metric system. This code is intended chiefly to recommend the requirements of design and quality of equipment and the methods of installation of indoor public address amplifying and sound distribution systems, and it does not include all the necessary provisions of a contract. In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 1960 'Rules for rounding off numerical values (revised)'. Generally, works to be carried out as per BIS standard and applicable and National Building Code of India (NBC). Items are required to be use in Public Address System is as under, which may be change as per the future requirement of the Bank:

<u>S. NO.</u>	<u>ITEMS</u>	<u>SPECIFICATION (APPROVED BY ERTL/CE OR EQUIVALENT AND AS PER LATEST BIS:1881</u>	<u>MAKE/BRAND</u>
i.	Advanced Power Mixing Amplifier 120/240 Watt	120/240 Watt advanced power mixing amplifier with inbuilt blue tooth for audio streaming, supports audio play back form USB pen drive, 4 mike / line inputs plus music source input, 2 tone chime generator for channel 1, Inrush current 36 A, Freq response 80 to 18000 Hz, Distortion <1%, Bass & treble control +- 8Db, Front panel has Power-ON switch with LED indication • LCD display, USB port, UBS/BT key-	Bosch/Bose Sonodyne / JBL/ or equivalent

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		board functions with IR remote sensor • Four volume knobs for microphone inputs • Volume knob for AUX input • Knob for treble level • Knob for bass level • Master volume knob • LED VU meter for master output (LEDs for -18, -12, -6,-3,0 dB) Headphone socket and surge voltage protection.	
ii	Booster Power Amplifier	Bosch 240/480-WATT booster power amplifier having multiple outputs 70 /100 Volts and 8/4 Ohms. Temperature controlled forced front to back ventilation directly stackable, mains / battery backup ,2U 19" case, input voltage 230 Volts AC Frequency 60 to 18000 Hz, S/N Ratio > 85dB . Power consumption 760 VA, gain 40 dB. Impedance > 20 K Ohms with surge voltage protection.	Bosch/Bose Sonodyne / JBL or equivalent
iii.	Gooseneck microphone condenser type / wireless mic	Gooseneck microphone condenser type unidirectional with flexible stem / wireless mic, phantom powered, voltage range 12-48 Volts, sensitivity 2.5 mV/pascal, Freq 100 to 16000 Hz, output impedance < 200 Ohms. Mike to be fitted on some good quality desk stand with ON /OFF facility with announcement alert tune facility.	Bosch/Bose Sonodyne / JBL or equivalent
iv	Recessed mount (Ceiling), Speakers 4/6/8 watts with selectable 8 Ohms, 70 & 100 Volts taps	Recessed mount (Ceiling), 4/6/8 Watt with built in 100 Volt Line Matching transformers complete with dual cone loudspeaker and frame. A circular metal grille is an integrated part of the front. Ceiling speakers are supplied with a 100 V matching transformer with taps on the primary winding for full power, half-power, quarter-power, and eighth-power radiation. The unit has integral spring clamps on the rear which can be used to easily fix the loudspeaker into the false ceiling. Rated power SPL 108 dB, Effective Freq 150 to 15000 Hz, Rated impedance 1667 Ohms. Max power 8 Watt & rated voltage 70 / 100 Volts	Bosch/Bose Sonodyne / JBL or equivalent

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v	Wall mounted Speakers 4/6/8 watts with selectable 8 Ohms, 70 & 100 Volts taps	Wall mounted 4/6/8 Watt with built in 100 Volt Line Matching transformers complete with dual cone loudspeaker and frame. A circular metal grille is an integrated part of the front. Ceiling speakers are supplied with a 100 V matching transformer with taps on the primary winding for full power, Half-power, quarter-power, and eighth-power radiation. The unit has integral spring clamps on the rear which can be used to easily fix the loudspeaker into the false ceiling. Rated power SPL 108 dB, Effective Freq 150 to 15000 Hz, Rated impedance 1667 Ohms. Max power 8 Watt & rated voltage 70 / 100 Volts	Bosch /Bose Sonodyne/ JBL or equivalent
vi	Steel Rack for Amplifiers complete with pre-wired and control accessible from the front	-Convenient and quick movable on wheel -Cable entry from the rear side -Turning Angle of front and Rear Door over 180 ⁰ -Material SPC quality cold rolled sheet -Powder coating frame and door key lock -Compatible with 19" international standard. -Maximum Loading capacity 60-80 Kg -Welded frame with reliable structure -Front toughened Glass door with good quality of body finishing	Leading Brand fulfill the specification
vii	Wiring Cable	Wiring: 1.5 sq mm 2 core PVC insulated preferably FRLS with low impedance	Finolex / Polycab or equivalent
viii	Digital Selector & Recorder unit	Facility to Select the announcement at particular zone either all zones or compatible with any amplifier/booster amplifier, Emergency pre-recorded evacuation message (Prerecorded good quality of voice for minimum 10 mints), Voice Recording facility to play recording voice as and when required for min 10 mints recording facility for single voice, digital display of play back sound/voice etc.	Soft-Chip, Ahuja, or equivalent leading brand
ix	PVC Conduit	PVC Conduit 1"-1.5"	Leading / ISI Brand

2.0 SCOPE OF WORK

2.1 FOR NEW SUPPLY, INSTALLATION, TESTING, COMMISSIONING OF PUBLIC ADDRESS SYSTEM (INDOOR USE) COVERS THE FOLLOWING:

- a) Supply, installation, testing, commissioning, handing over to owner the complete **PUBLIC ADDRESS SYSTEM (INDOOR USE)** as per IS-18881-1998 (CODE OF PRACTICE FOR INDOOR INSTALLATION OF PUBLIC ADDRESS SYSTEMS) and as per latest edition of National building code/BIS.
- b) Transportation to site, unloading and intermediate storage at site, complete work of erection including final grouting, testing, and commissioning and putting into operation of entire fire protection system.
- c) Supply, installation, testing & commissioning of Public Address System as per schedule of work & specification.
- d) Supply of all consumable materials required to complete erection of the system.
- e) Supply, installation, testing, commissioning of complete cabling for PA system including earthing cable etc.
- f) Supply of various drawings, data, test reports, test certificates, operation, and Maintenance manual as necessary.
- g) The cost incurred for covering complete scope of work specified above shall be included in various items of schedule of works. No extra payment shall be given for covering anything of the above scope of works.

2.2 SHOP / EXECUTION DRAWINGS:

- a) Before starting the work, the contractor shall submit to the Fire Officer for his approval in the prescribed manner, the shop / execution drawings for the entire Installation.
- b) The BANK reserves the right to alter or modify these drawings if they are found to be insufficient or not complying with the established technical standards or if they do not offer the most satisfactory performance or accessibility for maintenance. Contractor shall supply in six (6) sets of all approved shop drawings for execution. Shop drawings shall be submitted under the following conditions: -
 - i) Large scale drawings showing fixing detail of fixtures, equipment, and showing co-ordination with other services. Showing any change in layout in the drawings.
 - ii) Equipment layout and wiring diagram along with Manufacturer's or Contractor's fabrication drawings for any materials or equipment supplied by him.
 - iii) The contractor shall submit four copies of catalogues, manufacturer's drawings, equipment characteristics data or performance chart as required by the Engineer-in-Charge.

2.3 INSTRUCTION/MAINTENANCE MANUAL:

The Contractor shall prepare and produce instruction, operation, and maintenance manuals in English for the use, operation and the maintenance of the supplied equipment and installations and submit to the Bank in (2) copies at the time of handing over. The manual shall generally consist of the following:

- i.) Description of the project.
- ii.) Operating instructions.
- iii.) Maintenance instructions including procedures for preventive maintenance.
- iv.) Manufacturer's catalog.
- v.) Spare parts list.
- vi.) Trouble shooting charts.
- vii.) Drawings.
- viii.) Type and routine test certificates of major items.
- ix.) One (1) set of reproducible 'as built' firefighting system drawings.

2.4 COMPLETION CERTIFICATE: On completion of the Fire Fighting installation a certificate shall be furnished by the contractor countersigned by the licensed supervisor, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local supply authority.

2.5 GUARANTEE: At the close of the work and before issuance of final certificate of completion by the SBI Fire Officer/Consultants, the contractor shall furnish written guarantee indemnifying the owner against defective materials and workmanship for a period of **one Year**. The contractor shall hold himself fully responsible for reinstallation or replacement, free of cost to owner, the following:

- i.) Any defective work or material supplied by the Contractor.
- ii.) Any material or equipment supplied by the owner which is damaged or destroyed as a result of defective workmanship by the contractor.
- iii.) Any material or equipment damaged or destroyed as a result of defective Workmanship by the contractor.

2.6 MAINTENANCE DURING WARRANTY PERIOD:

- i.) During the currency of the warranty and annual maintenance contract, any number of fault complaints shall have to be attended-to, free of charge. It is to be noted well that any such complaint has to be attended within the timeframe laid down i.e., within 24 hrs. Failure on this score may invite penal action.
- ii.) The initial maintenance during the warranty period of the system as well as the battery (which is covered by its separate warranty) will be free of charge and shall include free replacement of any / all failed components / spares, **with regular quarterly visits to carry out maintenance of the system, as per the enclosed schedule** and scope of work under AMC.

2.7 DEMONSTRATION /TRAINING OF PA SYSTEM

Imperative Training / demonstration on handling of PA System is vital role for the Bank's staff posted at the Branches / Offices. Therefore, to avert any Fire Incident in its incipient stage the occupants must have the knowledge on handling /operation of the PA System available at the site. It is necessary for the Vendors / Firms /Contractors, to visit the Branches/Office for AMC / Maintenance as per schedule (whenever they due), or on any Breakdown whenever warranted. Representative of the Firm have to conduct demonstration with prior permission to the BM to conduct a small training session (10-15 minutes) during AMC / **New Installation**. The details of training /demonstration must be recorded in Security Information register and also mentioned in Service Certificate issued to the Branches / Offices.

3.0 INSTALLATION PRACTICE: All equipment should be robustly made and designed for continuous operation. Equipment should securely be installed in such a manner as to have convenient access to all sides of it. Access by unauthorized persons should be guarded against. Precautions should be taken to keep away dust from the equipment, especially if earth moving machines, concrete mixers, etc., are working in immediate vicinity of the accommodation provided. Controls All preset controls should be mounted behind cover plates and designed for adjustment only by use of a tool, such as a screwdriver. The use of manual controls should be restricted to as few as necessary.

a) All controls should be mechanically and electrically noiseless. For temporary installation or when the number of items of equipment is not large, they may be placed on a table and wired. The positioning of the equipment should be such that the lengths of the interconnecting cables are kept minimum for convenience.

b) Rack mounting for permanent installation or in case the number of items is large; it is desirable to mount them in racks of suitable dimensions. The racks may be of metal or wood

and having compartments of uniform width assembled. Each compartment shall contain one item of equipment. The height of the rack will depend on the number of items to be mounted and accommodation available, ensuring that all manual controls are within easy reach.

c) Switches should be provided for isolating any faulty section of the equipment, thereby facilitating operation, and avoiding danger to the operating personnel. The arrangements made should enable the remaining part of the equipment to be available for use. The patch cords, if used, should be tested, and neatly arranged to avoid obstruction and should be easily identifiable. Necessary safety measures should be adopted to avoid accidental contacts with high voltage points in the rack.

3.1 MICROPHONE INSTALLATION: Microphones should be, as far as possible, behind the loudspeakers in order to minimize acoustic feedback. The microphone stands may be on the floor, table, or desk type, capable of adjustment so that the height and direction of the microphone can be adjusted to suit the speaker. The microphone plugs and sockets should preferably be multi-contact type and freely interchangeable. The microphone sockets may be permanently fixed on the foot-light troughs as shown in Fig. 3 or suspended from ceiling. When suspended types of microphones are used, these should be hung and concealed from the audience. The correct distance between the microphone and source should be predetermined and arranged to be constant as far as possible. It is important to see that if the level of reverberant sound (undesired) or surrounding noise near the microphone is high, the distance between the microphone and the source of sound (desired) should be reduced. The sound source should be directed towards the microphone as otherwise the high notes which are highly directional, would not be satisfactorily picked up by the microphone and thereby the clarity of the speech sound reproduced by the public address system will be poor.

Microphone should be low impedance type which permits the use of long microphone cables without any loss of high frequencies. When more than one microphone is employed, the output from several microphones should be mixed in a mixer and the common output fed to the amplifiers. Where the amplifier itself is capable of mixing the individual microphone inputs, separate mixer is not required.

3.2 LOUDSPEAKER INSTALLATION: For high quality reproduction, directional type of loudspeakers should be used. Vertical directivity pattern of the system should be such as to feed the audience at uniform level, avoid harmful reverberant sound or echo, and avoid feedback of energy to the microphones. In the horizontal plane, the directivity should be uniform across the width of the hall.

3.3 WIRING AND CABLING: Microphone and Other Input Source Cables carry low level signal currents and are therefore susceptible to electrical interference. It is preferable to use twin core screened (copper braiding) microphone cable. The copper braiding should be sheathed with an insulating covering. The microphone cables should be isolated from power, loudspeaker, and telephone cables. Joints in the cables should be avoided as far as possible. The plugs and sockets used for microphone cables should have strong self-cleaning contacts so as to eliminate noise and they should be non-reversible and have a sufficient number of pins to connect not only the main conductors but also the cable shield. Microphone cables should be laid without sharp bends as far as possible. Inside the building they may be laid on the floor along the walls or under the carpet to avoid damage due to heavy object falling on them and cutting them. When laid in the open, they should be either buried in the ground to a depth of not less than 20 cm or laid through an iron pipe buried in the ground to a depth of 15 cm if heavy pressure is expected due to movement of personnel over the surface. They may also be laid overhead at a height not less than 3.5 m from the ground clipped securely to a bearer wire which may be galvanized iron of diameter 1.60 to

2.00 mm, the length depending on the span of suspension. Protection by conduit or capping should be provided wherever there is a risk of damage or interference with the wiring. Any wiring, that is, to be run below about 1.8 m in height along corridors or outside walls or on the floor should be protected likewise. The conduit should permit easy drawing in and out of the cables. The input and output cables of the amplifying equipment should not be run in the same conduit in which mains power supply cables are drawn.

3.4 WIRING OF THE EQUIPMENT: A schematic diagram of the equipment, switching arrangements and incoming and outgoing lines should be drawn before the equipment is assembled and wired. The main and stand by equipment (if any) is wired in accordance with the scheme. Patch cords, if used, for connecting the equipment should be carefully checked for faults before use.

3.5 POWER SUPPLIES: MAINS SUPPLY: The equipment should normally be operated from 240 volts single phase 50 Hz AC mains supply. If, however, the supply is different, for example, 110 volts AC, a transformer of the required capacity and rating may be used. A voltage regulating device will have to be provided if the regulation of the power supply is poorer than +5 percent. The supply mains should be terminated in an iron clad switch with fuses of adequate capacity to meet the estimated load and provided with indicator lamps for each phase. Auxiliary switch board with 3 pin socket outlets and switch controls should be provided for connecting the soldering iron, test gear, inspection lamps, etc.

3.6 ABSENCE OF MAINS SUPPLY: If no mains supply is available, petrol or diesel engine driven generating sets of the required capacity giving 240 volts, single phase, 50 Hz AC power supply should be used. Such a generating set should be located at sufficient distance from the rostrum preferably a large building shielding it, so that its noise at the rostrum is not higher than what is present in the vicinity.

3.7 BATTERY SUPPLY: In case of low power installations or when no mains supply is available, the amplifying system should be capable of operation directly from a strong battery. All amplifiers should preferably be capable of operating on 12 V/24 V DC car battery besides on 240 V, 50 Hz AC supply.

3.8 EARTHING: Proper earthing of the entire installation (with appropriate earthing of the individual equipment also) is essential to avoid danger from any possible shock to the users of the equipment, the operating personnel, or the audience.

3.9 QUALITY OF REPRODUCTION: The sound reproduction resulting from indoor public address systems may be classified as follows with reference to the quality of reproduction: a) 'A' category - desirable when high quality reproduction is aimed at (for example, theatre, halls, and large auditoria having good acoustical properties). b) 'B' category - Adequate for lecture and assembly halls and similar applications.

'A' category system should be governed by the following requirement:

- a) Frequency response - The frequency response of the system (excluding loudspeakers) shall be within 53 dB from 100 to 10 000 Hz.
- b) Harmonic distortion - Total harmonic distortion of the system (excluding loudspeakers) shall not exceed 5.0 percent at rated output of the amplifier.
- c) Signal-to-noise ratio - The signal-to-noise ratio under operating conditions of the amplifier system as a whole with flat operation of the tone control shall not be worse than 50 dB.

'B' Category systems should have a useful frequency range from 100 to 7 500 Hz within +/-3 dB (excluding loudspeakers). In noisy and reverberant locations this can be further limited to improve speech intelligibility.

4.0 REQUIREMENTS FOR ANNUAL MAINTENANCE CONTRACT OF PUBLIC ADDRESS SYSTEM (INDOOR USE) IN THE BRANCHES/OFFICES UNDER SBI BHUBANESWAR CIRCLE.

Annual Maintenance Contract of PA System at the various Branches / Offices under SBI LHO Bhubaneswar Circle. This would include repair and maintenance of PA system at site to ensure 24x7 operation of the system.

Details of the Parts of the PA system installed: (quantity and specifications may be edit as per requirements)

S.NO.	ITEMS PARTICULARS	QUANTITY INSTALLED
1.		
2.		
3.		
4.		
5.		
<u>...and so on....</u>		

- a) Scope of work in Annual Maintenance Contract shall include checking, cleaning, repairing, and maintenance at the site to ensure 24x7 operation of the system. The system shall be maintained on “**AS IS WHERE IS**” basis. Any modification/shifting/extension of the system shall be carried out on chargeable.
- b) During the currency of the contract, the firm will attend to any number of break-down calls without any additional charges and any break down will be repaired **within 48 hrs.** For this purpose, communication by any means e.g., **Letter, Email, SMS, Instant Messages, Mobile Phone Calls etc.** which are independently logged will be considered sufficient and the vendor shall have no right to insist on any particular form of communication. For all Electronic Forms of communications, the time of sending shall also be considered as time of receipt by the vendor unless the vendor is able to prove delayed receipt of such communication.
- c) Any part required to be replaced shall be genuine and from Original Equipment Manufacturer (OEM).

4.1 QUARTERLY AMC VISIT

- i.) Checking, testing, cleaning, and repairing/rectifying, of the system.
- ii.) Clean the amplifiers, speakers, and accessories properly.
- iii.) Switch “ON” the system and ensure all indicating lamps are glowing. If any of them are not glowing the same to be rectified.
- iv.) All the switches and push buttons should be in working condition.
- v.) The sound level LEDs should be in working condition.
- vi.) The console panel to be tested of its function i.e., isolating the floors/wings, function to be ensured.
- vii.) Each speaker of the system to be made in working condition without unwanted Noise/Sound (Humming, Motor beating, Hissing sounds etc.)
- viii.) Each amplifier and all the Amplifiers, Audio level must be equally maintained.

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- ix.) The LMT (Load matching Transformer) diaphragm and the magnet of all the speakers to be checked.
- x.) Wiring of the system to be checked and maintained.
- xi.) The amplifiers input and output terminal connection should be made with colour code wiring and kept in working/proper condition.
- xii.) The microphone and its connecting wire plug to be maintained. The sensitivity of the microphone to be set at an optimum level.
- xiii.) Whenever the microphone is switched ON/OFF, music shall be electronically muted giving electronic indication by a ting tong sound, prior to speech with ON/OFF switch.
- xiv.) Check and ensure the proper function of the rotary selector switch.
- xv.) Volume control regulator of the monitor speaker to be tested/checked.
- xvi.) The sound level indicator LED's corresponding each rack shall be activated whenever a speech or tone is fed into the system to indicate the output level.
- xvii.) The level indicator panel indicates the input level. This is directly connected to the pre-amplifier in the control desk and indicates whether the input signal is being well received or not.
- xviii.) Whenever the microphone is switched ON, a chime shall be heard through either the monitor speaker or the speakers in the selected zone.
- xix.) Selector switch button/LED's to be tested simultaneously "all call "button/LEDs too.
- xx.) Ensure proper earthing. All fuses to be tested.
- xxi.) Please ensure that the volume control settings and the sensitivity settings of all amplifiers and booster amplifiers are like what they were at the time of commissioning.
- xxii.) Main junction box to be kept free from foreign particulars.
- xxiii.) The record player system to be checked & kept in working condition.

4.2 OTHER CONDITIONS

- a) The checking and testing should be carried out by your qualified technicians/Engineers only.
- b) The Firm representative or technician shall carry an identity card in original, issued by firm's along with a copy of AMC allotment letter issued by the Bank's.
- c) The status of the system will be recorded in the register or logbook provided at control room daily which is maintained by control room staff; same should be put up to the Fire Officer for his perusal.
- d) In case of any break down (minor or major) Firm's Engineer or Technician should be deputed for rectifying the system immediately. Besides, the agreed scope of service, your service engineer or technician will be required to attend to any number of breaks down calls during the period of this contract, free of charge including the cost of material required as and when we intimate to your firm about the break down.
- e) As per instructions from our office the firm will depute its service Engineer or technician to be associated with our designated personnel to jointly arrange a mock fire drill

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to see the reactions of the security or other staff as to how they behave under emergency conditions of fire.

- f) If any recommendations or suggestions for the improvement of the system (PA system) are required to be made, then the same should be brought to the notice of Branch Head (Bank's Fire Officer in case of LHO and its establishment). If any alteration is to be required, prior permission of the Branch Head should be obtained and inventory to be made in the concerned register or logbook maintained at control room. However, in case any materials (spare parts) are required to be replaced, it should be done with the prior permission of BM.
- g) The repairs or servicing of the system or equipment's shall be carried out to the entire satisfaction of the Branch Head.
- h) The repairs or servicing of the system or equipment's shall be done as per the guidelines of the respective manuals of the manufacturers.
- i) The spare parts used for the repair or servicing of the all the systems (PA system or parts of it) shall be of the Original Make. Any damage caused to the system due to the use of spurious parts (decided by the Branch Head on confirmation from original equipment manufacturer) etc. shall be recovered from the firm if used, as recommended by him.
- j) In case spare parts or components accessories supplied and to be used for replacement or repair or servicing of the system or equipment should be brought for verification by Branch Head. After the satisfaction or approval of the Branch Head, the spare parts can be used for repairs or replacement.
- k) All disputes arising out of or in connection with this agreement shall be deemed to have arisen in Bhubaneswar and the courts at Bhubaneswar shall have jurisdiction in case of any dispute.

The firm or its employees undertaking the work shall maintain total and complete secrecy and assure not to communicate or allow to be communicated to any person or divulge in any matter or information relating to the ideas, concepts, know-how, techniques, data, facts, figures, and all information what so ever concerning, relating to the bank and its affairs to which the employees have the access and the employer shall also execute letters of fidelity and secrecy in such form as may be prescribed by the bank and the firm hereby guarantees the fidelity and secrecy on behalf of its employees.

C. GENERAL REQUIREMENTS AND MINIMUM TECHNICAL SPECIFICATIONS OF FIRE EXTINGUISHERS FOR NEW PROPOSED BUILDING OF ADMINISTRATIVE OFFICE BERHAMPUR

- i.) **Dry Chemical Powder (DCP/ABC) Type Fire Extinguishers**: It should be of **gas cartridge type** provided with **squeeze grip control valve** operating mechanism overall conforming to IS 15683 and ISI marked.
- ii.) **Carbon Dioxide Type Fire Extinguishers**: It should be of **wheel type control valve operating mechanism** over all conforming to IS 15683 and ISI Marked.
- iii.) **Water Type Fire Extinguishers**: It should be of **gas cartridge type**, provided with **squeeze grip control valve** operating mechanism overall conforming to BIS 15683 and ISI marked.
- iv.) **Clean Agent Type Fire Extinguishers**: It should be pressurized provided with **squeeze grip control valve** operating mechanism overall conforming to IS 15683 and ISI marked.

Note: All components of above fire extinguishers should satisfy the requirements of construction material, dimensions, sizes, ratings, tests criteria and all other requirements as per latest BIS 15683/2190 and it should be overall conforming to IS 15683 with ISI mark. The CE certified & with QR Code brand shall be preferred.

The following specifications required for Portable Fire Extinguisher as per IS: 15683/IS: 2190. Details are as under:

1) **DRY CHEMICAL POWDER (DCP), CARTRIDGE TYPE PORTABLE FIRE EXTINGUISHERS:**

These Extinguishers should contain Sodium Bicarbonate based dry powder as per latest BIS: 4308 and **capable of firefighting class B and C Fires**. Propellant in cartridge operated extinguishers shall be carbon dioxide gas cartridge. The method of expulsion of dry power shall be by means of pressure produced from compressed or liquefied gas from gas cartridge attached to the cap after piercing it uprightly or by piercing the squeeze grip.

a) PERFORMANCE & CONSTRUCTION REQUIREMENT:

PERFORMANCE	CAPACITY -04KG	CAPACITY -06KG
Approvals/certification	IS:15683, ISI Marked	IS:15683, ISI Marked
Fire Rating	21B or upwards	21B or upwards
Working/Operating Temperature (°C)	-30 to +55	-30 to +55
Burst Pressure	55/80 bar (min)	55/80 bar (min)
Cylinder Testing Pressure	35 bars	35 bars
Service/Working Pressure Min-Max	15 -18 bar max	15 -18 bar max
Minimum Effective Discharge Time	13-28 Seconds	08-18 Seconds
Bulk Range % Discharge	2-to-4-meter, 85%	2-to-6-meter, 85%
Propellant	Carbon Dioxide Gas, 100-120 gm	Carbon Dioxide Gas, 100-120 gm
Thickness (Approx.)	1.6 mm	1.6 mm
Height Without Base (Approx.)	385-510 mm	520-540 mm
Diameter (Approx.)	140-150 (+/-10) mm	140-150 (+/-10) mm
Gross Weight (Approx.)	7-8.5 kg	10-11.5 kg
Extinguishing Agent Charge	Sodium Bicarbonate	Sodium Bicarbonate

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	based dry powder	based dry powder
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These cartridge operated extinguishers the cartridge shall be pierced, and the pressure allowed to build for 06 second before opening the control valve.

- b) CONSTRUCTION:** The cylinder body, expansion space, neck ring, cap, gas cartridge and cartridge holder, plunger rod and piercing mechanism, cap joint washer, hose. Nozzle and bottom ring shall be confirmed as per Indian Specification (IS: 15683).
- c) MANUFACTURING TESTS:** The Extinguishers shall comply all manufacturing tests specified in the IS: 15683, like leakage test, burst strength test, impact resistance test, hose assemblies test, safety locking device etc.
- d) COLOUR:** The colour for extinguisher bodies shall be in fire red colour confirming to IS: 05 and paint shall confirm to IS: 2932.
- e) MARKING:**
- i.) The operating, recharging and inspection and maintenance instructions shall be in the form of an etched or embossed metal nameplate or band, or an acceptable pressure-sensitive nameplate attached to the side of the extinguisher body, or in the form of silk-screening of paint directly on the extinguisher body. The marking shall identify the extinguisher as to type of media and shall include the manufacturer's name and model number and the rating and classification of the fire extinguisher.
 - ii.) The marking shall include a sequential serial number.
 - iii.) The year of manufacture, or the last two digits of the calendar year, and the factory test pressure shall permanently mark into the extinguisher body or non-transferable nameplate. Extinguishers manufactured in the first three months of a calendar year may be marked with the previous year as the date of manufacturer.
 - iv.) The marking shall include a reference to the range of temperatures at which the extinguisher is usable, such as acceptable to use at temperature from..... to or the equivalent.
 - v.) The applicable statement or the equivalent shall be included in the marking: Re-charge immediately after any use.
 - vi.) The gas cartridge shall be permanently marked with:
 - a) Empty mass in gram,
 - b) Nominal full mass in gram,
 - c) Year of manufacturer, and
 - d) Name or code of the manufacturer.
 - vii.) The marking on each extinguisher shall include its exact gross mass or minimum and maximum gross mass, which may be expressed by a tolerance. The gross mass shall include the mass of the charged extinguisher and discharge assembly.
 - viii.) The Extinguisher shall be marked with BIS standard. The use of standard mark will be governed by the provisions of the BIS Act 1986.
 - ix.) Operating instructions: the operating instructions shall be arranged as follows:
 - a) Word "INSTRUCTIONS" shall be at the top of the nameplate.
 - b) Operating instructions shall be in the form of numerically sequenced photograph. The sequence shall be as follows:
 - c) Making ready the extinguisher by disengaging the safety locking device,
 - d) Aiming the extinguisher at the base of fire, included recommended distance from the fire at which to begin discharge, and indicating the intended operating attitude of the extinguisher,

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- e) Taking whatever action necessary to initiate operation of the extinguishers, and
- f) Describing the intended method of applying the extinguishing media on the fire.
- g) The extinguisher shall be marked with letters “B”, and “C” indicating their suitability for respective class of fires.

2) CARBON DIOXIDE (CO₂) GAS TYPE FIRE EXTINGUISHERS:

- a) These Extinguishers shall be based on the Carbon Dioxide (CO₂) gas shall confirm to IS: 15222. The quantity shall be determined by weighing. The filling ratio is the ratio of mass of liquefiable gas that is allowed to be filled into the container in view of safety considerations to the mass of water required to fill the container at 15degree centigrade. It is operated by holding upright, removing the locking pin or seal or safety device from the **wheel type control valve operating mechanism**.
- b) The Extinguisher is made from **seamless** manganese steel cylinders confirming to IS: 7285 with ISI Marked & **approved from Chief Controller of Explosives (CCE)**. Valve confirming to IS: 3224 with ISI Mark.
- c) The extinguisher discharge horn shall be constructed to withstand crushing when 25 kg applied to its extremity for 5 min immediately after having completely discharged the extinguisher through the horn. Check that the horn does not show any evidence of cracking or breakage.

d) PERFORMANCE & CONSTRUCTION REQUIREMENT:

PERFORMANCE	CAPACITY -4.5KG	CAPACITY -22.5KG
Approvals/certification	IS:15683, ISI Marked	IS: 2878, ISI Marked
Fire Rating	13B-21B	As per BIS, Min 21B
Working / Operating Temperature (Degree Centigrade)	-30 to +55	-30 to +55
Burst Pressure (Approx.)	335-350 bar	335-350 bar
Cylinder Testing Pressure	250 bars	250 bars
Minimum Effective Discharge Time	08-17 Second	20-60 Second
Bulk Range % Discharge	02-to-04-meter, 85%	BIS, 95%
Propellant	Carbon Dioxide Gas	Carbon Dioxide Gas
Thickness (Approx.)	4.2 mm	5.5 mm
Height (Approx.)	610-700 mm	1030 mm
Diameter (Approx.)	140-150 (+/- 10) mm	267 mm
Gross Weight (Approx.)	17 kg	93 kg
Extinguishing Agent Charge	CO ₂ Gas	CO ₂ Gas

- e) **CONSTRUCTION:** The cylinder body, discharge fittings, trolley, valve, (i.e., Nozzle, Hose, etc) shall be confirmed as per Indian Specification IS: 15683 & IS: 2878.

f) PAINTING:

- i.) Each Extinguisher shall be painted fire red confirming to shade No. 536 or 537 of IS: 5.
- ii.) A picture showing a man operating the extinguisher in the correct manner shall be shown on the body of the extinguisher.
- iii.) The extinguisher shall be marked with the letters B, & C indicating their suitability for respective classes of fires as laid down in IS: 2190:1992.

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g) **MARKING:** Each extinguisher shall be clearly and permanently marked with the following information:

- i.) Manufacturer's name or trade – mark, serial No., and year of manufacture shall be **EMBOSSSED** at the bottom ring/body/neck.
- ii.) Method of operation in prominent letter.
- iii.) The words “Carbon Dioxide Type” “class BC
- iv.) Capacity of the extinguisher in kg.
- v.) Year of manufacturer of extinguisher and date of refilling.
- vi.) Source, Year of manufacture of the cylinder and its test pressure.

h) The product shall be marked with BIS Standard Mark.

The following information to facilitate filling or recharging shall also be marked on the head of extinguisher or on the neck of the cylinder:

- i.) The weight of extinguisher (to include operating head, Internal discharge tube and carrying handle but not any hose or discharge horn assembly) shown as EW.
- ii.) Filled weight (FW) of extinguisher (to include operating head, internal discharge tube, carrying handle and gas filled contents but not any hose or discharge horn assembly) shown as FW.

3) WATER CO₂ SQUEEZE GRIP CARTRIDGE TYPE PORTABLE FIRE EXTINGUISHERS:

These Extinguishers shall water as per IS: 15683 and **capable of firefighting class A** Fire. Propellant in cartridge operated extinguishers shall be carbon dioxide gas cartridge. The method of expulsion of water shall be by means of pressure produced from compressed or liquefied gas from gas cartridge attached to the cap after piercing it uprightly or by piercing the squeeze grip.

a) PERFORMANCE & CONSTRUCTION REQUIREMENT:

PERFORMANCE	CAPACITY -06 Liter	CAPACITY -09 Liter
Approvals/certification	IS:15683, ISI Marked	IS:15683, ISI Marked
Fire Rating	02A	2A
Working/Operating Temperature (°C)	+05 to +55	+05 to +55
Burst Pressure	55/80 bar (min)	55/80 bar (min)
Cylinder Testing Pressure	35 bars	35 bars
Service / Working Pressure (Approx.)	15-18 bar	14-15bar
Minimum Effective Discharge Time	13-33 Second	13-42 Second
Bulk Range % Discharge	02–06-meter, 85%	02–07-meter, 85%
Propellant	Carbon Dioxide Gas Cartridge	Carbon Dioxide Gas Cartridge
Thickness (Approx.)	1.6 mm	1.6 mm
Height (Approx.)	530-570 mm	570-585 mm
Diameter (Approx.)	150-175(+/- 10) mm	175-180 (+/- 10) mm
Gross Weight (Approx.)	06-10 kg	12-15kg
Extinguishing Agent Charge	Water	Water

These cartridge operated extinguishers the cartridge shall be pierced, and the pressure allowed to build for 06 second before opening the control valve.

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- b) CONSTRUCTION:** The cylinder body, expansion space, neck ring, cap, gas cartridge and cartridge holder, plunger rod and piercing mechanism, cap joint washer, hose. Nozzle and bottom ring shall be confirmed as per Indian Specification (IS: 15683).
- c) MANUFACTURING TESTS:** The Extinguishers shall fulfill all manufacturing tests specified in the IS: 15683, like leakage test, burst strength test, impact resistance test, hose assemblies test, safety locking device etc.
- d) COLOUR:** The colour for extinguisher bodies shall be in fire red colour confirming to IS: 05 and paint shall confirm to IS: 2932.
- e) MARKING:**
- i.) The operating, recharging and inspection and maintenance instructions shall be in the form of an etched or embossed metal nameplate or band, or an acceptable pressure-sensitive nameplate attached to the side of the extinguisher body, or in the form of silk-screening of paint directly on the extinguisher body. The marking shall identify the extinguisher as to type of media and shall include the manufacturer's name and model number and the rating and classification of the fire extinguisher.
 - ii.) The marking shall include a sequential serial number.
 - iii.) The year of manufacture, or the last two digits of the calendar year, and the factory test pressure shall permanently mark into the extinguisher body or non-transferable nameplate. Extinguishers manufactured in the first three months of a calendar year may be marked with the previous year as the date of manufacturer.
 - iv.) The marking shall include a reference to the range of temperatures at which the extinguisher is usable, such as acceptable to use at temperature from..... to or the equivalent.
 - v.) The applicable statement or the equivalent shall be included in the marking: Recharge immediately after any use.
 - vi.) The gas cartridge shall be permanently marked with:
 - a) Empty mass in gram,
 - b) Nominal full mass in gram,
 - c) Year of manufacturer, and
 - d) Name or code of the manufacturer.
 - vi.) The marking on each extinguisher shall include its exact gross mass or minimum and maximum gross mass, which may be expressed by a tolerance. The gross mass shall include the mass of the charged extinguisher and discharge assembly.
 - vii.) The Extinguisher shall be marked with BIS standard. The use of standard mark will be governed by the provisions of the BIS Act 1986.
 - viii.) Operating instructions: the operating instructions shall be arranged as follows:
 - a) Word "INSTRUCTIONS" shall be at the top of the nameplate.
 - b) Operating instructions shall be in the form of numerically sequenced photograph. The sequence shall be as follows:
 - c) Making ready the extinguisher by disengaging the safety locking device,
 - d) Aiming the extinguisher at the base of fire, included recommended distance from the fire at which to begin discharge, and indicating the intended operating attitude of the extinguisher,
 - e) Taking whatever action necessary to initiate operation of the extinguishers, and
 - f) Describing the intended method of applying the extinguishing media on the fire.
 - ix.) The extinguisher shall be marked with letters "A" indicating their suitability for respective class of fires.

NOTE: All components of above fire extinguishers mentioned above should satisfy the requirements of construction material, dimensions, sizes, ratings, tests criteria and all other requirements as per IS 15683 and it should be overall conforming to BIS 15683 with ISI mark.

4) TECHNICAL SPECIFICATIONS OF ABC TYPE MODULAR TYPE SELF EXTINGUISHING FIRE EXTINGUISHER, CAP-5KG

The following important features should be:

- a) An automatic detection and suppression system together in a single unit and should be reusable cylinder.
- b) The system should provide Automatic round the clock protection and nonfreezing.
- c) The system should be Rechargeable and easy to service.

The following performance required as data given as under:

- a) Propellant should be used as Nitrogen Gas.
- b) Working pressure should be 7 to 15 kgs/cm².
- c) Testing pressure should be 35 kgs/cm².
- d) Area of protection should be 3.5-to-4.0-meter square and volume protection should be 8.0 m³
- e) Feasible to hang vertically above risk is 1.5 to 2.0 meter.
- f) Operation time should be 99% in 10-15 seconds.
- g) Extinguishing media should be used **ABC (Mono Ammonium Phosphate- MAP-90)** powder.
- h) The cylinder should be MIG welded M.S. Body 2mm CRC Sheet upper part of which is fitted with adapter or flange for fixing on ceiling wall and below part fixed automatic release Nozzle based on Sprinkler technology unlike the sprinkler nozzle is gas tight the release temperature is adjusted with sprinkler bulb as 57 to 68 degree centigrade with pressure gauge fitted for instant verification of reliability of every unit.
- i) Nozzle should give more than 95% discharge and scattering cone on 40-to-45-degree angle.

D. GENERAL REQUIREMENTS AND MINIMUM TECHNICAL SPECIFICATIONS OF FIRE SAFETY AUTOGLOW SIGNAGES FOR NEW PROPOSED BUILDING OF ADMINISTRATIVE OFFICE BERHAMPUR

1) GUIDELINES FOR THE OEM:

OEM should have online dedicated support center available during working hours and a fully equipped repair and maintenance office in India. Document details to be submitted for the same for verification.

- a) OEM should have valid BIS Certification.
- b) Documents of Manufacturing license/ Excise Registration of the OEM factory need to be submitted for verification.
- c) Product Certification copies to be attached as per the specifications.
- d) Vendor will be responsible for non-genuine products. Audit for Banks whether actual material is provided or not needs to be done by OEM, as and when required by Bank, without any additional cost, as a service support to Bank.

2) WARRANTY & GUARANTEES:

The supplier should also give guarantee for the Auto glow Signages and LED Based Emergency Lights as per OEM recommendation. The supplier must warrant all equipment, accessories, spare parts etc., against any manufacturing defects during the warranty period. Service Provider shall be fully responsible for the manufacturer's warranty in respect of proper design, quality, and workmanship of all equipment, accessories, etc.

3) The following specifications required for flexible sheet and rigid sheet auto glow signage:

S. No.	Particulars	Flexible Sheet signage	Rigid Sheet signage
Glow signage:			
I.	Description	Flexible signage should be photo luminescent based glow-in-dark sheeting with luminous properties enclosed in a weatherproof UV stabilized film with UV screen printing.	Rigid signage (on Acrylic sheet) should be photo luminescent based glow-in-dark rigid sheet with high intensity luminous properties enclosed in a transparent weatherproof UV stabilized coated sheet, with UV screen printing (lamination).
II.	Thickness and service temperature	0.2 mm (+/-: 10%), -20 to +120 °C	1mm (+/-: 10%), -20 to +120 °C Sheet thickness 2.5 to 3.0 mm
III.	Surface Colour	Greenish yellow	Greenish yellow
IV.	Visibility	Glow visible up to 1-2hrs in total darkness	Glow visible up to 1-2hrs in total darkness
V.	Properties	Fungi static, Nontoxic, Non-radioactive, contains no lead or phosphorous, Simple to install by pasting and Self extinguishing	Fungi static, Nontoxic, Non-radioactive, contains no lead or phosphorous, Simple to install by screwed or just peel off to stick and Self extinguishing
VI.	Life	Life > 10-15 years for best working in indoor	Life > 10-15 years for best working in indoor

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VII.	Certifications	These signs adhere to BS: 5499-1 and the health & safety (safety signs & signage) regulation.
LED CONFIGURED EMERGENCY (E)/NON-EMERGENCY EXIT (NE) EDGELIT LIGHT:		
a) Should be Ceiling mounted and confirmed IS:9583, b) The facia on clear acrylic and the arrow should be available, c) Facia on clear acrylic and the arrow should be Visible from both sides. d) Ni-Mh/Ni-Cd rechargeable battery with constant voltage charger and maintained battery backup for 02 hrs minimum, e) Input 230 V, 50Hz. f) Size should be 180mm x 300 mm in Aluminum Housing Body (25mm x 45 mm).		

Also, the following specifications are required for Auto glow / Led Based Fire Safety Sign-ages must be followed by the applicants wherever required by the Bank Branches/Offices:

- i.) Is: 10322 (Part-5/Sec-8):2013 "Led Luminaries for Emergency Lighting.
- ii.) Is: 12349:1988 "Fire Protection-Safety Signs"
- iii.) Is: 9457:2005 "Safety Colors and Safety Signs"
- iv.) Is: 9583:1981 "Specification for Emergency Lighting Units"
- v.) National Building Code of India-2016

Note: The make quoted as per technical specification AND the information brochure for the signage should be enclosed.

4. LOCATION TO BE INSTALLED

S. NO.	LOCATION TO BE INSTALLED
1.	Main EXIT door from inside
2.	In banking hall or any gallery to indicate the EXIT gate (Left direction)
3.	In banking hall or any gallery to indicate the EXIT gate (Right direction)
4.	At the staircase landing area towards getting down direction
5.	In banking hall or any gallery to indicate the EMERGENCY EXIT gate (Left direction)
6.	In banking hall or any gallery to indicate the EMERGENCY EXIT gate (Right direction)
7.	At each door both side
8.	lift lobby for marking Outside Fire Lift
9.	All floors / Near Stationary / Record room
11.	Near fire alarm manual call point (MCP)
12.	Near main electrical panel & master switch
13.	Near hydrant point if hydrant system installed
14.	Near the Fire Extinguishers
15.	Safe area to be marked outside of the premises for assembly of the occupants in case of emergency
16.	lift lobby above the lift entrance door centrally in the lift lobby on all the floors and one inside the Lift car
17.	Near the Fire Alarm Panel ideally located near Exit Gate
18.	Green Diagonal laminated scratch proof Tape on Flexile material for Marking safe area and exit door highlighting escape identification at staircase
19.	Green Diagonal laminated scratch proof Tape on Flexile material for Marking safe area and exit door highlighting escape identification at staircase
20.	Way Finding Tape on Flexile material laminated scratch proof for (Low location light), directional route marking way finding (Left / Right-handed directional)

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21.	To be pointed towards EXIT gates at each floor as per requirements. LED configured emergency (E) edge lit light: Should be Ceiling mounted Size should be 180mm x 400 mm in Aluminium Housing Body (25mm x 45 mm).
22.	EXIT gates at each floor as per requirements Self-contained rechargeable emergency (LED MULTI LIGHTS WITH आपातकालीन निकास / EMERGENCY EXIT (Hindi & English both) & SIGNAGE) automatically switched-on mains power failure and provides illumination on battery source for specified duration

SCHEDULE OF RATES

1. The schedule of rates should be read in connection with all the other sections of the tender.
2. The quantities shown against the items of work are only approximate and may vary to any extent. No extra whatsoever shall be entertained.
3. The rates inserted in the bills of quantities are to be for the full inclusive value of the work described under the several items, including all cost and expenses which may be required in and for the construction and full protection of the work described, together with all risks, liabilities, and obligations set forth or implied in the documents on which the tender is based. The quoted rates shall be for all heights, lifts, and lead unless otherwise mentioned specifically in the description of the item.
4. General direction and description of work and materials given elsewhere in the contractor documents are not necessarily repeated in the Bill(s) of quantities. Reference to be made to the other documents for the full information/details.
5. The contractor shall be deemed to have visited the site before quoting for the tender and to have examined for himself the conditions under which the work will be carried out including local conditions affecting labor and to have studied the items of the bills of quantities, the drawing and specification, relating to them and to have satisfied himself that the rates quoted by him provide for all minor accessories and contingent works or service as necessary for the works described even though there are not specifically defined.
6. Tenderer is advised to read items of works carefully and quoted the rates accordingly. However, if he quotes different rates for the same item(s) of work under different schedules of items, the lowest rates quoted shall be made applicable to all the Bill of Quantities and the contract sum shall be corrected accordingly.
7. Where an item of work not mentioned in a particular bill of quantities, is required to be executed and where the rate for such an item of work is quoted under a different bill of quantities forming a part of this contract, then the contractor being called upon shall execute the work and shall be paid at the rate so quoted. Nothing extra over shall be payable on this account.
8. The drawing(s) attached with this tender document are for the purpose of tender, giving the tenderer a general idea of the nature and the extent of works to be executed.
9. The rates quoted by the tenderer shall be deemed to be for the execution of the works in accordance with the "Construction Drawings" (to be supplied to the contractor at the "Design Aspect" of these drawings).
10. The rates quoted by the tenderer shall include all labor, tools and plants, materials inclusive of all, transport, loading, unloading charges, all levies, all taxes, excise duties, etc. at the time of quoting their rates. The quoted rates shall remain firm throughout the contract period. No escalation on prices of labor and materials shall be entertained.

LETTER OF UNDERTAKING

To,
The Assistant General Manager
Premises & Estate Dept.,
2nd Floor, J. N Marg, Kharvel nagar,
Bhubaneswar

Dear Sir,

Construction of Proposed G+2 Storied Building for Administrative Office & Regional Business Office at Ambapua, Berhampur, Odisha.

Having examined the terms & conditions, drawings, specifications, design relating to the works specified in the memorandum hereinafter set out and having visited and examined the site of the works specified in the said memorandum and having acquired the requisite information relating thereto and affecting the quotation, I/We hereby offer to execute the works specified in the said memorandum within the time specified in the said memorandum on the percentage rate basis mentioned in the attached schedule and in accordance in all respect with the specifications, design, drawings and instructions in writing referred to in conditions of Tender, conditions of contract and with such conditions so far as they may be applicable.

MEMORANDUM

(a)	Description of work	Construction Of G+2 Storied Building For Administrative Office & Regional Office at Ambapua, Berhampur, Odisha
(b)	Earnest Money	Rs.7,26,700/- by means of Demand Draft / Pay Order from any scheduled Nationalized Bank drawn in favor of "SBI" and payable in "Bhubaneswar".
(c)	Time allowed for completion of work from the date of issue of work order.	18 calendar months from the date of commencement as per tender.

Should this tender be accepted, I/we hereby agree to abide by and fulfill the terms and provisions of the said conditions of Contract annexed hereto so far as they may be applicable or in default thereof to forfeit and pay to SBI, the amount mentioned in the said conditions.

I/we have deposited Demand Draft / Banker's Cheque / FDR for a sum of **Rs.7,26,700/-** as Earnest money deposit with the SBI. Should I/we do fail to execute the contract when called upon to do so, I/we hereby agree that this sum shall be forfeited by me/us to SBI.

We understand that as per terms of this tender, the SBI may consider accepting our tender in part or whole or may entrust the work of **Construction Of G+2 Storied Building For Administrative Office & Regional Office At Ambapua, Berhampur, Odisha**. We, therefore, undertake that we shall not raise any claim / compensation in the eventuality of Bank deciding to drop any/part of the building / buildings from the scope of work of this tender at any stage during the contract period. Further, we also undertake to execute the work entrusted to us in phases on our approved rates and within the stipulated time limit without any extra claim for price escalation.

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As when ask by the SBI, I/we shall submit the supporting technical data sheet, specification and make of the items as per the BOQ.

We, hereby, also undertake that, we will not raise any claim for any escalation in the prices of any of the material during the currency of contract/execution/completion period.

Yours faithfully,

Signature of contractor
With Seal